

SPECIAL ISSUE 2

OCTOBER 2024

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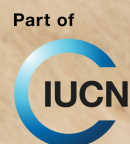
SPECIAL ISSUE

SCIMITAR-HORNED ORYX

BACK TO THE WILD



Antelope
Specialist
Group



Species Survival Commission



IUCN Species Survival Commission *Antelope Specialist Group*

Welcome to the **GNUSLETTER** Special Issue Number 2, which is exclusively dedicated to the Scimitar-horned Oryx. **GNUSLETTER** is the biannual newsletter of the IUCN SSC Antelope Specialist Group (ASG). First published in 1982 by the first ASG Chair Richard D. Estes, the intent of **GNUSLETTER**, then and today, is the dissemination of reports and information regarding antelopes and their conservation.

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

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- David Mallon, ASG Co-Chair
- Philippe Chardonnet, ASG Co-Chair

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- Sophie Whitemore, Marwell Wildlife
- Tania Gilbert, Marwell Wildlife

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GNUSLETTER Special Issue: Scimitar-horned Oryx Editorial Board

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Front Cover. *Scimitar-horned Oryx, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad* (©Jaime Dias/Wings for Conservation)



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FOREWORDS

Statement from the IUCN SSC Chair

Jon Paul Rodríguez

Chair IUCN Species Survival Commission



When I decided to run for Chair of the IUCN Species Survival Commission (SSC) in 2015, I reached out to the Leaders of the SSC for inspiration. I asked them: Why do you do this work? How come, in addition to a very busy professional life, you chose to volunteer and spend several hours of your time dedicated to SSC?

The answer was always the same. They said: We are experienced with red listing. We know how to do assessments and reassessment. We will continue doing these, as we understand their importance and significance to the global conservation community, their use by biodiversity conventions. But we do not want to be remembered for listing a species, we want to be remembered for saving them!

This issue of *Gnusletter* is a celebration of saving species. The downlisting of the Scimitar-horned Oryx (*Oryx dammah*) from Extinct in the Wild to Endangered and Saiga antelope (*Saiga tatarica*) from Critically Endangered to Near Threatened, are massively important success stories. In both cases, the outcome was achieved thanks to a vision, followed by dedication and partnership, with a strong dose of evidence-based interventions. Governmental commitment and leadership from Environmental Agency Abu Dhabi and the Chadian government in the case of the oryx, and national governments in the distribution of Saiga were fundamental. But engagement with academia and civil society were also key. Achieving a one-step downgrading in IUCN Red List category is already a major feat – achieving two or three, as shown here, and in such a short period is very uncommon.

Almost a decade ago, the IUCN Species Survival Commission adopted the species conservation cycle, which includes three sequential steps – assess, plan, act – and two transversal components – network and communicate. All the activities of our more than 10,000 experts in almost every country of the world (recognized by Guinness World Records as the largest volunteer conservation-science network) are guided by this framework. *Assess* is about understanding and informing the world of the status and trends of biodiversity, such as the IUCN Red List of Threatened Species. *Plan* addresses the development of collaborative, inclusive and evidence-based conservation strategies and policies. *Act* refers to convening and mobilizing conservation actions to improve the status of biodiversity. *Network* enhances and supports collaboration and capacity building among experts. *Communicate* aims to drive strategic and targeted communications to enhance the impact of species conservation initiatives.

The success stories of the recovery of Scimitar-horned Oryx and Saiga antelope are examples of effective application of the species conservation cycle. Since 2009, the number of targets of SSC Groups that focus on action has almost doubled, reflecting the desire of SSC Leaders to impact positively on the status of species that they work with. A few decades ago, some might have thought that the Scimitar-horned Oryx and Saiga antelope had declined beyond hope, and that their survival would be linked to human care, at best. But history has shown that carefully planned, evidence-based interventions can work, when they bring together all the relevant players. I look forward to learning about more stories of the recovery of antelopes and other taxa, to reaffirm that conservation works... but we need to do much more of it to reverse biodiversity decline.



Statement from the Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals



Clara Nobbe

Head, Terrestrial Species Team, CMS

The Secretariat of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) is particularly pleased to see the recovery of both the Scimitar-horned Oryx (SHO) and Saiga Antelope. Both species have been listed on CMS Appendices (SHO on Appendix I and II in 1994 and 1979 respectively and Saiga on Appendix II in 2002) triggering intensive conservation efforts by Range States of the species, scientists and conservation organizations through the Sahelo-Saharan Megafauna Concerted Action and the Memorandum of Understanding concerning Conservation, Restoration and Sustainable Use of the Saiga Antelope. The re-classifications of SHO and Saiga show that if there is political will and concerted effort, it is possible to bring species back from the brink of extinction.



Herd of Scimitar-horned Oryx, Dghoumes National Park, Tunisia (©Tim Woodfine)



Saving the Scimitar-horned Oryx from extinction: a testament to vision, unwavering commitment and solid partnership



H.E. Dr Shaikha Salim Al Dhaheri

Secretary General, Environment Agency – Abu Dhabi

Since 2012, the Environment Agency – Abu Dhabi (EAD) has played a pivotal role in the restoration efforts aimed at reviving endangered desert wildlife in Chad. Under the visionary leadership of H.H Sheikh Hamdan bin Zayed and inspired by the enduring legacy of the late Sheikh Zayed, EAD undertook this monumental initiative to reintroduce the Scimitar-horned Oryx to its historical habitat in Chad. This initiative stems from the UAE's commitment to environmental conservation and reflects Sheikh Zayed's profound vision of safeguarding biodiversity for future generations. With the UAE serving as home to the world's largest single population of oryx, our involvement in Chad symbolises our nation's dedication to preserving natural ecosystems and upholding Sheikh Zayed's heritage of environmental stewardship.

This work has been done in partnership with many institutions across the world and in collaboration with the Government of Chad who have been our partners since the conceptualisation of the project. Implementing such a large-scale reintroduction project was only possible through continuous engagement with all key stakeholders, both in the country and across the world and remains one of the finest examples of working together for an important cause.

The downlisting of the Scimitar-horned Oryx from 'Extinct in the wild' to 'Endangered' by the International Union for the Conservation of Nature (IUCN) is a testament to the vision and years of constant dedication and collaboration. We are immensely proud of this achievement, which underscores the success of the world's most ambitious reintroduction program in Chad.

It is a moment of great personal significance, reflecting the culmination of our unwavering commitment to conservation. We extend our heartfelt gratitude to our wise leadership, inspired by the late Sheikh Zayed, whose vision continues to guide us. Moreover, this milestone represents a pivotal moment for the institution I lead – the Environment Agency – Abu Dhabi (EAD), reaffirming the effectiveness of our strategies and the importance of collective action in safeguarding endangered species. It inspires us to continue our efforts with renewed enthusiasm, knowing that our work can make a visible difference in preserving biodiversity. Reversing the fortunes of the Scimitar-horned Oryx, is one of the few conservation success stories in the world. It raises hope and reaffirms that species can bounce back with our help and commitment.

Restoration of endangered species is undeniably a long-term endeavour that demands unwavering commitment, specialised expertise, partnerships, and substantial funding. These elements were integral to the success of the Scimitar-horned Oryx introduction program in Chad. As we chart the course forward, we anticipate the need to navigate complexities such as securing habitats, mitigating human-wildlife conflicts, and addressing the pervasive threats posed by climate change and habitat degradation.

However, we remain steadfast in our resolve, motivated by the success of the oryx program and the interest expressed by other countries in emulating our initiative. Our focus now extends to similar plans for other critically endangered species, including the Addax and Dama Gazelle. By leveraging our experience and fostering collaboration, we are confident in our ability to overcome these challenges and advance our mission of conserving endangered desert wildlife.



EDITORIALS

Downlisting the Scimitar-horned Oryx

David Mallon, Sophie Whitmore, Tania Gilbert & Philippe Chardonnet
For the IUCN SSC Antelope Specialist Group Chairs and Programme Office

This Special Issue has been produced to celebrate the positive change in status of the Scimitar-horned Oryx on the IUCN Red List of Threatened Species™. Scimitar-horned Oryx became extinct in the wild by the end of the 1980s or early 1990s. Animals from the large *ex situ* population were re-established in fenced protected areas in Tunisia beginning in 1985 and in Senegal in 1998. The programme to reintroduce a fully free-living population in Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR, *Réserve de faune de Ouadi Rimé – Ouadi Achim*) in Chad began in the early 2000s. The first group of captive-bred Scimitar-horned Oryx was transferred from Abu Dhabi to Chad in March 2016 and placed in an acclimatisation enclosure. Twenty-one oryx were released into the wild in August 2016 and the first wild birth was recorded in September. Eight more releases have occurred and young oryx have been born every year since 2016.

According to the Red List guidelines, a species can move out of the Extinct in the Wild category if it has persisted for five years, or when viable offspring have been produced (whichever is longer). The purpose of this rule is to ensure that the reintroduced population has become established and is not just a short-lived success.

These conditions were met for the species in August 2021, but political uncertainty and restrictions imposed due to the COVID-19 pandemic affected travel, monitoring and conservation work, so the assessment was delayed until we were confident the improved situation had been maintained. Oryx mortality due to disease in 2018 and hot weather in 2024 underlined this need for caution. By late 2022, the oryx population was estimated at 575 but with a very wide confidence interval (227-1452). On the precautionary principle, as recommended in the Red List guidelines, the lower figure of 227 was used for the assessment, equating to 140-160 ‘mature individuals’ (defined by the Red List as those capable of breeding). This total was well above the threshold of 50 for Critically Endangered, so Scimitar-horned Oryx qualified for the Endangered category under criterion D. Following consultation with the main stakeholders, the assessment was completed and submitted on 1 November 2022.

Scimitar-horned Oryx thus became the third large mammal species to have been reintroduced successfully after having been extinct in the wild and downlisted on the Red List. The other two being Przewalski’s horse (*Equus przewalskii*), reassessed as Critically Endangered in 1998 and Endangered in 2011, and Arabian oryx (*Oryx leucoryx*), reclassified as Vulnerable, also in 2011. The success of all three operations demonstrates clearly that restoration of viable wild populations of large mammals is achievable.

The population in OROAFR is well protected and if it continues to grow the species may soon reach the threshold for the next category, Vulnerable (more than 250 mature individuals). However, a single population is inherently susceptible to stochastic events such as disease, poaching, drought, fire, ineffective management, or changes in the security situation. Therefore, long-term viability of the Scimitar-horned Oryx will require more populations to be reestablished across parts of the former range.





A feasibility study on the reintroduction of Scimitar-horned Oryx to a reserve in Niger has been produced and Morocco's national strategy envisages the reintroduction of the species at an appropriate time in the future. However, the costs of restoring free-living populations and subsequent patrolling, monitoring and management, are considerable. Another major challenge across the whole region lies in identifying extensive areas of habitat that are in good condition and can be protected from uncontrolled hunting. These constraints will likely limit the number of potential reintroduction sites that could be considered in the next few years.

Other options are available. In Tunisia there are around 200 Scimitar-horned Oryx held at four sites and managed under a metapopulation strategy, as well as over 200 in an enclosure inside Ferlo Nord Faunal Reserve (*Réserve de faune du Ferlo Nord*), Senegal. Expanding these initiatives and exploring ways to integrate their oryx populations into the Red List would be a positive step. In fact, under the current circumstances, releasing oryx in large, fenced enclosures may be a more realistic scenario in the short or medium-term.

The large *ex situ* population (around 15,000) and good genetic information provide both an insurance against the complete extinction of the species and a reliable source of animals for operations to establish either free-living or fenced populations: the long-term restoration of the Scimitar-horned Oryx across its historic range will surely require the use of both these, and all other available strategies.



Running scimitar-horned Oryx in OROAFR, Chad (©Jaime Dias/Wings for Conservation)



A quirk of fate

Tim Woodfine
Sahara Conservation



By a quirk of fate, my first meaningful experience with scimitar-horned oryx was assisting the release of animals into Sidi Toui National Park (*Parc national de Sidi Toui*) in Tunisia in 1999. By the end of 2023, I had the pleasure of watching herds of truly wild Scimitar-horned Oryx in Ouadi Rimé–Ouadi Achim Faunal Reserve (OROAFR) in Chad just prior to the formal IUCN Red List announcement that the species was no longer Extinct in the Wild. The intervening years interwove threads of interest from Tunisia to Chad, and with the international zoo and scientific communities, including some personal highlights and seminal moments in the recent history of this iconic species.

In 1998, the Convention on Migratory Species Djerba Declaration on the Conservation and Restoration of Sahelo-Saharan Antelopes brought much needed attention to the plight of the oryx and its close relatives. However, for many of us it was the subsequent formation of the Sahel & Sahara Interest Group (SSIG) that catalysed the critical connections that would underpin the progress over the next two and a half decades. Indeed, it was through close knit relationships at SSIG that we founded the Sahara Conservation Fund that would go on to play a pivotal role in the process. The SSIG meeting in Abu Dhabi in 2008 proved to be a particularly important moment, bringing together representatives of range states and global custodians of captive scimitar-horned oryx for the first time to discuss the future of the species. Indeed, that initial dialogue opened a pathway toward the eventual reintroduction of Scimitar-horned Oryx in Chad.

At this time, Tunisia was leading the way. The Sidi Toui project followed an earlier release of scimitar-horned oryx into Bou Hedma National Park (*Parc national de Bouhedma*), and gave impetus for the translocation of animals to Oued Dekouk National Reserve (*Réserve naturelle d'Oued Dekouk*). Taking into account the need to manage oryx across a network of fenced protected areas, the next significant step was the formulation of a new national strategy for the conservation of the species. This was achieved at a meeting in Douz in 2004 and included the goal of bringing oryx to a fourth protected area. Hence, in 2007 after considerable local and international preparation, animals were translocated from Bou Hedma to Dghoumes National Park (*Parc national de Dghoumès*), then genetically augmented with stock from US and European zoos. I enjoyed many more visits to Dghoumes, witnessing the growth in oryx numbers, impressive regeneration of vegetation and recovery of other species benefitting from protection of the habitat. It shortly became a rewilding success under the umbrella of oryx reintroduction.

Elsewhere, the search was on for a location where an unrestricted, free-living population of oryx could be re-established. I recall numerous in person and online workshops and including a detailed site selection process that ultimately pointed to the OROAFR in Chad. The game changer was the ground-breaking agreement between the Environment Agency – Abu Dhabi and the Government of Chad, bringing the vision and ambition to enable the dream to become reality. The captive breeding programs that provided animals for Tunisia now contributed to a genetic ‘world herd’ in Abu Dhabi as the source population. Sahara Conservation and supporting partners then undertook the now well-documented process of implementing the reintroduction of scimitar-horned oryx to this vast landscape.

Throughout the years the outstanding memories have been about collaboration, friendships and a shared sense of purpose amongst the many people from many backgrounds who contributed to the story of the Scimitar-horned Oryx. From zoos to the field, from physical work to board room decisions, it has taken a cast of thousands. Seeing the species back in its natural environment and celebrating the successes in Tunisia and more recently in OROAFR with our Chadian and international colleagues has brought special satisfaction but tempered with the knowledge that conservation is a journey not an end point, and there is still more to do!



The Sahel & Sahara Interest Group annual meeting, 2024, Morocco (©Sahara Conservation)



Scimitar-horned Oryx in the Ouadi Rimé–Ouadi Achim Faunal Reserve, Chad (©Tim Woodfine)



The next conservation success

Violeta Barrios

Sahara Conservation



Last December 2023, the Scimitar-horned Oryx was officially reclassified from Extinct in the wild to Endangered by the IUCN Red List - joining the very few species to be downlisted from Extinct in the Wild at a global level. From an initial group of 25 oryx arriving to Chad in March 2016, there are now over 600 individuals roaming free in Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR).

In times of unprecedented biodiversity loss, this major success story gives us hope and reasons to believe conservation works. Almost more importantly, this downlisting recognized the value of a long-term initiative, which mobilized a vast, cross-border collaborative effort engaging the Government of Chad, the Environment Agency of Abu Dhabi, Sahara Conservation, the Smithsonian's National Zoo and Conservation Biology Institute, the Zoological Society of London, the Royal Zoological Society of Scotland, Saint Louis Zoo, Marwell Wildlife and Fossil Rim Wildlife Center, and so many others.

The remarkable comeback of the Scimitar-horned Oryx represents both the restoration of a species, and also of a whole ecosystem through the role they play in it, as well as the opportunity to restore other critically endangered species while putting desert ecosystems on the global conservation agenda. Indeed, the Scimitar-horned Oryx has become a flagship species for an entire community of desert wildlife, plants, and habitats. Its restoration is providing positive benefits for other animals, such as the addax, dama gazelle, vultures and carnivores.

While we celebrate this significant conservation milestone, we can't but look to the future as efforts must continue to secure the long-term survival of what is still a threatened species. And next steps will inevitably mean focusing on the vast conservation and socio-cultural landscape of the OROAFR. Because even if oryx became extinct due to humans 40 years ago, to succeed conservation must transition through meaningful relationships between nature and humans, protecting biodiversity *for* humans, rather than *from* humans. Indeed, times of the traditional conservation approach of managing protected areas from which people are excluded as much as possible are gone. New approaches require people and organizations involved in the management of multi-purpose protected areas to engage with all stakeholders to entail the construction of management models that integrate humans and nature instead of separating them.

Our next conservation success will be that of humans and nature in Ouadi Rimé – Ouadi Achim Faunal Reserve thriving equally in harmony.



HISTORY

Oryx: ambassadors for change and harbingers of rainfall

John Newby
Sahara Conservation



Late last year I had the privilege of interviewing two senior members of Chad's pastoralist community as part of a new documentary being made on the groundbreaking initiative underway in the Ouadi Rimé – Ouadi Achim Faunal Reserve to reintroduce the Scimitar-horned Oryx. The filmmaker, Sean Viljoen, was keen to have a local perspective on the reintroduction and had asked me to organize the interview and act as interpreter. The two elderly gentlemen we interviewed, Bishara Hidjer and Hissein Talko, are both local Arabs and had been born and brought up in traditional pastoralist families in the area covered by the reserve since its creation in 1969. Both were familiar with the oryx before its extinction in the wild in the late 1980s and were well placed to provide us with some objective, firsthand insights into the antelope's return and the value of the reintroduction project to the local people.

In a nutshell, both Bishara and Hissein were highly supportive of the initiative, stressing the value to them of the reserve's wildlife and especially the oryx, an iconic species. Wildlife is considered to be a form of wealth, alongside their livestock. It is an indicator of environmental quality and a harbinger of plentiful rain and pasture. They both recalled the fact that the first rains to fall in 2016 – the year the oryx were brought back to Chad – were precisely where the antelopes were being held prior to their release. Fortuitous coincidence or not, the event was taken as a singular omen.

Knowing of the passion the Arabs had for hunting the oryx before its extinction, I quizzed them on this, stimulating a lively and informative discussion. Both had hunted oryx, describing how it was carried out. This tallied with my own experience from the 1970s, when part of my job was to join anti-poaching patrols in the Ouadi Rimé-Ouadi Achim reserve. Although oryx hunting could take place at any time of the year, the hot season was preferred, partly because the oryx could be found in relative proximity to the pastoralist' camps, and partly because at this time of the year, when temperatures regularly reach 45°C in the shade, the oryx tire more easily and are reluctant to leave the shady bosquets under which they shelter for most of the day. Hunting was carried out on horseback, with spears and lances. Hunting parties were often significant in size, occupying whole families. Camels would be loaded with food and water for people and horses, and if the hunt was successful, replaced by sacks of dried meat for the journey home.

Apart from its excellent meat, fresh or dried, the oryx was particularly prized for its hide and the sturdy leather products that could be manufactured from it. Sandals were a popular item, along with ropes used for securing baggage and drawing water. These were pre-plastic days, when the use of leather, wood and palm fibre was common practice for all manner of household goods, tools, storage containers, etc. Especially prized were the large *girfa* sacks used to store cereals, like sorghum and millet, and the wild *kreb* grass seeds collected during the rainy season along the margins of temporary watercourses or wadis. A good sack required the hides of two oryx and when tanned and sewn together could hold well over 100kg each.

Oryx hide, especially that of the neck, chest and shoulders of the males, is especially robust. Not surprising really when one considers the long, sabre-sharp horns and the spectacularly fierce territorial battles the males engage in. It's amazing how any of them manage to survive. Seriously scarred oryx are not uncommon to see and it is not unusual to find dead males that have succumbed to their wounds, often sporting sizeable lengths of broken horn embedded in their necks or shoulders.

Medieval travellers, like Al-Hasan ibn Muhammad al-Wazzan, aka Leo Africanus, and Valentim Fernandes, chronicling the trans-Saharan trade between what we know of today as the Sahelian countries



of Senegal, Mauritania, Mali and Niger, and North Africa and beyond, mentioned the vibrant and extremely lucrative trade in the hides of an animal known as the *lamt* or *lemta*. Alongside ivory, ostrich feathers and slaves, the trade in the raw hides of what we now know to be the Scimitar-horned Oryx was considered very profitable. The demand from the armies of the north for the manufacture of highly prized shields and parts of body armour was considerable. In his description of Africa from Ceuta to Senegal, written around 1506-1507, Valentim Fernandes lists the prices of trade goods brought from the interior for sale in the major entrepots. An oryx hide was equivalent in price to that a camel, slightly less expensive than a slave.



Oryx hunting party pictured in 1975, OROAFR, Chad (©John Newby)

If the shields made in Europe and North Africa were mostly round, and as such easier to handle and carry into battle, a full, body-length version made from an entire oryx hide was preferred by the sword-bearing Tuaregs of the central Sahara. Beautifully decorated, often with copper or silver inlays, the *ayar* was a highly prized item, handed down from generation to generation. Examples of these impressive shields can be found in several European and American museums.

Returning to the interview with Bishara and Hissein, they both stressed the need for a strong and well managed protected area for the oryx and other wildlife. While recognising increased numbers and impacts of livestock, they also underlined the presence of adequate space to satisfy the needs of both pastoralists and wildlife. Finding equitable solutions to successfully accommodate competing demands for access to water, grazing and space is critical to the long-term success of the oryx reintroduction programme and the growth of a sustainable, secure and free-ranging oryx population.

Personally, I am convinced it can be done but it's not going to be easy. Long gone are the days when the area covered by the reserve was occupied by a small number of mostly subsistence pastoralists, exploiting the land in rhyme with the seasons and the constraints imposed by an austere environment and severe climate. Today, people have access to an escalating number of deep wells and boreholes, are becoming increasingly sedentarised, and as result the number of livestock has skyrocketed, increasing impact on the land, agricultural encroachment, competition with wildlife, bushfires and poaching. Furthermore, subsistence herding is being replaced by more business-orientated practices, dominated by a relatively small number of monied and influential operators that can afford to bring water to their animals rather than the reverse. The rapid expansion in the use of portable water bladders, filled by bowsers trucked in from afar, means that fragile pastures are being over exploited. In the past, the lack of water meant that large areas were abandoned during several months of the year, saving grazing from overuse and creating a vast area where wildlife had an unopposed monopoly. Unless proper resource and land use management is brought to the reserve, ultimately everyone will suffer, especially the poorer communities that still operate in more traditional ways; ways that favoured a more equitable and softer use of the land and provided time for pastures to recover during waterless periods.

Like Hissein and Bishara, I am convinced the return of the oryx can play a significant role in the search for viable solutions. The story of its return from imminent extinction, especially a return using animals



whose forebears originated in Chad, has captured the attention of the nation. There is both pride in and recognition of the oryx as an important cultural asset. As an ambassador for change and the search for both viable and sustainable conservation solutions there is none better. Or as Hissein so rightly put it, if it were not for the presence of oryx and other wildlife in the desert, why on earth would the Good Lord see fit to bring rainfall there at all.



Oryx hunting party pictured in 1975, OROAFR, Chad (©John Newby)

Some interesting reading

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Oryx in the prehistoric rock paintings and engravings of the Sahara

Koenraad De Smet, Yves Gauthier & András Zboray

Prehistoric rock art is found all over the Sahara, leaving a record of the environment and the way of life of its ancient inhabitants. The depictions show a wide range of subjects, among them both domesticated and wild fauna, and their interactions with humans. The way wildlife and livestock were mixed provides much information about the contemporary environment and habitats.

Not surprisingly, Scimitar-horned Oryx (*Oryx dammah*) were regularly depicted, both in paintings and in engravings. The species appears in scenes ranging from the Red Sea littoral in the east up to the Atlantic Ocean in the west. It is remarkable that the oryx is more often depicted than the other key desert species, the addax, frequently appearing in hunting scenes, being chased by dogs and humans.



The age of most Saharan rock art ranges broadly from 6500 to 2000 BCE, with some more favoured regions extending until the start of the Common Era. In the Messak region (SW Libya), the large format engravings may be more precisely dated to the 4500-4000 BCE period, while the very fine Iheren-style paintings of the Tassili n'Ajjer (SE Algeria) to 3500-3000 BCE. One needs to be prudent for overall conclusions, however, we may note that most depictions are from pastoral or post-pastoral periods, that is the later part of the rock art producing period (e.g. Jebel Uweinat region of Egypt/Libya/Sudan border region). One may also note that overall, the oryx were less represented in the western part of the Sahara (Mali, Mauritania, former Rio de Oro). Based on the archeozoological record one may safely assume that the shown species in all cases is the Scimitar-horned Oryx, there is no record of any of the other species ever inhabiting the Saharan region.



Map of North Africa showing location of selected sites with depictions of Scimitar-horned Oryx



The attached map shows the location of selected sites with oryx depictions; however, it needs to be stressed that it does not represent all known locations. The various locations are from different (and sometimes precisely unidentifiable) periods from within the broad temporal range, and only illustrate where the animals were present. Not all groups practiced rock art, animals or themes were represented selectively and we lack images in erg / reg / swamp regions for obvious reasons (absence of rock shelters or outcrops) which make up a large part of the Sahara. Oryx were most likely present in regions where there is presently no depiction.

In the following pages several examples are provided that depict this species, both paintings and engravings. Some images are processed with Photoshop or DStretch, a software developed to enhance faint rock paintings, as noted.



Oryx rock art depicted in Adjujel, Algeria (©Yves Gautier)



Oryx rock art depicted in Meesak, Libya (©Yves Gautier)



The Scimitar-horned Oryx: an analysis of different vernacular names

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Introduction

The Scimitar-horned Oryx (*Oryx dammah*) was an abundant and widespread species in the arid and semi-arid areas of North, West and Central Africa before its extinction in the wild in the late-1980s (Meunier, 1922, 1924; Jebali, 2008). Its range extended across both the vast steppes north of the Sahara and the endless plains of the sparsely wooded Sahelian zone to the south. In these large spaces, the species, known for its great movements (In Tanoust, 1930; Dekeyser, 1955), interacted with humans who used the available natural resources and hunted the oryx itself. These people, with their varied and intertwined origins and histories, had their own perceptions of the natural world around them. To distinguish the components of their environment, they assign names to each in their own language or dialect based on a striking detail, a dominant characteristic or a significant event. The Scimitar-horned Oryx, an imposing antelope by its size, colouration and thickness of its skin, and especially by its long and arched horns did not go unnoticed.

In this note, we describe the different names given to this species by people that have encountered it across its range. For the purposes of this paper, we will ignore the multiple scientific names attributed to the species over time since its first description by Western taxonomists. Without claiming to be specialists in linguistics, we resign ourselves to compiling according to the availability of different names left in old accounts dating from the classical period and especially from the 19th and 20th centuries. These are the works of travellers, explorers, hunters, soldiers, anthropologists, historians and scientists. Often, these same people took on several roles, especially during the colonial period. The name's transcription will be identical to that found in these works (in English/French/or other) even if it indicates the same thing. While listing the various vernacular names attributed to the oryx it is difficult to overlook the relationship between the oryx's name in some parts of its range and the use to which the hide of the antelope was put in the fabrication of medieval shields and body armour.

Results and Discussion

The inventory of local names for the Scimitar-horned Oryx shows that the antelope has throughout its range more than twenty different denominations excluding the specific derivatives for different age or sex classes (male, female, young, group or solitary animal). However, despite the wealth of names reported by the different authors (Table 2), the meanings of most of them are not mentioned. Those having an interpretation, often in the Arabic language, almost all converge in reporting names describing the animal in relation to its horns in the shape of an oriental sabre, javelin or lance (Hemprich & Ehrenberg, 1829; Sclater & Thomas, 1899; Lydekker, 1908; Ward, 1910; Brocklehurst, 1931; In Tanout, 1930; Hufnagl, 1972), to distinguish it by its red neck and shoulders contrasting with the rest of its whitish body (In Tanoust, 1930; Brocklehurst, 1931), or to relate it to its wild habitat (Nachtigal, 1881) (Fig. 1).



The role of the Oryx in the fabrication of shields

It is probably through the writings of the classical period, particularly in Arabic (Idrissy, ~1153; El Bakri, 11th century; Ibn Hodeil el Andalusy, ~1400; Marmol, 1667) (Table 1) that we get the first mentions of the Scimitar-horned Oryx under its name of *Lamt* (but also *Lant*, *Dant* or *Dante*) whose origin remains unknown. For several centuries, its skin was highly valued in the making of round shields called, depending on the authors, the language and the eras: *adargue*, *daraq*, *targe*, *adargua*, *daraqa* (Léon L'Africain, 1556; Buttin, 1960; Monod, 1977; Camps & Barrère, 1991). These shields were renowned for their strength, which made the animal (through its skin) a recurring reference in stories of wars and conquests. Table 1 provides an indication of the extent of use of these so-called "*Lamtian*" shields, but it also informs us indirectly about the abundance of the species at that time, particularly in an area that probably covers southern Morocco, Mauritania and "Western Sudan", known today as Mali. The fabrication of shields made from oryx hides initially had the Oued Noun region of Morocco as its nerve centre. It was very quickly supplanted by Fez, which kept the monopoly on the manufacture and trade in this valuable commodity until its disappearance following the advent of firearms (Buttin, 1960). The city of Fez was not only a centre for collecting and processing oryx hides, but it also received from other regions further south, probably from the Tuaregs, already assembled "*Lamtian* shields" which it ensured, in addition to local production, the distribution and marketing in the Maghreb and across the Iberian Peninsula and beyond (Cenival & Monod, 1938; Buttin, 1960; Camps & Barrère, 1991). The huge quantities of skins used in this "military industry" (Table 1) make us wonder about the real amounts taken from nature and the resilience of the species. They also lead us to ask, like Joleaud (1918) at the beginning of the 20th century, whether the Scimitar-horned Oryx was not subjected somewhere to the west of its range to a kind of semi-domestic breeding, like what happened in the east in ancient Egypt in order to satisfy such a high demand for *Lamtian* shields. Other authors (Hemprich & Ehrenberg, 1829; Barth, 1860; Lavauden, 1934; In Tanoust, 1930) inform us that the manufacture of oryx hide shields was not exclusive to North Africa. It was also widely practiced by the Tuaregs, both those of the Sahara and those of the Sahel up to the banks of the Niger River (Aymard, 1911; Mounier, 1942; Camps & Barrère, 1991).

Table 1: Short compilation presenting the extent of use of shields made of Scimitar-horned Oryx hide in Andalusia and North Africa between the 11th and 16th centuries. (LQ = Large Quantity).

Date	Quantity	Citations	Sources
991	1000	"A thousand shields made of <i>Lamt</i> skin" offered to El-Mansour Ibn Abi Amer, sovereign of Courdou, by the Governor of Fez, Ziri Ibn Atia, in addition to a few <i>living Lamt</i> .	Ibn Khaldoun, XIV th C. Joleaud, 1918
XI ^e century	LQ	Several shields made of " <i>lamt</i> skin" sent by Youssef Ibn Tachfin to the kings of Andalusia"	Ahmed ben Khaled En Naciri Es-Slaoui, XI th C.
1086	4000	"About four thousand of the Black Guard dismounted and entered the battlefield armed with shields made of <i>Lamt</i> leather."	Ahmed ben Khaled En Naciri Es-Slaoui, XI th C. Camps & Barrère, 1991
Beginning of XIV ^e century	LQ	In Granada, "the troops' equipment includes...leather shields called <i>lamt</i> "	Lisan-ed Din Ibn Al-Khatib, XIV C.
1341	4000	The Marinid Sultan of Fez, Abou El Hassan Ali, offered the Sovereign of Egypt, El Melek en Nacer, "four thousand shields made of <i>Lamt</i>	Ahmed ben Khaled En Naciri Es-Slaoui, XI th



		leather, two hundred of which had gold buttons and eight hundred had silver buttons.”	C. Ibn Khaldoun, XIV th C.
XIV ^c century (around 1400)	1900	Among the treasures of the Mamluk caliph Montanzer "1900 shields of <i>Lamt</i> "	Butin, 1960; Taki ed-Din Ahmed el-Makrizi,
1556	600	The Lord of the Mountain of Tensita sends to the king of Fez "about six hundred skins of animals hides called <i>elamt</i> "	Léon l’Africain, 1556

The vernacular names of the Scimitar-horned Oryx

The Arabs of Chad call the Scimitar-horned Oryx by the name of *Ouahch* or *Wa’hash*, meaning “wild or feral animal” (Hemprich & Ehrenberg, 1829; Nachtigal, 1881; In Tanoust, 1930; Lavauden, 1934; Malbrant, 1952). The same name was also given to the species in North Africa, but preceded, according to these authors and especially according to their ability to pronounce and transcribe Arabic letters by the variants “*Bagar* or *Beger* or *Bakar*” to mean “cow”. Hence the antelope’s name was *Bagar el Ouahch*, “wild cow” (Sclater & Thomas, 1899; Joleaud, 1918; In Tanoust, 1930; Brocklehurst, 1931; Rode, 1943; Hufnagl, 1972).

At the beginning of the 20th century this name was also used to designate at the same time other species that share the area with the Scimitar-horned Oryx, such as the addax (*Addax nasomaculatus*), the North African hartebeest (*Alcelaphus buselaphus buselaphus*) before its extinction, and even in some distant sites, like the forests of the Atlas Mountains to name the Atlas deer (*Cervus elaphus barbarus*) (Joleaud, 1918). Thus, the name *Bagar el Ouahch* seems to be a generic name to assign a group of the area’s ungulates and is not specific to the Scimitar-horned Oryx alone, presenting a source of confusion (Joleaud, 1918). The open plains and wild valleys in which the species lived also presented another source of name among the same ethnic groups of oriental dialect. The oryx was then called *Beger el Ouadi* “the ox of the wadi or the bush animal” (In Tanoust, 1930) to thus situate the species in its habitat.

In the north of present-day Sudan (Sennar, Dongola and Kordofan) as well as in the south-eastern tip of Libya and probably in some areas of eastern Chad, other names seem to be more characteristic of the animal such as *Abu Harb* "the one with a spear" (Hemprich & Ehrenberg, 1829; Sclater & Thomas, 1899; Lydekker, 1908; Ward, 1910; Brocklehurst, 1931; In Tanout, 1930; Hufnagl, 1972) or *Bou'el'rema(h)* "the one with javelins" used east of the Ténéré (Dekeyser, 1950) to distinguish the antelope by its venerable tapered and pointed horns. With their relatively curved appearance, the horns of the Scimitar-horned Oryx have acquired the resemblance to the oriental scimitars. Furthermore, the name *Asseyef*, "the swordsman" or "the animal that fights like a swordsman", recently resurrected in Tunisia and Libya, certainly referred to this form of sword and was probably also inspired by the way in which the species uses its horns during fights between rival males. In 2019, this name was used for a philatelic issue intended for endangered species (fig. 2). On the other hand, the neck and sometimes the shoulders of the animal, notable for their musculature and especially for their rusty colour which contrasts with the rest of the body which is sometimes very white, especially during the dry season, to be called among some Arabs in northern Chad and North Africa by the name of *Bou ragaba* or *Bou rakkaba* "the one with the neck" (Nachtigal, 1881; In Tanoust, 1930). In northern Darfur and Kordofan, some specimens were distinguished by locals under the name of *Abou kiteif* "the one with the shoulder" thinking that it is a separate race (Brocklehurst, 1931; Malbrant, 1952). South of Oued ed-Dahab (Rio de Oro) and in Mauritania, lands of the Moorish dialect, the Scimitar-horned Oryx was known under the name of *ourguiya*, pl. *Ouerg* or *Ourg* or *Ourk* (Joleaud, 1918; Chudeau, 1920; In Tanoust, 1930; Lavauden, 1934; Monteil, 1951; Roure, 1956). Some authors think that this name, with some small deformations, could have the same origin as the word oryx bequeathed by the ancient authors (Joleaud, 1918; In Tanoust, 1930; Lavauden, 1934).



Figure 1: The horn shape, the neck colour or the antelope's habitat are often the basis of the names given to the Scimitar-horned Oryx throughout its range. Katané Enclosure, Ferlo Nord Faunal Reserve, Senegal (©Abdelkader Jebali)



Figure 2: The scimitar-shaped horns of the antelope are the origin of the name “asseyef” (the swordsman) immortalized in this stamp (Coll. A. Jebali)



In the Central Sahara and the Sahel, the designations attributed to the oryx are as rich and various as the multitude of ethnic groups and their dialects (Table 1). In this context, the Tamachek (Tuareg) and the Hausa are distinguished by a great variability in the names given to the species (Dekeyser, 1950). These dialects provided information depending on the name used, on the sex, age or social formation encountered: group or solitary individual (De Coutouly, 1925; In Tanoust, 1930; Lavauden, 1934; Rode, 1943; Dekeyser, 1950; Monteil, 1951; Malbrant, 1952; Lhote, 1954; Roure, 1956; Chaker, 2013). However, this richness is confused by the "desire" of the authors mentioned to give the meaning and/or the imaginary representation of these names. This uncomfortable analytical situation limits the extensive exploitation of the panoply of names presented in Table 2.

Examining the names of the Scimitar-horned Oryx used throughout its range shows that the appearance of the species, particularly its long, arched horns, its red neck and the habitat it prefers are all important sources of inspiration in its naming by the different people of the region. On the other hand, its thick and light skin has been the basis of the *Lamtian* shield industry north and south of the Sahara and beyond for several centuries. The history of the Scimitar-horned Oryx, a species with many names, seems to be linked to that of humans who have lived alongside it, used it, and ultimately provoked its extinction.

Table 2: Vernacular names of the Scimitar-horned Oryx (*Oryx dammah*) throughout its range.

Name	Language	Region/Country	Sources
Lamt اللّمت	Arabic	North Africa	Ibn Hodeil el Andalusy, 1400; El Bakri, 1859; Lavauden, 1934; Cenival & Monod, 1938
الوحش، بقر الوحش، وحش Ouash/ beger el ouash ou Bagar el Wahash (la vache ou le bœuf sauvage); Bakar el wahsch	Arabic	North Africa; North Chad; Sudan	Hemprich & Ehrenberg, 1829; Brocklehurst, 1931; In Tanoust, 1930; Lavauden, 1934; Rode, 1943; Bourgoïn, 1949; Malbrant, 1952; Hufnagl, 1972
أبو حربة، أبو حرب، Abu Harba (l'animal à la lance); Abu Harb; Beger el Ouadi (le bœuf de brousse); Abu hurab	Arabic	Libya (south east with the Sudan border). Eastern Dialect Arabs, Sudan: Dongola, Sennar, Kordofan	Hemprich & Ehrenberg, 1829; Sclater & Thomas, 1899; Lydekker, 1908; Ward, 1910; Brocklehurst, 1931; In Tanout, 1930; Hufnagl, 1972
Bou ragaba (l'animal au cou)	Arabic	North Africa	In Tanoust, 1930
بو الرّماح Bou'el'rema(h)	Arabic	East of Ténéré	Dekeyser, 1950
Bakar El-Wahschi; Bou Rakkaba (l'animal au cou)	Arabic	Chad (Bahr El-Ghazal, Borkou, Djourab)- Tibesti	Nachtigal, 1881
السّيّاف Asseyef (L'épéiste, l'animal aux cornes en forme de cimenterre)	Arabic	Tunisia & Libya	This study
Abou kiteif (l'animal à l'épaule); Mirazawa	Arabic	North Darfur, Kordofan	Brocklehurst, 1931; Malbrant, 1952



Ouerk; Ourguia; Ourguiya	Ouerg; Ourguiya	Moorish (Hassaniya)	Mauritania, Western Sahara	Chudeau, 1920; Lavauden, 1934; Bourgoin, 1949; Roure, 1956
Louerguiye			Western Sahara (South Morocco, Mauritania)	Monteil, 1951.
Ourguiya, pl. ourg			South Morocco and Mauritania	In Tanoust, 1930; Rode, 1943; Régnier, 1960.
Aggas	Azza (Toubou)		North of the Gouré circle (tribe specializing in net hunting)	Dekeyser, 1950
Ehem; ézem; ézam; Izem	Tamahaq		Hoggar	Lavauden, 1934. Monteil, 1951; Lhote, 1954; Chaker, 2013
Ezem, pl. izimmen, ehem, ihemmen	Tamahaq		Hoggar (Algeria)	Régnier, 1960
Echam, pl. ichaman	Tamahaq			Aymard, 1911; In Tanoust, 1930
Ezem/ezzam ou izem	Tamachek		Mali, Niger, Algeria	De Coutouly, 1925; Rode, 1943; Bourgoin, 1949; Roure, 1956
M: ézom F: tézom Pl: izaman <i>Hararared:</i> (animal solitaire en brousse) <i>Ebarèye:</i> petit oryx, pl. <i>ibareyen</i>	Tamachek		Niger (Aïr)	Dekeyser, 1950
Diawar, pl. Diadi, Ourguia	Toucouleur		Senegal, Mauritania, Mali	Roure, 1956
Dangalan Koulé	Bambara & Malinké		Mali, East Senegal	De Coutouly, 1925; Rode, 1943; Bourgoin, 1949; Roure, 1956
N'Doubsa, Darwa	Peul		West Africa	Roure, 1956
Dieri karé			Dori (North of Burkina Faso)	De Coutouly, 1925; Rode, 1943
Houndei	Sonraï/ Sonhraï	ou	Niger, Mali	Roure, 1956
Dieri karé			Dori (North of Burkina Faso)	De Coutouly, 1925; Rode, 1943
F: oualouaji M: oualouasena Juv: dan oualouaji Pl: oualouasèye, oualouazinnèye (Ader), oualouaji de awa (plus usité)	Hausa		Niger, Chad	Dekeyser, 1950
Oual-Wadji ou Oualouaji	Hausa		Niger	Roure, 1956; Malbrant, 1952.
Dierikarl	Djerma		Niger	Roure, 1956
Guskil	Manga			Roure, 1956
Trô zodé	Toubou		Niger, Chad	In Tanoust, 1930



Tchioungué	Toubou	Chad	Dekeyser, 1950
Tro	Toubou	Termit (Niger)	Roure, 1956
Porto	Kanembou		Rode, 1943
Toroua zedo	Gorane	Chad	Rode, 1943; Bourgoïn, 1949; Malbrant, 1952;
Forto	Kanouri	Chad, Niger	Dekeyser, 1950

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RANGE STATES

CHAD

Reintroduction of the Scimitar-horned Oryx in the OROAFR in Chad: from 2011 to 2024

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Directorate of the Wildlife and Protected Areas



As an ecologist assigned to the Directorate of Wildlife and Protected Areas (DFAP) of Chad, I took my first steps in the field in 2011 in the Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR) with the NGO Sahara Conservation (SC, previously known as Sahara Conservation Fund) for an upcoming mission. Following several more missions in 2014 I was appointed coordinator of the said reserve. I had the chance to participate in all stages of the reintroduction of the Scimitar-horned Oryx.

Located in North-Central Chad, the OROAFR was created by Decree No. 135/PR/FFPC/PNR May 10, 1969, for the protection of Sahelo-Saharan antelopes, cheetahs and ostriches. With an area of 7,795,000 ha, it is an IUCN Category IV protected area. Before the reserve was classified, several oryx had been captured there and transported elsewhere in the world.

In 2011 and 2012, the DFAP and SC carried out several prospecting missions in the reserve in the dry and wet seasons. These missions made it possible to confirm that the oryx had disappeared, but also that its environment remained suitable for its reintroduction. The herders attested that the last oryx had been poached in 1989 in the Todi area to the north of the reserve.

In May 2012, a technical workshop on the reintroduction of oryx into the reserve was held in N'Djamena with the participation of representatives of breeders, wildlife services and international conservation organizations. The participants recommended that the Chadian Government and partners rehabilitate the Reserve and reintroduce the oryx into its historic habitat.

In 2013 and 2014, the Ministry of the Environment, Fisheries and Sustainable Development in Chad (MEPDD) and the Environment Agency - Abu Dhabi (EAD) held several meetings on the reintroduction of the oryx. A memorandum of understanding on the reintroduction of oryx into OROAFR was signed in September 2014 between the MEPDD and EAD, and the implementation of the project was entrusted to SC.

In 2014 and 2015, a site was selected in the reserve to install the project infrastructure. In accordance with its commitments, the MEPDD deployed a team of guards in the reserve to ensure its protection and raise awareness among local communities about the reintroduction of the oryx.

In March 2016, a first group of 25 Oryx from Abu Dhabi was successfully reintroduced into the reserve. The event was made official by the MEPDD with the participation of local administrative and traditional authorities and partners. Several waves of reintroduction followed. With births in the reserve, more than 600 oryx were roaming freely in the reserve at the time of the last inventory in November 2023.



The reintroduction has not been without problems, including seasonal bushfires that consume pastures, the poaching of an oryx in 2017, and a disease that affected a group of oryx in 2018.

The downlisting of the conservation status of the oryx on the IUCN Red List of Threatened Species is a very important event for the conservation of global biodiversity and for Chad, which has contributed to this global success.

The Oryx Project has already exceeded its initial goal of 500 Oryx in the wild. However, this success remains fragile because certain external factors are difficult to control, such as climate change and epidemics. We must therefore continue the program and strengthen its resources.

My personal impression is above all the satisfaction of having contributed to the success of this adventure which is a real success in terms of conservation, and which marked the start to my career. My thoughts also go to those of my colleagues with whom I began this adventure and who are no longer with us.



First Scimitar-horned Oryx reintroduction in OROAFR, Chad, 07h55 on the 15 March 2016 (©John Newby)



The best flight of my life

Steve Monfort

University of California Natural Reserve System



On March 14, 2016, I had the privilege of being a passenger on the huge Ilyushin IL-76 cargo plane carrying the first 25 Scimitar-horned Oryx headed to Chad for release into the wild in the Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR). This was without question the best flight of my life.

My entire career had been building up to that moment: a tangible opportunity to help save a species from extinction. The plane was loud, the jump seats were uncomfortable, but the journey was joyful, and I was filled with an incredible sense of anticipation and fulfilment unlike anything I'd experienced before in my career.

Despite the clamour and roar of the jet engines, I found myself sifting through memories, retracing the arc of the journey that had gotten me a jump seat on this plane. I recalled the good fortune, the audacity, the partnerships, the friendships, and the collective work of literally hundreds of like-minded individuals seeking to make a difference, to find meaning in their lives, and to be part of something bigger than themselves. The Scimitar-horned Oryx was our cause, our vehicle, and the inspiration to dream of doing something that for so long had seemed out of reach: helping nature repair itself against all odds by reintroducing the formerly Extinct in the Wild Scimitar-horned Oryx back into the wild in Chad.

In the mid-1990s, my Smithsonian Institution team was conducting research on captive oryx, seeking to unravel the mysteries of their reproductive physiology and behaviour. I was also a Science Advisor to the AZA Antelope TAG, which at the time was being led by Steve Shurter. In January 1998, Steve phoned me to ask me if I might be able to represent the Antelope TAG at the first ever Convention of Migratory Species (CMS) range states meeting on Sahelo-Saharan antelopes, to be held in Djerba, Tunisia. I hate to admit it, but I had never even heard of Djerba and had never travelled to North Africa before. But it sounded exciting, and I soon found myself attending this "random" meeting in February 1998 that turned out to be an inflection point in my life and career.

It was in Djerba where I met a disparate group of mostly Europeans, including John Newby, Roseline Beudels, Koen de Smet, Teresa Abaigar, Mar Cano, and others. While I didn't know them personally, I had read their papers, and I knew that this was the group of people whose deep knowledge would be essential to any efforts aimed at saving the five Sahelo-Saharan antelope species that were the focus of the CMS meeting. Fortunately, they were a friendly bunch and welcomed me to join them socially. At a slightly boozy dinner one evening, I turned to John and asked him, "So, what are you all collaborating on together?", to which he replied, "We're not because we don't have anyone to organize us". At some point in the conversation, John turned to me and said, "Why don't you do it", *i.e.*, help us get organized. While that seemed ridiculous to me at the time, John and I committed to following up after we both returned home. Later that same year, I invited John to join me in attending what turned out to be a very consequential AZA Antelope TAG meeting being hosted by a pioneering antelope conservationist, J. David Bamberger, at his ranch in Texas. John was a featured speaker, raising our awareness of the silent extinction crisis ongoing in the Sahara, and we all were motivated by David's call to action: "If not the people in this room, then who will speak up for the Sahara's wildlife?"

It took John and me some time to rally resources, but in May 2000, we convened a meeting at Marwell Wildlife's zoo, with facilitation by the late Mark Stanley-Price and with 20 participants, including nearly all the individuals I had met in Djerba. Paraphrasing David Bamberger, I opened the meeting stating that any chance of success in saving Sahelo-Saharan species depended on the people in this room. I shared that I was simply there to challenge each attendee to commit to actions to save these mostly forgotten species



from extinction. That meeting was very much the birth of a movement, and from it arose the Sahel & Sahara Interest Group (SSIG).

From then on, things heated up. Firstly, in 2002, with a mind-blowing trip to the UAE, where our SSIG delegation “discovered” nearly 2,000 Scimitar-horned Oryx on Sheikh Zayed’s private island, Sir Bani Yas. In 2003, a key meeting of SSIG members was held in Warrenton, Virginia, where we decided to focus our initial efforts on oryx and addax, developing an outline concept for a conservation program focused on the Termit - Tin Toumma region of Niger, which eventually led to the establishment of the Termit & Tin Toumma National Nature Reserve (*Réserve naturelle nationale de Termit et de Tin-Toumma*) in 2012. To better fund, promote and organize our efforts, we then established the Sahara Conservation Fund (now Sahara Conservation) as an international non-profit organization in 2004. The real game changer was establishing a partnership with the Environment Agency – Abu Dhabi and the government of Chad, and the development of the “World Herd” vision for Scimitar-horned Oryx, which brings me back nicely to how I got a seat on that cargo plane in the first place.

As the doors on the shipping crates were pulled up and the oryx launched out into their pre-release pens, tears streamed uncontrollably down my cheeks. Eighteen years since Djerba, and against massive odds, we had done it! We—a group of passionate, like-minded individuals—had done it! I was over the moon when in December 2023, the IUCN reclassified the Scimitar-horned Oryx from Extinct in the Wild to Endangered. Wow, wow, wow!

While my career has distanced me from Sahara Conservation, it remains near and dear to my heart. I feel pride in accomplishment, but most importantly, I treasure the friendships and collegiality, and the sense of common purpose, connection, and joy that will fuel me for the remainder of my days. Long live Sahara Conservation and long live the Scimitar-horned Oryx.



Oryx release in 2016, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Tim Wachter)



First Sahelo-Saharan Interest Group meeting in 2000, Marwell Wildlife, UK



Sahelo-Saharan Interest Group meeting in 2003, Airlie, USA - From left to right: Steve Shurter, Steve Montfort, Philippe Chardonnet (©John Newby)



A pioneering life in the field of oryx reintroduction

Marc Dethier
Sahara Conservation



It was in late 2015 that I started working on the Scimitar-horned Oryx reintroduction project in Chad. I recall receiving an email from John Newby on October 16 giving me the coordinates of the base camp I was being asked to build. John stressed the need to reduce impact on the land as far as possible. Shortly after, I left N'Djamena with four container trucks carrying the fencing materials purchased in the USA to build the oryx quarantine enclosures. In December 2015, the 44-ha enclosure was installed. In March 2016, the first 25 oryx arrived. And in April of the same year, the camp was fully built. Today, in 2024, I have been a project manager in the field for nine years, with a one-year break.

Currently, we are a team of 15 people at the camp. In addition, a rotating team of eight rangers is based in an adjacent camp to ensure our safety. I am the only permanent expatriate at the camp.

We are in regular contact with the Department of Wildlife and Protected Areas, as well as with the traditional leaders of the local people and the administration. Since the first arrival of oryx, there has only been one recorded poaching incident, in 2018. Overall, the arrival of oryx in Chad is not well accepted, but even desired by many Chadians.

At base camp we regularly welcome student interns. We also receive significant support from teams from the Environment Agency – Abu Dhabi (EAD), the Smithsonian Institution, the Fossil Rim Wildlife Center and the Zoological Society of London. Visitors also include our colleagues at Sahara Conservation headquarters in Paris and from specialists at various times throughout the year.

Life at the camp resembles that of an oil rig! We are isolated but we have everything we need on site: electricity, water for showers, dormitories, prepared meals, permanent internet, etc.

As can be expected, staff miss their families, but we do our best to compensate for this. Those who live in the nearby towns of Arada and Biltine (located respectively 70 km and 120 km from the base) return home on the weekend between Friday noon and Sunday evening. Those who come from N'Djamena or further afield work two months on and one month off.

As for me, I currently do four months at a time before taking a break. So long as there is activity and work to be done, it is not difficult. And each season brings its joys and sorrows. It is such a motivating project that we are satisfied with very little.

The routine tasks are firstly feeding and watering the antelopes kept in the quarantine enclosure, then monitoring the oryx which have been released into the open environment, and finally maintaining the base camp and its equipment.

From 4:30 to 5:00 a.m., after morning prayers, the team in charge of the enclosures leaves to cover up the water troughs to prevent birds, like crows and vultures, from contaminating the antelopes' drinking water. We also fill the feeders according to a feeding plan established by EAD, with hay, alfalfa or peanut tops, and feed concentrate pellets. The enclosures are located 700 meters from the base camp.

Then, around 7:00 a.m., after receiving by Internet the latest GPS coordinates of the oryx in the wild, the monitoring teams set off to search for the targeted animals according to the month's program. Ideally, each



collared oryx should be observed at least once a month. During the morning, the maintenance team takes care of vehicles, jobs at the base or logistics and transport between the camp and the nearby towns for supplies and to transport staff.

The personnel generally return to the base for lunch at around noon, except those who have gone on mission. Between 12 p.m. and 2:30 p.m.-3 p.m., it is a rest period, free time. Then, the teams resume their activities, feeding the antelopes in the enclosures, with a second outing for the ecological monitoring team but shorter than that of the morning. The last to finish the day are those who started it when they head back to the enclosures to open the water troughs for the night.

What I like to call the “vertical” part of the project is well under our control: the reception of the oryx from Abu Dhabi, the quarantine and food transition phase in the enclosures, the release and the post-release ecological monitoring. This part is entirely in our hands. This is the ‘easy’ part and it’s a success.

On the other hand, we have far less control over the "horizontal" part of the project, which is to say the environment in which the released oryx now live. The challenge here is in protecting the oryxs’ habitat and pasture which are constantly threatened by bush fires, agricultural encroachment, expanding numbers of livestock and overgrazing. We also need to protect the oryx from the diseases present in domestic animals.

Regarding the control of bush fires, we are improving our strategy from year to year, in particular with the establishment of firebreaks. We have greatly improved the effectiveness of our firefighting.

Mobile pastoralists have been passing through the area along well-known corridors for decades, with their movements tied to the natural, seasonal cycle of climate and rainfall. Over the past few years, however, a new type of pastoralist has appeared on the scene. Wealthy and influential people come and install enormous water tanks to settle their large herds of camels and cattle in all seasons. The space is now occupied by thousands of camels during the hot dry season, the period when wildlife is most vulnerable. As shade areas under trees are busier and grazing becomes rarer, contact between wild and domestic animals is more frequent. This is a big problem of environmental awareness because the businessmen do not realize the negative ecological impact of their activities. This situation is paradoxical, because the reintroduction zone was chosen precisely for its low presence of livestock due to the absence of wells or other sources of accessible groundwater.

The oryx released into the wild are truly in their natural environment. This is evidenced by their fitness at the end of the long dry season. It is very impressive to see a strong animal, one could almost say “body-built”, living in conditions as difficult as those of the hot dry season between April and May. Coming as I do from the Belgian countryside, certain oryx remind me of white-blue-Belgian cattle, a breed hyper-selected for meat. The reserve being so big, the oryx can move widely and choose habitats that are best suited to them.

The successful reintroduction of the oryx into the wild led us to reintroduce also the addax and the red-necked ostrich. While the reintroduction of the addax has proven to be successful, the restoration of the ostrich is proving to be more difficult. We are still waiting to see successful breeding of ostrich in the wild, although we have had some success in captivity.

Along with the oryx and addax, we are also strengthening the local dama gazelle population through a program to release individuals born in captivity. We have also started a research project on the lappet-faced and Rüppell’s vultures, and on bustards.

The EAD team trained us very well on the management of the animals in the enclosure. The length of time newly arrived oryx from Abu Dhabi stay in the enclosure varies from 34 days to more than 200 days, depending on the date of arrival of the animals. Those that arrive in October and November are already



equipped with GPS collars and are released in January. On the other hand, those that arrive in March are not yet equipped with collars and cannot be released in the dry season because the vegetation is dry with low nutritional value, they are only released in the rainy season, in July or August.

Experience has taught us the limits to respect in the management of the enclosures. For example, the carrying capacity of the enclosure must remain less than 75 oryx at a time. Another example, biting insects and ticks tend to proliferate in the rainy season, with the risk of transmitting diseases to confined animals. The important thing is that each time we were able to receive advice from specialists to avoid the pitfalls of bad experiences. This is one of the particularities of the oryx project, working with an experienced multidisciplinary team!

Outside the enclosures, we intervene in the hot dry season, if necessary, with individual animals suffering from severe thirst by bringing them water. This is beneficial because several females that were helped were then able to give birth. Generally speaking, for new arrivals in Chad, their first year is a tough time and apprenticeship to go through.

The reserve's ranger force is recruited locally. They gradually gain experience through training programs. A group of women from Arada assist us during major events in the construction of traditional huts and with catering.

Relations with the authorities are constructive, as well as with the transhumant pastoralists who view and respect us as breeders of oryx, addax, dama and ostriches. Several tourist operators have included a visit to the camp in their trips. All these exchanges are appreciated by the project team, who perceive them as recognition of the work they have accomplished over the years.

When the management plan for the Ouadi Rime - Ouadi Achim Faunal Reserve is implemented as foreseen, the future should be favourable for the ecosystem and its restoration. The greatest threat lies not in traditional pastoralism, which continues to follow its seasonal cycle, but in the recent enterprises of urban businessmen, whose mass livestock breeding is not a way of life but simply a source additional profit or prestige to the detriment not only of the environment but also of traditional society.



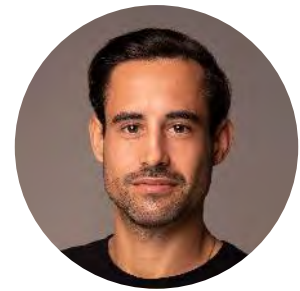
Oryx investigating Dorcas gazelle calf, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Tim Wacher)



Flying with the Oryx

Jaime Dias

Wings for Conservation



I first heard about the reintroduction of the Scimitar-horned Oryx to the Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR) in Chad in 2016. I had just founded my NGO, Wings for Conservation, and was in Chad to discuss signing an agreement with the Chadian government to provide aerial support to help protect and restore wildlife in the country. I signed an agreement with the government in 2017, and in the following years my work focused mainly on the south of Chad, particularly the protection of the elephant population in the Binder-Léré Reserve (*Réserve de faune de Binder-Léré*) and the creation of the Zah-Soo National Park (*Parc national de Zah Soo*).

My first mission in OROAFR took place in 2020. The project manager, Marc Dethier, had asked me to come to OROAFR with the aircraft to help locate several oryx and addax groups that were several hundred kilometres away from the project base. I had never seen an oryx or addax before and during the first flights I found it difficult to distinguish between the two species from a distance. This first mission was a success, and we were able to locate five out of seven groups.

The following year I returned for another mission. This time the main objective was to provide aerial support to locate groups of oryx and help guide a ground team to their position in order to collar individuals in each group. A second objective was to survey the wildlife in the reserve, including oryx, addax, dama gazelle and dorcas gazelle. During the mission, we recorded a group of 90 oryx, which was the largest group recorded at the time. Since then, this number has been far exceeded. Following the success of this mission, we signed an agreement with Sahara Conservation and began to provide aerial support in the reserve every month.



© Jaime Dias/Wings for Conservation

Scimitar-horned Oryx, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Jaime Dias/Wings for Conservation)



OROAFR is one of the windiest places in the world, which makes it very difficult to fly close enough to the ground to photograph oryx. Oryx and most other antelope are already very difficult to photograph from the air as they constantly change direction as soon as they hear the sound of the plane's engine, unlike other large animals, that normally walk along the flight path of the plane. On one of the first oryx tracking missions, I photographed an animal in a remote area without a collar but was able to distinguish the tiny number on the ear tag. I still vividly remember the amazement of the team at base camp when they received the information via satellite message. They couldn't believe that we had been able to read the ear tag number from the plane.

Over the years, our flights in the reserve have helped to locate and monitor oryx groups and individuals over long distances that would take a vehicle several days or weeks to cover. In September 2023, we recorded over 550 oryx, the highest count to date and the first time over 500 oryx had been observed. A milestone for the project. In all, I flew 345 hours, covering some 51,000 kilometres.

One of the highlights of my work in Chad was witnessing first-hand and contributing directly to the recovery of the Scimitar-horned Oryx. In March 2024, after almost seven years in Chad, I moved to Mozambique to start a new chapter and support new projects. I will greatly miss flying and tracking oryx from the air.



Scimitar-horned Oryx finding shade, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Jaime Dias/Wings for Conservation)



Tracking Oryx

Katherine Mertes

Smithsonian's National Zoo & Conservation Biology Institute



Scimitar-horned Oryx are utterly fascinating animals – but also extremely frustrating to study. I have fit nearly every oryx translocated from the source population managed by the Environment Agency Abu Dhabi (EAD) and released into the Ouadi Rimé – Ouadi Achim Faunal Reserve in Chad with a tracking device. Most of these devices are GPS collars weighing around 700 grams that contain a modem to receive geographic coordinates from GPS satellites, a second modem to send these data via Iridium communications satellites, and a VHF beacon to help find animals after release. Of the 278 oryx released since August 2016, 248 have carried at least one collar, for an average of 445 days each. Eighteen oryx have carried two collars – some for more than 2,000 days in total. Altogether, the Chad Oryx Reintroduction Project has collected more than 115,000 “oryx-days” of movement data and tracked reintroduced oryx for more than 805,000 kilometres. And yet, despite this mountain of movement data – and the many other types of data collected by the ecological monitoring team – much of what we have learned about oryx movement behaviour to date ultimately boils down to “it depends.”



GPS collared Scimitar-horned Oryx, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Sean Viljoen)

Do oryx establish home ranges? It depends – perhaps if the oryx in question is a healthy adult male that can successfully defend, and largely subsist on the resources available within a territory roughly 1,100 km² in size. How far does an oryx move in a day? It depends – if it's the rainy season, an oryx may move as much as 500 meters each hour, consuming high-quality grasses and forbs during this most productive time of year. However, if it's the hottest, driest peak of the hot, dry season, an oryx may stay under shade for most of the day, then move at nearly the same speed during the night. Do oryx disperse over large areas? It depends – most of the ca. 25 oryx that travelled more than 120 km from the release site, and the six adult oryx that crossed the reserve boundary, were females that may have been exploring or searching for mates. However, the vast majority of the reintroduced oryx population remains within 30 km of the release site, with only occasional forays outside this radius. Although this distance, too, has gradually increased over time. Do oryx prefer interdunal depressions, where water often collects after storms, grasses and forbs grow relatively lush, and large trees (and the seedlings they may shelter) offer valuable shade? It depends



– in a previous step selection analysis, we found that oryx embedded in larger groups, or moving during the rainy and cool, dry seasons, showed relatively strong preferences for interdunal depressions; however, this preference faded with greater post-release experience.

Such clear answers, and equally clear exceptions, build a complex picture of behaviours and preferences across just one population. The oryx is certainly not alone in showing high intraspecific variation: in many species, individuals develop diet specializations; if different diet items occur in different habitats, such specialization can lead to differential habitat selection and use. Accumulated differences among individuals may then modify competitive dynamics, demographic rates, and spatial distributions within groups and populations.

It also helps to consider broader principles: oryx occupy a constantly, sometimes abruptly, changing environment, and individual animals will repeatedly encounter extreme environmental conditions like windstorms, bush fires, and severe heat and drought over their lifespan. In this ecological context, narrow, inflexible strategies would almost certainly doom a species to extinction. Instead, plastic behaviours that are modified by different environmental cues, with substantial variation among individuals, offer a better chance for some portion of the population to survive a given environmental hardship. From this perspective, large inter-individual variation is an entirely appropriate attribute for species inhabiting extreme, highly variable ecosystems like Sahelian grasslands and savannas – and may even be critical for long-term persistence in these environments.

Considering high inter-individual variation as a potentially valuable trait may make it somewhat less frustrating to encounter in analyses of the reintroduced population in Chad. At the very least, openly recognizing its presence changes the frame for scientific inquiry. Instead of seeking a ‘typical’ or ‘mean’ response across a population, questions must be reframed to include a range of possible responses, along with the internal factors (for example, reproductive state) and environmental cues (for example, severe drought) that may trigger them. Identifying these ‘switches’ between modes of behaviour in recently reintroduced animals moving across ever-changing landscapes will be yet another fascinating dimension to explore.



GPS tracking Scimitar-horned Oryx, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©John Newby)



MOROCCO

The Scimitar-horned Oryx in Morocco: from extinction to a promising future

Latifa Sikli and Zouhair Amhaouch
Agence Nationale des Eaux et Forêts



Historical presence and disappointing disappearance

The Scimitar-horned Oryx, once ubiquitous in the sub-desert steppes, is a symbol of Sahelo-Saharan biodiversity in Africa. Historical records show that this species roamed freely in the Moroccan Sahara, from the Wadi Noun to the Drâa basin (Joleaud, 1918; Loggers et al., 1992). This region, rich in fauna and flora, could have harboured the oryx as far north as the Seguia El Hamra and even as far as Guelmim (Heim De Balsac, 1948; Cuzin, 2003). Unfortunately, the 20th century was marked by a dramatic decline of the species, as a result of intensive hunting and habitat degradation. The last groups of Scimitar-horned Oryx disappeared from the Saharan regions of Morocco around 1959, and the last observation of a solitary individual near El Argoub dates from 1973 (Aulagnier et al. 2017).

Reintroduction initiatives

Faced with the extinction of the Scimitar-horned Oryx at a national scale and its imminent global extinction, Morocco launched ambitious reintroduction projects in the 1990s. The year 1996 was an important turning point with the arrival in the Souss-Massa National Park (*Parc national Souss-Massa*) of about 20 Scimitar-horned Oryx from various European zoos. This *ex situ* conservation program aimed to establish a strong semi-captive population for future reintroductions. In 2008, a second semi-captive ‘insurance’ nucleus was created in southeastern Morocco, with the transfer of 40 founding individuals from Souss-Massa National Park to the M’Cissi reserve (*Réserve de Msissi*) (Tinghir Province), with an area of 4,000 ha. Currently, the population within this reserve is estimated at more than 140 individuals.

Towards a successful reintroduction into the wild

After two decades of semi-captive conservation efforts, Morocco is now home to a total population of about 400 Scimitar-horned Oryx, providing a solid foundation for launching reintroduction programs into the wild. Thus, as part of the Morocco Forest Strategy 2020-2030 implemented by the National Agency for Water and Forests, a new step has been taken with the creation in 2020 of an acclimatization station for the Scimitar-horned Oryx in Boujdour. This 600-ha facility is located in the heart of a vast reserve of 18,000 km², protected from hunting and under reinforced surveillance. Rich in *Panicum turgidum* and acacias, it is an ideal habitat for this species. More than 50 individuals are currently present there, with the aim of gradually acclimatizing them before release into the wild.

Conclusion and commitment

Morocco is resolutely committed to intensifying its efforts for the restoration of the Scimitar-horned Oryx in its natural habitats. Increasing the semi-captive populations and developing reintroduction programmes into the wild are key elements of this ambitious strategy, aimed at re-establishing viable populations and ensuring sustainable management of their habitat. While challenges remain, continued commitment and close collaboration among all stakeholders will ensure the long-term restoration, survival and well-being of the Scimitar-horned Oryx.



Individual Scimitar-horned Oryx against Atlantic Ocean, Souss-Massa National Park, Morocco (©ANEF)

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NIGER

Reintroducing the Scimitar-horned Oryx in Gadabéji Biosphere Reserve



Samaila Sahailou

Deputy Director General of Water and Forests of Niger

The Republic of Niger, like other African countries, has demonstrated its commitment to securing its existing Sahelo-Saharan wildlife and reintroducing an antelope that had disappeared not only from Niger but also from all of Africa, the Scimitar-horned Oryx (*Oryx dammah*).

Once widespread in the sub-desert savannahs of Niger, the Scimitar-horned Oryx saw its population decline rapidly during the 20th century, under the effect of uncontrolled poaching pressure, aggravated by the use of automatic weapons and all-terrain vehicles. In the middle of the century, Jeannin (1951) reported the species' presence in the north of the country (Aïr, Agadez, Bilma, Fachi, Agadem), towards Nguigmi near Lake Chad, as well as in the Tadress region where a protected area was created for its conservation, the Gadabedji Total Wildlife Reserve (*Réserve totale de Faune de Gadabédji*), later classified as a Biosphere Reserve. In the early 1980s, drought likely forced the survivors southward from their range, into an area where they were exposed to increased anthropogenic pressure. The number at that time was estimated at less than 200 individuals (Grettenberger & Newby 1990). The last observations in Niger date back to 1983 (Newby 1988; Grettenberger & Newby 1990) and 1986 (Millington et al. 1991).

In view of this situation and in the spirit of implementing its policy of conservation of rare and emblematic species, the ministry in charge of protected areas of Niger has initiated several initiatives:

- The process of creating two protected areas including the Communal Nature Reserve of Mount Egalah of Timia (*Réserve communale du Mont Egalah*) (Agadez region) and that relating to the conservation of giraffes in the Bosso dallol (Dosso and Tillabéri region).
- The development of species conservation strategies (addax, ostrich, dama gazelle, giraffe).
- Strengthening the legal framework to improve the conservation of species (National CITES Law and process of revision of Law 98-07 of April 29, 1998, establishing the regime of hunting and protection of wildlife).
- The creation of exchange frameworks with several partners (IGF Foundation, Sahara Conservation, the National Agency for Water and Forests (ANEF) of Morocco, Environment Agency - Abu Dhabi (EAD), Giraffe Conservation Foundation etc.) and also through the Sahel & Sahara Interest Group.
- The successful reintroduction of the giraffe into the Gadabédji Biosphere Reserve (GBR, *Réserve de biosphère de Gadabédji*).
- The declaration of intent between the Ministry of Hydraulics, Sanitation and the Environment (MHA/E) and the ANEF of Morocco on the conservation of biodiversity and the fight against desertification (Agadir, March 14, 2023).

The GBR, located in the historic range of the Scimitar-horned Oryx, was targeted by the Concerted Action Plan for Sahelo-Saharan Antelopes of the Convention on the Conservation of Migratory Species of Wild Animals as one of the priority sites for the reintroduction of the species in Niger. This reserve was retained by the Nigerien authorities to reintroduce the oryx into Niger with the assistance of EAD. The feasibility study for the reintroduction of the Scimitar-horned Oryx to Niger in the GBR in May 2009 (Lamarque, Saley & Chardonnet, 2009) confirmed the relevance of the project. The implementation of the project is being prepared with the prospect of the next return of the oryx to Niger.



Consulting local communities about the reintroduction of Scimitar-horned Oryx in Gadabédji Biosphere Reserve, Niger

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SENEGAL

Reintroduction of the Scimitar-horned Oryx in Senegal, historic success



Ndao Ibrahima¹, Gueye Ibrahima², Sarr Thialao³ & Fall Serigne Modou Mamoune⁴

1. Lt-Colonel, Conservateur de la Réserve Spéciale de Faune de Gueumbeul
2. Colonel, Directeur des Parcs nationaux du Sénégal
3. Lt-Colonel, Conseiller Technique Ministre de l'Environnement et de la Transition Ecologique
4. Commandant, Conservateur de la Réserve de Faune du Ferlo Nord

As part of its national biodiversity conservation strategy, Senegal embarked very early on, (around the 1970s), on a policy of redeployment of threatened or extinct fauna in the country's natural environments.

While some wildlife reintroduction experiments have ended in failure, like that of the giraffe in the early 1970s in the Niokolo Koba National Park, others have proven to be real successes like that of the Scimitar-horned Oryx, *Oryx dammah*, in the Gueumbeul Special Wildlife Reserve (RSFG, *Réserve spéciale de faune de Gueumbeul*) and the Ferlo Nord Wildlife Reserve (RFFN).

The history of wildlife transfers in Senegal, in particular of Sahelo-Saharan antelopes in the Gueumbeul and Ferlo Nord reserves, dates back to the 1980s thanks to Senegal's bilateral cooperation with the Kingdom of Spain and the State of Israel. The process started with the reintroduction of seven dama Mhorr gazelles, *Nanger dama*, (2 males/5 females) in 1984 following a gift from His Excellency the King of Spain, Mr. Juan Carlos de Bourbon to Mr. Abdou Diouf, President of the Republic of Senegal. This was followed by the reintroduction of eight Scimitar-horned Oryx (3 males/5 females) in 1999 from the Haï Bar Reserve in Israel, a translocation due to cooperation between Senegal and Israel. Four other oryx from the Bois de Vincennes Zoo (France) were added to this group in 2002. The third reintroduction was that of 20 dorcas gazelles *Gazella dorcas neglecta* (6 males/14 females) in 2007 from the Station experimental of the arid zones of Almeria (EEZA/CSIC) in Spain. These captive populations were first acclimatized in Guembeul before their transfer to Ferlo where they are kept in semi-captivity.

This policy has been strengthened with the involvement of private individuals and local authorities through the establishment of breeding pools in community and private nature reserves. The Katané acclimatization enclosure of the RFFN was gradually expanded from 500 ha to around 5,000 ha.

These various initiatives largely illustrate the desire of the State of Senegal, through the Directorate of National Parks, to make this program a real success. This was effectively materialized by the significant evolution of the Scimitar-horned Oryx population in the various reception sites on the national territory.

Indeed, after several decades of implementation of the strict government policy of restoring the species and protecting their habitats, involving private individuals and local authorities, the conservation status of the Scimitar-horned Oryx has clearly improved in the country. Oryx populations have increased from eight reintroduced individuals in 1999 to more than 500 animals in 2024 spread across several public or private protected areas.

In addition to these achievements in terms of adaptation of the species and evolution of the population, there is the appropriation by park agents and local communities of translocation and management techniques for this antelope.

In view of these conservation achievements, Senegal is positioned in the list of countries which have contributed significantly to improving the conservation status of the species in the world.



However, major threats stand in the way of achieving the objectives of the species reintroduction program. These include, among others, the recurrence of abortive infectious diseases, sometimes zoonotic, the increase in inbreeding of captive or semi-captive populations, the reduction of pasture areas invaded by cacti, population growth, transhumance, and predation of young antelopes by jackals and hyenas.

To remedy these threats, the priority areas of work of the National Parks Department will focus on the development and implementation of a national strategy for the redeployment of wildlife and the restoration of their habitats, the strengthening of epidemiological surveillance of wildlife diseases and strengthening bilateral cooperation between Senegal and other partner countries in terms of wildlife exchange and transfer.



Scimitar-horned Oryx in Gueumbeul Special Wildlife Reserve Park, Senegal (©Ibrahima Ndao)



TUNISIA

From zoos to the wild: a link between *ex situ* and *in situ* conservation

Tania Gilbert

Marwell Wildlife



It's funny how things work out sometimes. Without any planning or intention, I have spent much of my professional life working on the conservation of Scimitar-horned Oryx.

I had barely heard of Scimitar-horned Oryx when I started at Marwell Wildlife in 2001 until Tim Woodfine, Director of Conservation at the time, handed me the European Studbook for the species and its corresponding European *Ex situ* Programme (EEP) and wished me luck. To be fair, I was also sent on training courses and supported by a wonderful team at Marwell, but I found myself responsible for the management of the European Association of Zoos and Aquaria's (EAZA) population of around 400 animals in 50 EAZA zoological institutions across 14 countries at the time.

For those of you that are unaware, a studbook is a repository of the *ex situ* history of a species and contains information on births, deaths, locations, individual identifiers, and most importantly, parentage. The parentage enables us to build pedigrees for all individuals in the studbook and therefore analyse the genetic relationships. This is the foundation for population management within EEPs, which aim to maximise genetic diversity and maintain demographic stability of the population, whilst providing animals for reintroductions if it is appropriate.

Shortly after I became the European Studbook Keeper and EEP Coordinator for Scimitar-horned Oryx, we were approached by the *Direction Générale des Forêts* (DGF) in Tunisia for help with a new reintroduction of oryx to Dghoumes National Park (DNP) and addax to Jbil National Park (*Parc national de Jbil*), both in Southern Tunisia.

With the DGF, we began to develop plans with Heiner Engel (Hannover Zoo), Terrie Correll (The Living Desert), Bill Houston (St Louis Zoo), Ed Spevak (Cincinnati Zoo), and Tim Woodfine from Marwell. Together we comprised the studbook keepers and EEP and North American Species Survival Plan coordinators for the two species. Our intent was to evaluate the historic releases and identify unrelated animals from across Europe and North America to increase the genetic diversity of the Tunisian population. This required us to bring all the data together in one place and the European Studbook grew into an International Studbook, which enabled us to select the animals for release. In December 2007, we finally accompanied the oryx from North America and Europe to DNP.

I can't begin to describe the feeling of releasing those oryx from their crates into the acclimatisation enclosures in the park or of waking up early the next morning to see them huddled together against the morning chill in an ever-growing patch of sunlight. A few months after their arrival, the oryx were released into the park proper to join a group transported in early 2007 from Bou Hedma National Park. Today, we are 17 years on and generations of oryx have been born in DNP. The Tunisian authorities have invested in habitat and biodiversity restoration, and our camera traps and surveys are picking up a flourishing aridland flora and fauna and a healthy population of oryx. It is at times like these that we are reminded that conservation does work and, in a world where nature is under so much threat, that's cause for hope.



Three decades of reintroduction for the Scimitar-horned Oryx in Tunisia

Marie Petretto
Marwell Wildlife



Marwell Wildlife and the Direction Générale des Forêts (DGF) of Tunisia have collaborated for more than 30 years on an ambitious rewilding initiative for Scimitar-horned Oryx in four protected areas: Dghoumes, Bou Hedma, Sidi Toui and Oued Dekouk. The wildlife of these areas, either fenced or partially fenced, forms meta-populations that require some degree of management to minimise inbreeding and ensure long-term population stability. This rewilding process involves several key actions:

Reintroduction efforts: oryx were reintroduced to the four protected areas, creating isolated sub-populations in the species' historical distribution in the country. Other sympatric species, such as the Dorcas gazelle and North African Ostrich, were also reintroduced to recreate the natural herbivore assemblage. Special efforts were made to create a balanced ecosystem with minimal disturbances, providing an optimal environment for the recovery of residual wildlife populations.

Meta-population strategy: recognizing the genetic risks associated with small, isolated populations, Marwell is helping develop a meta-population management plan to facilitate genetic exchange between the sub-populations through carefully managed translocations, thus mitigating inbreeding risks and enhancing genetic diversity.

Post-release monitoring: the monitoring programme aims to gather data on oryx behaviour, distribution, and habitat conditions, prioritizing collaborative efforts with local park staff, including:

- **Routine observations:** park staff conduct regular observations, recording data on oryx numbers, births, and deaths.
- **Health monitoring:** health assessments are carried out, including visual body condition scores, blood and parasite sample collections, and post-mortem examinations.
- **Vegetation and invertebrate surveys:** monitoring the condition and diversity of vegetation and beetle communities within and outside the protected areas helps assess habitat quality and the impact of grazing.
- **Biodiversity surveys:** permanent camera-trap networks document the fauna in the restored habitats and interactions between oryx and other sympatric species, providing insights into ecological dynamics and the impacts of reintroduction on local wildlife.



Releases of Scimitar-horned Oryx in 2007, Dghoumes National Park, Tunisia (©Tim Woodfine)



Camera trap image of Scimitar-horned Oryx, Dghoumes National Park, Tunisia (©Marwell Wildlife)

Capacity building: the project provides training and development opportunities in ecology or veterinary science for local staff and students. This not only enhances local expertise but also ensures the sustainability of monitoring and management efforts.

Community engagement: our work extends to the communities surrounding the protected areas, including livestock and wildlife health monitoring, fostering goodwill and collaboration with local pastoralists. This engagement is crucial for mitigating disease risks and promoting coexistence between wildlife and livestock. We will soon start working with local schools to develop environmental education programmes, including interpretation in the eco-museums, raising awareness about the importance of conservation and the role of the oryx in the ecosystem. These initiatives help build a conservation ethic among the younger generation and the wider community.

Research and knowledge sharing: extensive research on the ecology of reintroduced oryx populations has been conducted. Genetic studies were particularly crucial, providing insights into the population health of the oryx and helping to inform management decisions. Findings from these studies have been shared through reports and publications, contributing to the global knowledge base on species reintroduction and conservation.

Over the past three decades, despite challenges, such as drought, disease outbreaks and poaching, Tunisia's oryx population has shown resilience, and the habitat quality within the protected areas is now recovering.

Looking ahead, we plan to continue refining population management plans, standardising monitoring practices across all four areas, expanding integrated health monitoring and outreach programmes, and conducting further research on habitat restoration. These efforts will ensure the long-term sustainability of the oryx population and its habitat, providing a model for similar reintroduction projects globally.



In summary, our collaborative approach is not only contributing to the reintroduction of Scimitar-horned Oryx in Tunisia but also enhances local conservation capacity, while generating valuable insights for future rewilding initiatives.



Opening of crates during release in 2007, Dghoumes National Park, Tunisia (©Tania Gilbert)



Adult and juvenile Scimitar-horned Oryx 2014, Dghoumes National Park, Tunisia (©Rob Cooke)



The creation of Dghoumes National Park, Tozeur Governorate, Tunisia

Abdelkader Chetoui†

*Former Park manager of Dghoumes National Park, CRDA of Tozeur
(Summary by Marie Petretto of the filmed interview by Austin Haeberlé)*



I am Chetoui Abdelkader, former park manager of Dghoumes National Park. Since my retirement, I have been working with the Charity Marwell Wildlife.

Before the park was established, efforts were made to create a park near Tozeur, given the diversity of ecosystems present: desert, mountains, wetlands, and wadis. These ecosystems represent four of the seven major ecosystems in Tunisia.

Initially, there were shepherds living in the park area. Despite our efforts to relocate them, some refused to leave. We installed fences and initiated discussions with them, but the situation remained unchanged for some. Since they had no land title, I requested intervention from the Ministry to prove that these lands were state-owned, and eventually, with the intervention of the authorities, they had to leave the area. Although initially discontented, many eventually understood the importance of the park for the region, particularly for the numerous jobs provided to the community.

With the implementation of protection measures, the park underwent a remarkable transformation, with significant development of vegetation and birdlife due to the cessation of pastoral activities. The construction of two entrances and three surveillance posts at the mountain top strengthened area management and prevented poaching.

Specialists then deemed it appropriate to reintroduce animals to the park. Dorcas gazelles were the first to be reintroduced in 2002, followed by oryx in 2007 and Red-necked Ostriches in 2008. Despite challenges, we succeeded in caring for these new species for us and restoring them to the wild in the park's restored habitat.

Water plays a crucial role in life at Dghoumes, but its supply is challenging due to the distance from the village and very low annual rainfall. Underground tanks were initially built to collect water from wadis and provide water to guardians, young plants, and acclimating animals. Then, we thought of creating hillside lakes to slow down water flowing to the chott. The stored water replenishes the groundwater and is used by wildlife; migratory birds benefit from this resting stop, and we can fill our tanks. Our interventions aim to support ecosystems and prevent desertification.

The difference between the inside and outside of the park is striking. Inside, vegetation thrives due to the absence of overgrazing, while outside, pressure from herds limits plant growth and prevents seed production for vegetation renewal.

Protecting ecosystems is crucial for preserving biodiversity. I believe that children should be educated from elementary school about the importance of wild animals to change attitudes and reduce hunting. The 2011 Revolution brought positive changes, including greater solidarity among Tunisians and new opportunities for youth, allowing them to play a crucial role in nature conservation.

I commend the efforts of former Directors of Conservation for prioritizing local wildlife in the creation of national parks and I am thankful for having experienced international collaboration within the framework of the oryx reintroduction: it is essential for preserving endangered species, and we must learn from experiences in other countries and share our knowledge to ensure a sustainable future for biodiversity in Tunisia.



Reviving hope: my journey with Scimitar-horned Oryx

Faouz Kilani

Association Tunisienne de la Vie Sauvage (ATVS)



As a biology student studying ecology, and growing up watching documentaries on wildlife, I always wanted to be involved in the field of conservation. However, my understanding of this field was limited and not clear until I had the opportunity to participate in a field trip in 2017, during which I learned about species monitoring with scientists from Marwell Wildlife. It was during this trip that I had my first encounter with the Scimitar-horned Oryx at Dghoumes National Park in Tunisia.

Witnessing this majestic creature roaming freely in its natural habitat, made me fall in love with it immediately. At that time, the field trip was organized by Marie Petteeto and Chawki Najjar, who were my mentors. Working alongside them, we collected data on the reintroduced population of the oryx.

Later, I had the privilege of carrying out research for my master's degree on oryx behaviour in the same national park supported by Marwell Wildlife. During this time, I dedicated two months to observing oryx herds, meticulously documenting every detail of their daily activities. This really motivated me to contribute more to the conservation of the oryx in Tunisia. I will never forget how the late Abdelkader Chetoui, the park's manager, talked to us about the amount of effort required to establish a stable oryx population, and I will always remember his dedication and commitment to his work.

All of this defined my journey and career as an ecologist. Now, four years later, I have the opportunity to work once again with this antelope thanks to the collaboration between the Tunisian Association for Wildlife, which I represent, and Marwell Wildlife. Our primary responsibility revolves around the monitoring of the oryx population and other species within the park. Additionally, we are training the park's rangers also to collect data on the oryx.

I remember how amazed I was when the Scimitar-horned Oryx was recently reclassified from Extinct in the Wild to Endangered on the IUCN Red List. It's living proof that conservation efforts can make a difference, and it made me feel really hopeful. Certainly, there is still a lot of work to do, but we are ready for it!



Memories of the reintroductions of the Scimitar-horned Oryx in Tunisia

Khaled Zahzah

Ex-Deputy Director of Hunting and National Parks at the Direction Générale des Forêts of Tunisia



Tunisia embarked on the reintroduction operations of Saharan antelopes, including the Scimitar-horned Oryx, since the 1980s. As Deputy Director of Hunting and National Parks at the Direction Générale des Forêts (Ministry of Agriculture, Hydraulic Resources and Fisheries, Tunisia), I had the opportunity to participate in all operations from 1995 until 2015, the year of my retirement.

Initially, the reintroduction project had significant moments as it was not just a partnership but a family effort where each of us contributed to the success of all. I recall in 1999, within the framework of the Convention Migratory Species / Fonds Français pour l'Environnement Mondial Sahelo-Saharan Antelopes Project, Renata Molcanova (Bratislava Zoo) and Simon Wakefield (Marwell Wildlife) prepared a reintroduction operation of Scimitar-horned Oryx at Sidi Toui National Park (governorate of Medenine) and Oued Dekouk National Reserve (governorate of Tataouine). However, the budget they managed to collect was not enough for the air transport of the animals, so we had to act swiftly in Tunisia to waive the landing and unloading fees, which amounted to about 30,000 Tunisian dinars, nearly 18,000 US dollars at the time. Thanks to direct contacts between myself and the Director of Tunisian Civil Aviation, we reached an agreement just a few hours before the flight arrived!

In 2007, a major reintroduction operation took place in Dghoumes National Park (governorate of Tozeur) despite the foot-and-mouth disease prevailing in Europe at the time, which prevented English zoos from providing animals, as was the case in 1988. The effort of the coordinators of the oryx and addax studbooks of the European *Ex Situ* Programme and the Species Survival Programme, particularly Tim Woodfine and Tania Gilbert (Marwell Wildlife, UK), Terrie Corell (The Living Desert, USA), Bill Houston (St. Louis Zoo, USA), Ed Spevak (Cincinnati Zoo, USA), and especially our dear friend the late Heiner Engel (Hanover Zoo), was vital for the success of this operation and its follow-up. I recall, for example, that due to budget exhaustion, we were unable to purchase concentrate and hay to feed the acclimating oryx: a brief phone conversation between myself and Heiner Engel† resolved this issue.

Initially, our oryx herd thrived thanks to the dedication of our conservators and notably the late Abdelkader Chetoui, conservator of Dghoumes National Park, and the support of our friends from Germany, England, Spain, France, and the USA. But after a few years, some negligence and inertia crept in among certain officials: this phenomenon reached its peak with the advent of the "Tunisian revolution" in January 2011, as protected areas were subject to acts of vandalism. We learned from this period the poor execution of the partnership project between protected areas and local populations, notably in Bou Hedma National Park (governorate of Sidi Bouzid), where science, social, and political aspects were mixed without caution. This indeed created dissatisfaction among part of the population, which manifested through these sporadic but revealing acts of vandalism.

In 2012, with the support of Marwell Wildlife, our friends Marie Petretto and Gian-Lorenzo D'Alterio conducted a genetic census through tele-biopsy: a first in the monitoring and evaluation of terrestrial mammal reintroduction! At the time, acts of vandalism perpetrated in various protected areas were discouraging both central and regional authorities from carrying out work in protected areas, but our determination (mine, Marie's, and Abdelkader Chetoui's†) to conduct this genetic census regardless of the conditions eventually prevailed. Thus, history shows us today that we must not give up and must continue to work tirelessly for the Scimitar-horned Oryx to finally reclaim their natural habitat across their full indigenous range. Failures should never discourage us but should instead prompt us to search for their causes and take them into account in future projects.



NON-RANGE STATES

UNITED ARAB EMIRATES

A first time for everything

Justin Chuvén

Environment Agency - Abu Dhabi



Leading up to the first translocation of Scimitar-horned Oryx from Abu Dhabi to Chad was a tale of firsts, some big and some small. The big one, on a personal level, was moving myself and my family across the world to live and work as an expat for the first time ever. This was not something I had planned but it somehow just happened, and if I had known it was going to lead to an incredible reintroduction of a species listed as extinct-in-the-wild, it would have made the decision a lot easier! About six years after making this big leap I found myself figuring out how to get the first cohort of oryx selected, prepped, onto a cargo plane and to the pre-release pens in one of the most remote places on earth. We set our sights high and not only wanted one hundred percent survival in the translocation, but we also wanted to ensure that we had the most genetically and demographically diverse, healthiest group of 25 oryx we could possibly assemble. This would start the project off with the resiliency it would need to be a success. We, at the Environment Agency-Abu Dhabi, were so excited to get this project underway after so many years of planning. Looking back on it, I'm incredibly proud of the huge leap that the Abu Dhabi team took. There were a lot of unknowns at this point, nevertheless, the decision makers remained committed to the goal of species restoration, and the project never would have gotten off the ground without that commitment.

Our team consisted of a diverse group of some of the most dedicated and talented veterinarians and animal managers I've ever worked with. In the months leading up to this historic, first translocation to Chad, we would all meet before sunrise in the far reaches of the Abu Dhabi desert where we would set up our testing and vaccination equipment and handle as many animals as we could before the temperature climbed too high and became unsafe for humans and animals alike. We had an incredible number of oryx in the collection at the time and separating the fit from the less fit turned out to be a daunting task and took way longer than we had expected. On the best mornings, we could process a hundred animals thanks to the animal handling facility we had developed and the experts in our team. Through all this work, we found we had a lot of animals but not a lot of genetic diversity in our initial source population. This led us to another first: importing animals from all over the US and Europe to incorporate into the group for reintroduction, something that would eventually become our "world herd". Importing ungulates from across the world is not the easiest of jobs



Justin Chuvén immobilising a Scimitar-horned Oryx, Ouadi Rimé-Ouadi Achim Faunal Reserve, Chad (©Felix Seger)



and doing so while facing the deadline of preparing for the first translocation to Chad was a daunting challenge.

As we were struggling through the process of acquiring the CITES and other required permits to send the animals to Chad, we were also figuring out how to arrange the charter flight, how to fit all the crates and supplies onto the cargo plane (the model of which was yet to be identified), and how to keep the animals safe and from overheating in their crates. There were so many aspects of the upcoming operation that led to sleepless nights. Would we have all the paperwork needed in time to get the animals and people on the plane? Had we thought of all the supplies we would need to keep the animals safe throughout the journey and during the few months they would spend in the pre-release pens? Would an animal get injured along the way? Could they handle the twelve-hour journey along a the potholed, spine-jarring road after landing?

Luckily most of my middle-of-the-night worries didn't happen and those that did (oryx horns getting stuck sideways in the transport crate) were all fixable. The first time-for-everything adventure was a total success and ended up being pretty stress free as soon the deafening jet engines of the behemoth Ilyushin IL-76 cargo plane fired up. This was probably helped by the fact that shortly after take-off the Ukrainian crew unlocked a cabinet high up in the cargo area that held some special vodka in an unmarked bottle that we all shared...another first for me.



Ilyushin IL-76 transporting Scimitar-horned Oryx arriving from Abu Dhabi in Abéché, Chad (©John Newby)



How do you feed 400 oryx in the desert?

Jon Ll. Minguez
Doctor Veterinarian



How do you feed 400 oryx in the desert? Come with me, and I will explain. You would do as Deleika does.

Deleika is a wildlife conservation centre in Abu Dhabi, where all the oryx released into Chad come from. It houses mostly Scimitar-horned Oryx but also Addax, Arabian oryx, Dama gazelles and other kind of gazelles. A total of 991 animals of different species call Deleika home.

Deleika is located in a sandy flat area, formerly covered by dunes. Its total footprint is 257 ha, with 54 ha devoted to animal enclosures. There is a total of 88 enclosures (called “camps”) grouped into nine sections. A further eight other isolated camps are used for quarantine.

In each section, adjacent camps are linked through gates. A network of corridors and sliding doors joins all the camps, with a wildlife chute (tamer) in one corner. Each camp contains different numbers of animals, according to species, breeding status and health issues. Each camp has shade areas, feeders, water troughs and a covered catch pen.

So, now that we have an idea of what Deleika is, how do they feed the animals?

Feeding is done daily and follows an “all you can eat” (*ad libitum*) scheme. The amount of food given to each camp is adjusted based on the number of animals, their status (breeding, resting, juveniles, pre-release...) and through evaluation of the leftover food. The diet of the animals is composed of alfalfa, blue grass, bermuda grass, pelleted food, water, and salt blocks. It takes 50 tons of grass and six tons of pellets per month to satisfy their hunger!

If you are thinking that this feeding system rings a bell, you might have something!

In the livestock world, steers and heifers are fattened up in feedlots using a feeding strategy that shares many traits with how Deleika does it. While the objective of a feedlot is to fatten up the animals before being slaughtered, its feeding management strategy can be extrapolated to a wildlife centre like Deleika. In both types of facility, large numbers of animals are kept enclosed in different groups with different purposes. The daily feeding routine is streamlined and mechanized as much as possible to make it efficient. In Deleika a total of 17 workers and three tractors with trailers are involved. While many elements at an operational level are shared, others differ in respect to the purpose of the animals, the diet, and the layout of the facilities, for example.

What other advantages could a feedlot style system bring, you might ask?

Having separated groups helps veterinary management, for example. They also allow fine tuning in response to the nutritional needs of each group, as well as facilitating the observation of possible health issues in the animals. The oryx can even be medicated orally with this feeding method. This is done by the veterinary team, mixing the chosen drug with the feed pellets. Oryx love the pellets and never say no to an extra mouthful!

So, next time someone asks you how to feed 400 oryx in the desert, you will know exactly what to say. Special thanks to the Environmental Agency - Abu Dhabi for the amazing job they do and particularly Ricardo Orlando Pusey for the exact numbers and photos provided.



Feeding routine in Deleika Wildlife Conservation Center, Abu Dhabi, (©Ricardo Pusey)



Mix ATB and pellets to feed the Scimitar-horned Oryx in Deleika Wildlife Conservation Center, Abu Dhabi, (©Jon Ll. Miguez)



UNITED STATES OF AMERICA

Fossil Rim's four decades of Scimitar-horned Oryx *ex situ* conservation pays dividends



Adam Eyres

Fossil Rim Wildlife Center

Fossil Rim Wildlife Center, located in central Texas, has been working with Scimitar-horned Oryx in captivity since 1983. The founder of the ranch was very keen to work with other zoos to conserve highly endangered species. He was a private ranch owner who reached out to the directors of the Fort Worth and Dallas zoos to make a difference for *ex situ* conservation by providing large landscape opportunities for animals generally raised in the rather restricted spaces of zoos. Jump ahead 30 years and that commitment has paid off by releasing Scimitar-horned Oryx back into the wild through participating in a global project with the government of Chad, the Environment Agency - Abu Dhabi and Sahara Conservation.

In 2009, Fossil Rim was interested in sending someone to Niger with Sahara Conservation to get to know the organization better, see the work it was doing, maybe even put some of the *ex situ* animals that have been at Fossil Rim for decades back into the wild. That initial trip fell through but was rescheduled for 2010 and from that point on Fossil Rim was hooked on working to help get Scimitar-horned Oryx back into the wild.

In both 2012 and 2014 planned trips took the team through many regions of Chad, most notably the Ouadi Rime - Ouadi Achim Faunal Reserve. All the efforts of the past several years led to the decision that this was the best place to do this reintroduction work, and where the scimitars would have the best chance of survival. There was a three-day stakeholder workshop during the 2012 trip, with a ten-day excursion into the reserve during the dry season. In 2014 we returned to the region, but during the rainy season this time. Wow, what a difference a season can make! The 2014 trip also saw the selection of a specific site to install a base camp from which to manage operations, as well as carrying out some soil and pasture research.

In addition to helping with *in situ* reintroductions, Fossil Rim's facilities are also well suited to carrying out research that may be difficult to do in the wild, but highly applicable to the project. Along with researchers from the Smithsonian's National Zoo and Conservation Biology Institute, Fossil Rim did some of the initial satellite collaring of captive scimitars using our own *ex situ* population. Given that our animals are on only 100 acres, with set routines they are already accustomed to each day, we could immobilize, measure, model and test the collars on our oryx in a very controlled manner. This allowed us to make sure the collars worked as expected, didn't impact animal welfare, and even helped determine which collar manufacturers were the best to work with.

By 2016 things were moving fast and the first scimitars had already arrived in Chad. Fossil Rim had played a role in a lot of the work that had gone into this, including architectural design for the breeding facilities at Deleika in Abu Dhabi. Now we also had the opportunity to provide some of the animals that would join the world herd in Abu Dhabi, and ultimately be released in Chad. Staff from Fossil Rim travelled to Chad to assist with putting GPS collars on nearly 75 animals and preparing them for release from the almost 100-acre acclimation pens. We went back in 2018 and 2020 for more scimitar work, but also included addax releases, as well as dama captures in the Manga region of Chad to start an *in situ* captive breeding facility at the oryx base camp.

Fossil Rim Wildlife Center maintains its commitment to aridland species and working to conserve species and habitat in the Sahel-Sahara region. We have long term commitments to breeding and producing animals that not only contribute to zoos and the education of our guests, but ultimately as a reservoir that can be tapped into for projects like the reintroduction of Scimitar-horned Oryx in Chad. We are ever ready to help with future projects that include animals that call Fossil Rim home.



Scimitar-horned Oryx thriving in Texas ranches

Adam Eyres¹ and John Newby²

¹Fossil Rim Wildlife Center

²Sahara Conservation



For over 60 years Scimitar-horned Oryx have lived in zoos in the United States.

Early on, however, probably in the late 1960s, they were also raised on ranches where they proved to be very well adapted to that lifestyle, producing many calves and building the ex-situ population into thousands.

Texas, not only because of the favorable climate and rangeland, has become a haven for many African ungulate species. It is also a state where much of the land is privately owned, and the custodians of that land are interested in protecting the native wildlife and in playing a role in larger conservation efforts. Landowners enjoy seeing ungulate species thrive on their property. Some are engaged in a rewilding process, having changed the land use from traditional agriculture, usually cattle or sheep ranching, to exotic species conservation. Many of these species can be bought and sold, both for breeding and hunting, and that revenue allows the owners to expand their conservation efforts and fund the programs. Additionally, there are some wealthy landowners that simply see ranching endangered ungulates as an important altruistic endeavor.



Feeding herd of Scimitar-horned Oryx, Bamberger Ranch Preserve Texas, USA (©John Newby)

No one knows the exact number of scimitars on Texas ranches. In 2015, the Source Population Alliance (SPA) was established with the goal of including more private sector partners in mainstream conservation initiatives. At the time, the facilities of SPA partners came close to housing a thousand Scimitar-horned Oryx. Also in 2015, the Exotic Wildlife Association (EWA), a conservation-minded group of ranch owners and others interested in exotic species, conducted a survey for their members (around 3,000 strong) showing 5,708 oryx on ranches, mainly in Texas. EWA intends to carry out a new survey to update their figures. As zoos, ranches and conservation centers continue to grow their relationships, the species' survival potential continues to increase. Today, educated guesses currently put US oryx at some eight to ten thousand individuals.



In the early 2000s, Scimitar-horned Oryx, along with Addax and Dama gazelle, were subject to legal controversies around their status as “endangered species” under the terms of the US Endangered Species Act. This would entail a lengthy permitting process that put many people off. Fortunately, the owners of these species and other conservationists convinced the government that not only were current methods highly successful but that any changes in the legislation would be detrimental to the long-term conservation of the species worldwide. As a result, the law was not changed, and numbers continue to increase.

The collaborative efforts of global conservation, as seen so strikingly in the reintroduction program for the Scimitar-horned Oryx implemented by the Government of Chad, the Environment Agency - Abu Dhabi, and Sahara Conservation, is tangible evidence that working together for conservation is not only critically important but highly successful. This includes both zoos and the private sector.

The members of the Association of Zoos and Aquariums, the European Association of Zoos and Aquariums, the Zoological Association of America, and other zoo organizations do an excellent job of informing their guests about the plight of animals on our planet, including oryx. Similarly, private game ranches in Texas host large populations of wildlife, including oryx, in extensive suitable landscapes, some as large as 100,000 acres. In working closely together, these and other key players have a terrific opportunity to bolster efforts to assist wildlife recovery in Africa.



Small group of Scimitar-horned Oryx, Indianhead Ranch, Del Rio Texas, USA (©John Newby)



The wilds connection

Dan Beetem

The Wilds, Columbus Zoo Family of Parks



When I was a rookie zookeeper way back in the early 1980's, the very first antelope I ever put my hands on was a Scimitar-horned Oryx. I was impressed with their beauty and strength. I started digging through books to read more about them and learned that these animals were close to extinction in their native habitat. At the same time, the American zoo association (then AAZPA, now known as the AZA) had a relatively new concept called a Species Survival Plan (SSP). Scimitars-horned Oryx were one of ten species selected to become SSPs when the program started in 1981. Here was a plan to keep this species from going totally extinct, by ensuring the zoo population was as genetically diverse and demographically stable as we could make it. As a young, idealistic keeper I was all in. I wanted to do all I could to support this program.

Fast forward about thirty years and I am now the Director of Animal Management at The Wilds, a conservation centre in Ohio, and serving on the AZA Antelope and Giraffe Taxon Advisory Group. When I first learned about the discussions to develop an oryx release project in Chad, I was hopeful that the zoo world could contribute. When the call came for animals from the US to augment the genetics of the new World Herd being constituted in Abu Dhabi, The Wilds was happy to contribute. One of the benefits of managing large herds is that we could afford to send a few animals out for a project like this when needed. We waited and watched for updates on the project. I was thrilled when I got the word the first group of oryx had been released in 2016. I was even more excited when I got an email a short time later informing me that three animals born at our facility in Ohio were part of that first release group.

I really wanted to be a part of this, so I managed to get myself invited to join the team in Chad in 2017. When we got to the base camp, one of the first things I did was sit down with Tim Wachter to compare ear tag and tracking collar numbers to figure out which animals were from The Wilds. Tim made sure I got to see each animal from The Wilds when we were out with the tracking team. I got to help place the tracking collars on the next set of oryx and be there to watch them walk out when the gates were opened for the release. One of my favourite memories of the trip was going out with John Newby on our last night at base camp. We found and watched the group of animals that had been released just days before.

It is easy to get caught in the doom and gloom cycle doing conservation work. Projects like this, where all of the necessary pieces line up successfully are rare. Getting a chance to visit Chad and see the team from Environment Agency - Abu Dhabi, Sahara Conservation, the Chadian government, the Zoological Society of London, and Smithsonian all working together was inspiring. It is hard to put into words how I felt when I looked through binoculars and saw a wild oryx wearing an ear tag that The Wilds team had put in the animal's ear not long after it was born in back in Ohio. I can tell you that it took about six months before I could give a presentation about the project and show photos of the Wilds' animals in Chad without getting emotional. It took me back to the beginning of my career when the idea of seeing scimitars in their original habitat again was just a dream. I feel honoured to have been a part of this effort and proud that we can tell our guests at The Wilds that the scimitars they see here have relatives running free again in Chad.



Right: Dan Beetem handling oryx, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©John Newby)



EXPLORING THE SCIMITAR-HORNED ORYX

Maximisation of genetic diversity in the Scimitar-horned Oryx reintroduction to Chad

Helen Senn¹, Kara Dicks¹, Emily Humble², Alex Ball¹, Mohammed Al Remeithi³, Justin Chuyen³, Ricardo Pusey³, Mahamat Hassan Hatcha⁴, Jo Howard-McCombe¹ & Rob Ogden²



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The Convention on Biological Diversity recognizes three pillars of biodiversity: that of Ecosystems, Species and Genes. Genetic variation is encoded in the DNA molecule, which is common to all living organisms and is inherited from one generation to the next. Genetic variation encodes diversity within species (e.g., variations in physiology, behaviour, appearance) and is important because this inherited variation allows species to adapt to future environments resulting from emerging disease, environmental perturbation and climatic change. As species' populations shrink, genetic variation is lost forever, before species themselves become extinct. Once lost, genetic variation cannot be retrieved. It is therefore of critical importance to manage genetic diversity carefully in small populations of conservation concern. This is especially important for species that are extinct in the wild, for which there is no other option than re-establishment from captive sources, as is the case for the Scimitar-horned Oryx (SHO).

According to available records, the captive population of SHOs was initially founded from approximately 48 individuals taken from the wild in the 1960s who were used to initiate breeding programmes in the world's zoos. Between 1963 and 1967, individuals were captured in Chad and divided between the USA (c.29), Europe (c.17) and Japan (n= 2) (Woodfine and Gilbert, 2016). Fundamentally, this founder stock represented a tiny fraction of the population once roaming across the vast 1.5 million km² of its estimated historical Sahelo-Saharan range (Durrant et al, 2013). When the Ouadi Rimé – Ouadi Achim Faunal Reserve (OROAFR) in Chad was selected as the reintroduction site in 2013, the global captive population of SHO had increased from these ~48 founders to ~15,000 animals, primarily found in two types of captive facility:

1. Zoos, where breeding is managed collectively through studbooks – predominantly the Species Survival Plan® (SSP) based in North America, and the European Endangered Species Programme (EEP) in Europe. Collectively these represent around 1,000 captive individuals.
2. Non-zoo collections, often consisting of large herds but without the ability to manage breeding pairs through studbooks. These holders are found across the Arabian Peninsula and the USA and hold most of the captive population. One such holder is the Environment Agency - Abu Dhabi (EAD), representing the world's single largest collection, and the primary source for the Chad Reintroduction Project.

At the outset of the Chad reintroduction project, it was feared that whilst the global captive population was numerous, genetic diversity might be limited and highly partitioned between different holders, as a result of the history of founder sourcing, subsequent bottlenecks caused by international movements, and varied management approaches. Although the small managed populations within the EEP and SSP had an international studbook that could, to some extent, be used to inform founder selection (an approach used effectively for the selection of animals for reintroduction to protected areas in Tunisia since 1985, co-led by Marwell Wildlife (see e.g. data in Figure 1)), the relative value of these EEP and SSP animals compared to the other captive sources, and particularly the proposed source from the EAD, was effectively unknown.



As genetic analysis in support of the future releases commenced in 2014, co-led by the Royal Zoological Society of Scotland and University of Edinburgh under direction from the EAD, it quickly became clear that the original proposal, to source animals from a single population, would not be representative of global genetic diversity. Only seven maternal mitochondrial DNA lineages (haplotypes) were found in the first screening of the EAD source population, matched by a limited amount of nuclear genetic diversity. Further to this, it was clear that global genetic diversity, a total of 43 mitochondrial haplotypes, was indeed highly partitioned between different captive sources (Figure 1).

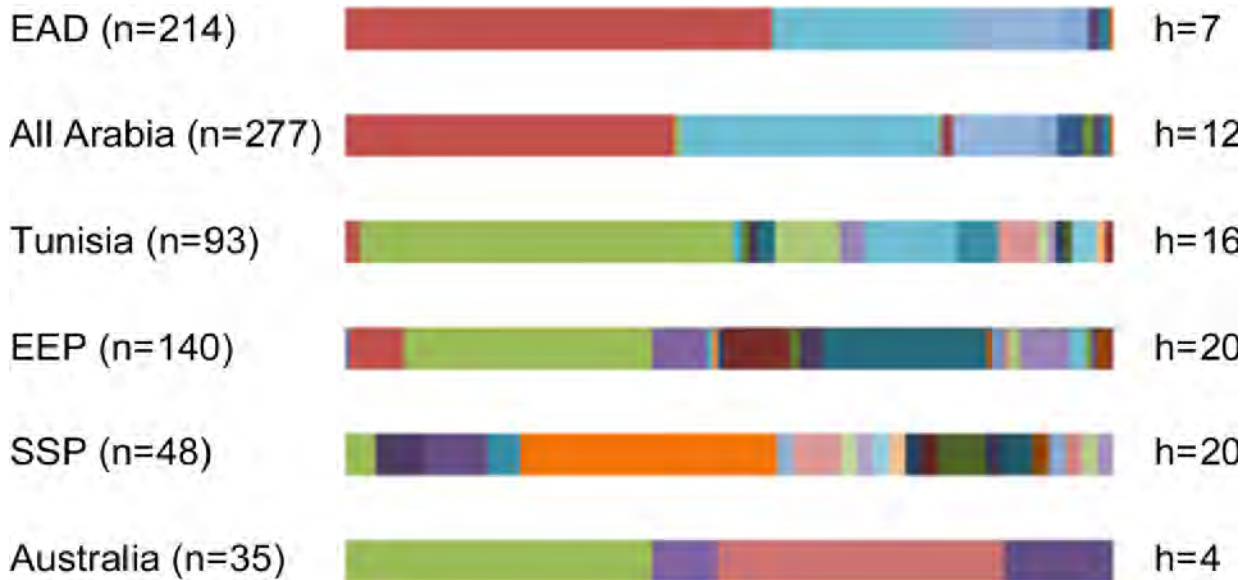


Figure 1: A global review of SHO genetic diversity conducted in support of the project (Ogden *et al.* 2020). The bar chart shows mitochondrial DNA “control region” haplotype diversity (*h*: total number of haplotypes) in each of the main oryx source populations (*n*: total number of individuals sampled). Each colour indicates a different haplotype. Samples from the Abu Dhabi Environment Agency collection (EAD) are presented separately, and also included within the Arabian regional collections as a whole (‘Arabia’). Clearly, the studbook managed populations (EEP and SSP) had the highest number and most even diversity of haplotypes. This data inspired the sourcing of additional founders from across the USA and Europe.

This data inspired a considerable effort led by the EAD to source animals at a global level to support the reintroduction efforts, creating a mixed population in Abu Dhabi (the “World Herd”) to act as a source population. This has ensured that the released animals encompass more genetic diversity than if they had been founded from the single, originally proposed, source population (Howard-McCombe *et al.* in prep).

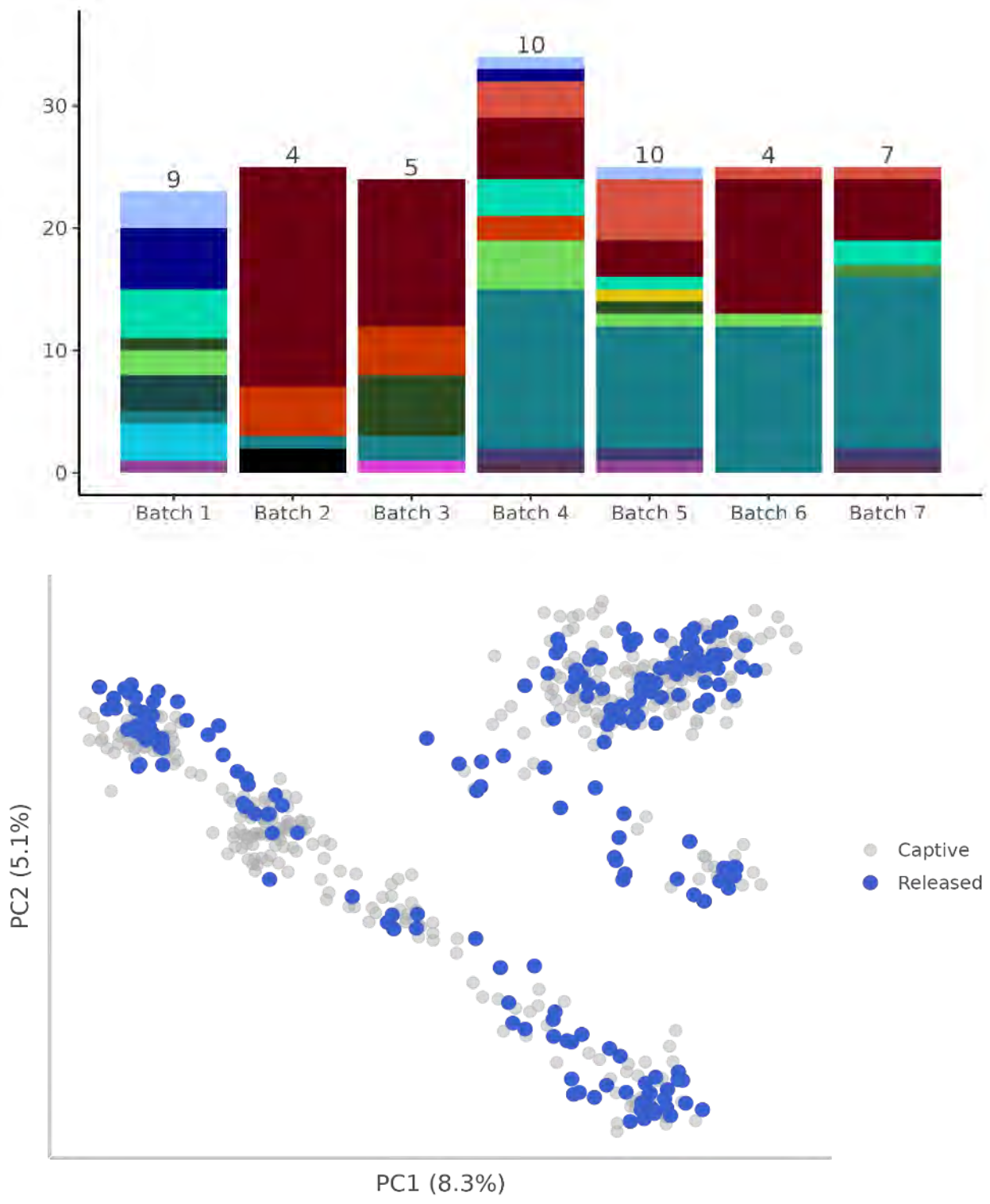


Figure 2: The genetic diversity of the first seven batches of animals taken to Chad between March 2016 and February 2020: a) at mitochondrial DNA “control region” haplotypes. In total 18 haplotypes are represented: b) at 4729 nuclear DNA markers (single nucleotide polymorphisms, SNPS). Each animal is represented by a point. The proximity of the points to each other represents their genetic similarity. The points are coloured grey if they are from animals held in captivity (collections sampled globally) and blue if they were part of the Chad release. It is apparent at both markers, that a wide spread of genetic diversity has been captured in the Chad release. Figures adapted from Howard-McCombe et al. (in prep).

Early research into SHO mitochondrial DNA pointed toward the fact that this was a species that had naturally high levels of genetic diversity, likely due to a history of population restriction and expansion



during repeated glacial cycles, followed by the maintenance of enormous migratory herds over the past few thousand years (Iyengar et al 2007). This observation was borne out by the first whole genome study which was conducted in support of the release project (Figure 3; see also Humble et al. 2020), which shows that despite being restricted to captivity for many generations, the reintroduced oryx have similar levels of genetic diversity to other mammal species.

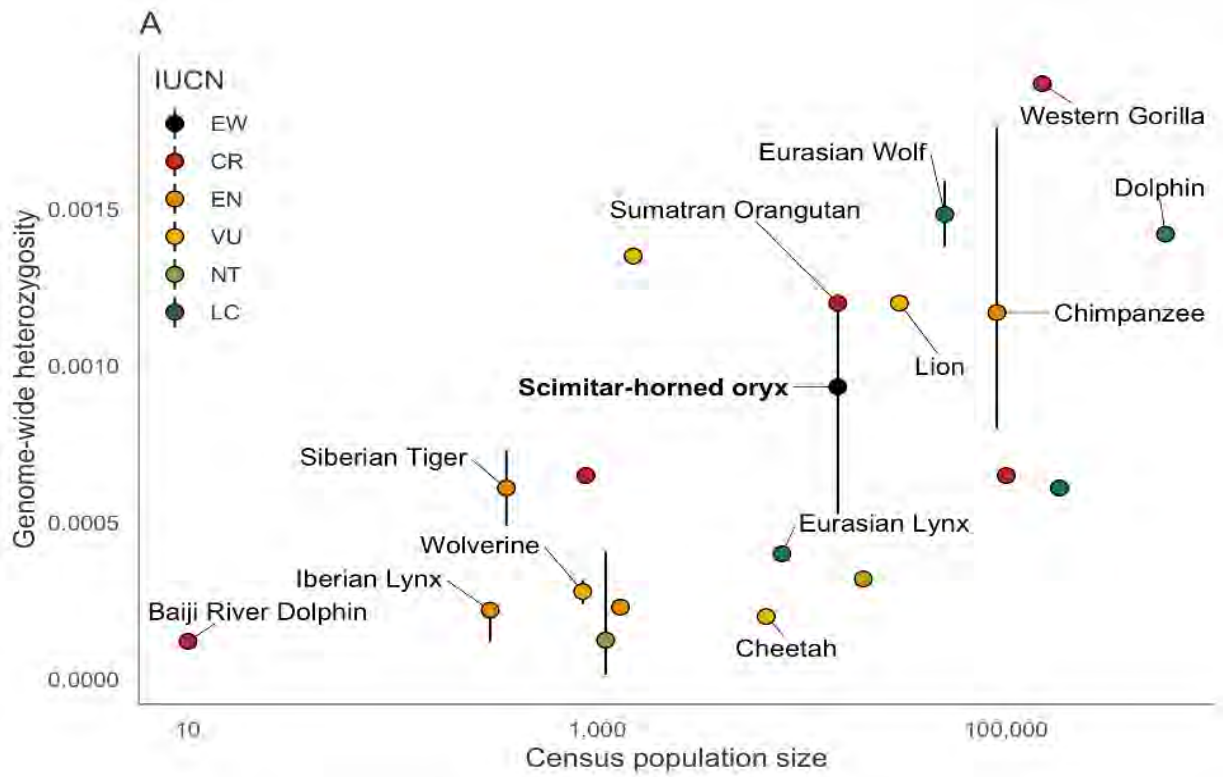


Figure 3: Relationship between genome-wide heterozygosity (an estimate of genetic diversity) and census population size for a selection of mammals, with individual points colour-coded according to IUCN status. Some species names have been removed for clarity. The SHO is highlighted in bold. Vertical bars correspond to the range of genome-wide heterozygosity estimates when more than one was available. Note that SHO diversity estimates are based on data from all 65 individuals that were whole genome sequenced in support of the Chad project and therefore are different from those reported in Humble et al. 2020 which were based only on a subset of six individuals. Further analysis of whole genome data can be found in Humble et al. 2023.

Overall, the demographic recovery of SHO from Extinct in the Wild to Endangered can be considered to have been accompanied by significant, but incomplete, genetic recovery. The good news is that baseline levels of global genetic diversity for the species were high and, although historic levels of diversity of the now extinct wild population are hard to fully understand, it seems the captive population has retained substantial genetic diversity. A significant proportion of which has, through careful genetic management, been captured in the Chad reintroduction. Going forward we make the following recommendations:

- Captive populations are still required. The maintenance and genetic management of the World Herd in the UAE that was developed by the EAD in support of this project, along with the maintenance of the EEP and SSP and Source Population Alliance programme in North America (<https://www.conservationcenters.org/source-population-alliance.html>) should still be considered a priority. There is significant genomic evidence that the more managed populations have been able to minimise the impacts of inbreeding (Humble et al 2023).
- Ongoing selection of animals for release should use individual DNA analyses to maximise founder representation and, where necessary, increasing the numbers of under-represented founders remains important.
- Support should be provided to post-release monitoring of the reintroduced population by using molecular tools to track genetic composition through time and projects should be developed to support



the capacity for conducting this genetic analysis within OROAFR/Chad

- Post-release monitoring to assess hybridisation between addax and SHO should remain a priority due to the proximity of release sites and previous records of inter-breeding.

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Post-release monitoring of reintroduced Oryx in Chad

Tim Wachter

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The initiative to reintroduce the Scimitar-horned Oryx to Chad, led by the Environment Agency - Abu Dhabi (EAD), has placed emphasis on ensuring a significant and sustained effort to monitor its outcome. From the outset, a long-term view was taken, recognising that the project would require management over decades, and that methods for assessing population growth would by necessity change over time.

The strategy has been to establish a genetically diverse population quickly by successive annual transport and release of appropriately vaccinated and health-screened captive-bred founder groups derived from the herd assembled by EAD. In 2014-15, a carefully selected release site within former oryx range was identified, together with construction of a base camp to provide capacity for animal care and monitoring. Over the past seven years, 296 oryx have been released following pre-release acclimatisation periods varying between 2-6 months, mostly in herds of 25 or more.

All released oryx are fitted with ear-tags and identification collars providing frequent satellite location, a local VHF radio-tracking signal, and either active or passive drop-off mechanisms. Recovered collars provide additional information from accelerometers. Key objectives are to record movement, dispersal, social behaviour, survival, and in the case of females, reproductive performance of every released individual for as long as possible.

To achieve this, a six-strong Chadian monitoring team has been trained to use EarthRanger software to access near real-time animal tracking data (managed and forwarded daily by project partners at Smithsonian National Zoo and Conservation Biology Institute - SNZCBI) and process daily updates of animal location coordinates to vehicle-mounted GPS screen displays. Daily field trips are planned to locate and record standard information from oryx, organised by distance and direction from the base camp, prioritised against a daily record of which individuals have already been observed in the current month. On finding a target oryx, details of herd size and habitat, all identifiable animals present, and any information on individual reproductive status is collected on hand-held devices using CyberTracker software. Every birth and death detected triggers additional reporting protocols to capture relevant details. Downloaded monitoring data sets are regularly sent back to EAD and partners and used to create monthly internal field reports.

The monitoring team have to date (May 2024) recorded 557 births (spread across all months) and 157 deaths (peaking in the late dry season) in the wild in Chad since the first release of oryx in August 2016. After a policy of non-interference in birth events over the first three years, a wild-born calf tagging programme was introduced in September 2019. Since then, 173 wild-born calves have been caught by hand and ear-tagged.

The monitoring data collected are used to create a monthly sighting-resighting matrix (with presence/absence of a functioning satellite collar and known deaths also encoded) for all founder and tagged wild-born oryx. This allows estimation of survivorship by origin (founder or wild-born), sex, release group and release season, allowing for the effect of collars on detectability. Since 2021, a smaller cohort of tagged, wild-born oryx older than two years and some original founders, have been captured in the wild by darting and immobilisation to be fitted with new satellite collars. This provides opportunities for additional veterinary sampling post exposure to the natural habitat, and additional comparisons of movement and habitat use between wild-born and experienced founder oryx relative to the initial results from 'naive' captive-born founders.



Over the first three years of the project, with all founders satellite tagged, it was possible to maintain an exact count of all individuals in the wild. But in anticipation of the need to adapt methods as the oryx population expands and disperses, the monitoring team have been conducting seasonal sample surveys using fixed line transects (20 km - 40 km transects in survey blocks) across a c. 3,200 km² area encompassing the release site since well before the first oryx releases. Originally focused on other key species in the reserve, including Dorcas and Dama gazelles, bustards, and livestock, line transect encounters with oryx, while still very limited compared to Dorcas gazelles, have built up steadily in successive years.

Since 2021, aerial surveys have also been used in both sample survey and total count mode to enhance the transition from individual-based monitoring to a population-based approach. The current monitoring policy follows advice from SNZCBI to continue releasing all new founders with satellite collars, maintaining collars on at least 50 oryx overall at any one time. The collared oryx provide a focal study group and with ear-tagged individuals, provide a protective function in advertising to the local communities that the oryx are closely studied and watched.

Results to date have confirmed that the oryx have remained almost entirely within the reserve's boundary and have centred most of their activities to date within a 100 km radius of the release site. Some individuals and groups have exhibited remarkable capacity to explore long distances, up to 250 km, and subsequently navigate directly back towards the release area. Monitoring has also revealed a high overall calving rate and a growing population. A significant mortality event in the wet season of 2018 was associated with a mixture of management, dietary and disease factors. Other incidental mortalities have occurred due to grass fires and fighting between males. Some newly released oryx have also been lost in their first dry season and on occasion a small number have been opportunistically assisted with individually targeted supplementary water or food.

Only one oryx is known to have been shot and in general the oryx have been very well received by pastoralists using the reserve. Notably, six years after the 2018 mortality episode, a renewed wave of losses is taking place, this time in the current hot dry season, associated with high temperatures and poor grazing.



Team Monitoring Scimitar-horned Oryx, OROAFR, Chad (©Julie Martin)



The project planning process for the reintroduction assumed waves of elevated mortality every five years on average. Hence a further test of the initial modelling is underway.



Oryx family observed during line transect survey, OROAFR, Chad (©Tim Wacher)

Through 2023, three line transect sample surveys each produced population estimates in the range of 608 to 646 oryx, though all with very low precision (coefficient of variation between 32% and 47%). This was backed up by a minimum total count from the air of 552 oryx in September 2023. Notably no survey in 2023 covered all areas where oryx were present. A third approach to assessing population size used Vortex software to model population growth by furnishing it with the actual number and timing of founder and supplementary release groups, observed post-release survival rates in Chad (founders and wild-born), observed sex ratios, and modal calving intervals, all measured in the field over the first seven years. Scenarios using these data predicted a population of around 600 by 2023.

These three, independently derived, monitoring assessments provided core evidence for the downlisting by IUCN of the Scimitar-horned Oryx from Extinct in the Wild to Endangered at the end of 2023. Further supplementary releases are planned. Nevertheless, the Endangered status is important. The entire wild population is still small and living at one location, and as noted, 2024 is delivering a particularly harsh dry season.

Assuring permanent resources to maintain the oryx base camp and develop its function as a Sahelian monitoring and research centre supporting local research and employment activities is an important next step. Further development of a network of fully trained and equipped ranger teams to protect the Scimitar-horned Oryx, and other critically endangered species inhabiting this unique wildlife reserve is also needed. Specialist tourism opportunities can be used to develop benefits to local communities. More widely, seeking new release sites across the antelope's huge former range and making good use of the world herd resource established by EAD in Abu Dhabi to support and maintain genetic viability of the species everywhere, both in new projects, but also in the existing semi-captive populations present in other north African countries, are all actions needed to assure the permanent security of the Scimitar-horned Oryx in the wild.



Investigating disease risks in reintroduced Scimitar-horned Oryx

Stephanie Brien

Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh



The close evolutionary relationships between antelope and domestic ruminants mean that they frequently share susceptibility to the same infections. Population density is crucial in infectious disease dynamics, so the presence of infected livestock reservoirs can lead to population decline in susceptible wildlife species that would otherwise be too small to maintain pathogens. This can threaten the viability of small populations of endangered antelope and potentially the success of reintroduction programmes. On the other hand, disease outbreaks in livestock risk the health and livelihoods of pastoralists in the region, with impacts on food security and human welfare.

It is important to look at infectious disease risks through a broad lens, considering the health of the entire ecosystem and appreciating the interconnectivity of health in wildlife, livestock, and humans. In practice, this is often difficult to achieve, as many models of health and ecology have studied the different components of the system individually. For my PhD I have been exploring health risks at the wildlife-livestock interface for Scimitar-horned Oryx in conservation reintroductions in order to help inform practical steps we can take in managing the risks in the complex shared landscapes in which these reintroductions are taking place.

During my career as a veterinarian, I have combined clinical practice with research projects exploring the management of infectious diseases, including bluetongue virus in domestic ruminants and mpox in chimpanzees. My passion has always been trying to understand disease risks between different species. After working with captive wildlife in sub-Saharan Africa for several years, I was keen to do something to contribute to restoring ecosystems rather than treating the impacts of ecosystem damage. In collaboration with the Government of Chad, the Environment Agency - Abu Dhabi, Sahara Conservation and the Smithsonian Conservation Biology Institute, I have conducted health surveillance fieldwork in the Ouadi Rimé–Ouadi Achim Faunal Reserve in Chad in both antelope and livestock. My research primarily focuses on blood parasites. These are really interesting from an ecological perspective as typically they don't cause disease in hosts with which they have co-evolved, whereas they sometimes do cause disease in closely related species. Collaborators are investigating a range of other diseases of public health and economic importance. We hope the data collected will help to improve our knowledge of infections circulating in antelope and livestock, explore whether interspecies disease transmission is occurring, and identify potential risks to humans. The aim is to use this information to identify management interventions that can reduce the risk of disease transmission between livestock and wildlife.

I was lucky enough to visit the reserve to conduct my fieldwork. After reading so much about the challenges the oryx has faced over the past century, it was incredible to see herds of over a hundred animals roaming in their native Sahelian grasslands, surrounded by other iconic local species such as Addax, Nubian Bustards and North African Ostrich. I also worked with the field monitoring team to explore ways to collect samples for genetic and health monitoring from oryx calves when they capture them to place identification tags. As I sat holding a newborn oryx calf deep in the Sahel region, I was struck by the realisation that this was probably the first wild-born Scimitar-horned Oryx calf to be sampled in decades I feel immensely privileged to play a small role in this visionary reintroduction project and hope our research can help to address some of the infectious disease challenges these types of reintroductions face.



“I have never seen fresh grass, but when the moment comes, I will recognize it”

Philippe Chardonnet

IUCN SSC Antelope Specialist Group Co-Chair

IUCN SSC Wildlife Health Specialist Group member



“I have never seen fresh grass, but when the moment comes, I will recognize it”:

this was the answer of an oryx interviewed in its enclosure in the United Arab Emirates (UAE) before flying to Chad. It probably trusted its atavism, who knows? We can say what we like, but atavism still retains part of its mystery today, even if it is explained by genetics. We never really get used to the reappearance in one or more individuals of one or several ancestral hereditary characteristics that had disappeared for one or more generations. Atavistic characteristics can be anatomical or physiological but also, more surprisingly, behavioural in nature.

The original adaptation by the oryx to the harsh life of the Sahel could very well have been lost over the generations when it was removed from all constraints in the comfort of a well-managed captive breeding system that in the UAE could almost be described as luxurious. Logically, the original genetic characteristics of natural adaptation to the Sahel should gradually diminish from one generation to the next in such artificial living conditions. Because the least well-adapted ancestors that normally would never have been able to survive in the Sahel have been placed here in confined conditions where they can survive and even reproduce. Thus, they would transmit to their descendants a reduced capacity to adapt to the Sahel, perpetuating by genetic drift a lineage of oryx that is less and less adapted or able to readapt.

Intensive captive breeding

During their entire life in the UAE, oryx have never known a world other than intensive captive breeding enclosures. In this system, also named “zero grazing”, the animals are confined in rather small, enclosed areas, and provided with food entirely brought from outside the station. The animals are totally dependent on humans. Subjected to the management method imposed on them, they lead a life that can be described as passive without having to make any choices or take any initiative.

Overall, everything is done to ensure that the oryx are in the best possible general condition to achieve the best possible reproductive performance. Human control over the animals is total. It begins with the space assigned to them, a space that is both fairly small and entirely fenced. The substrate is made of gravel, sand, cement, sometimes bare earth, no vegetation at all, nothing like natural rangeland. The oryx do not have to look for their own food, it is brought to them. They are fed only with processed food (this is easy to understand for commercial pellets, but it is also the case for hay which is the nutritionally rich product of the proper transformation of fresh grass, a very distinct product from dried-up pastures). Food and water are provided freely, in abundance and constantly, without seasonal fluctuations. The social life of the oryx follows an imposed path. The animals do not choose their own enclosure peers, no possible option or preference. Reproduction is also controlled, determined by management decisions.

The shock of reintroduction

And suddenly, in the space of a few hours, these same animals are ‘parachuted’ into the lands of their ancestors from another century. How do they react to their passage from one continent to another and to their radical change in lifestyle? The teams on site observe and follow them in the most meticulous way over the days and weeks. When you look closely, what a shock!

Space shock

First there is the space shock. Until then, the oryx had always lived "between four walls" as they say, in the confined space of an enclosure surrounded by wildlife proof fences. After a period of adaptation to local conditions in the quarantine on site, here they are released into the wild, going from a tightly confined space to a space without any fences and above all... infinite! But going from finite to infinite is not self-evident. There is a kind of protective comfort behind the fence, a comfort that suddenly vanishes when the fence is replaced by an endless horizon. Without the previously fixed landmark of fences, and without prior



maternal learning, the released oryx now explore their new world as if by feeling their way. From their previous passive life in "*laissez-faire*" mode, they find themselves forced to switch to "real life " mode, to make choices, to take initiatives. Freedom is imposed on them; they are forced to experiment with it.

But the natural habitat they discover is no joke, severely constrained by a formidable annual dry season, by the seasonal danger of bush fires from which they have to flee urgently, by the harassment of predators of all kinds on two or four legs, by the impact of diseases unknown to them until now. They had never set foot on natural rangelands and grassy steppes, but they quickly got used to it. Now, they will first have to feed themselves freely within the limits of new constraints of access to the best food available, then reproduce according to the new rules of intraspecific social relations.

Social shock

In their new world, the oryx find themselves in the presence of a large community of other oryx who are completely unknown to them, whereas they had always lived without social stress in the same small group of a few congeners. Then they find themselves confronted cohabiting with a whole motley assemblage of creatures, unfamiliar antelopes, unfriendly carnivores, all sorts of domesticated animals. Each one seems to live its own life, except at strategic locations where they first experience competition and rivalry, such as the last water points at the end of the dry season or the rare and disputed shade of the desert date trees (*Balanites aegyptiaca*).

Food shock

On their arrival in Chad, the oryx first move into to the quarantine and adaptation enclosures on natural pasture. This relatively short stay allows them to discover what a pasture is, something unimaginable for those who have only ever known a zero grazing breeding system devoid of any natural vegetation. During quarantine, they are supported with drinking water and food similar to that of their previous life. But then, a few months later, they are completely left to their own devices to look for their own food, which is no longer provided since no one is looking after them anymore. And they are no longer supported by rich food supplements. Of course, the quarantine interlude has softened the change in diet, but the transition is still severe. Those oryx that are released in the dry season experience the meagre ration of dried-up pastures, it is tantamount to famine. While the oryx released in the rainy season certainly satisfy their appetite with abundant green food but this barely covers their nutritional needs due to pasture with very high water and cellulose content.

Water shock

Under intensive captive breeding conditions, drinking water is available at will at all times and in all seasons. In the wild, drinking water is only available during the rainy season, when it is not really useful to the oryx since their diet is rich enough in water at this time of year to cover their needs. On the other hand, there is no more free water during the dry season, the time of year when oryx might need to drink. The physiology of an oryx raised in close captivity is obviously not prepared for a total absence of water for several months. We can imagine that the unaccustomed body of a reintroduced oryx is subjected to much greater water stress than that of an oryx born on site. How can we not admire these oryx, unprepared for such a diet, managing to survive the dry seasons, especially the first of their new life?

Health shock

Throughout their lives, oryx raised in intensive close captivity are meticulously protected from diseases of all kinds, their health is constantly monitored, they receive the full range of required vaccines available, they are systematically treated against all internal and external parasites, and their rare health incidents are immediately treated. Successive generations of oryx breeding in these intensive conditions thus succeed one another, protected from pathogens of all kinds by a powerful shield that is both prophylactic and therapeutic. Even the least resistant oryx can thus survive in these conditions, whereas in the wild they would have been eliminated by one pathogen or another, and they have therefore been able to transmit their genes of lesser disease resistance to their descendants. Theoretically, this should result in an erosion of immunological competence on two scales: (i) at the population level, generations in enclosed conditions would reproduce in the absence of natural selection of the least resistant animals; (ii) at the individual level, since immune mechanisms are less solicited than before due to lower exposure to pathogens, animals would not use the entirety of their immune defence capacities, which might not be maintained as they used



to be. Thus, this relatively healthy and well-protected environment, with little pathogenic contamination, would theoretically produce animals with little proven health resistance, therefore weakened and poorly prepared for a life without any prophylactic and therapeutic shield in an ecosystem heavily contaminated by a very wide and diverse range of pathogens.

On this point, the so far one-off episode of mass mortality of oryx in Chad in 2018 provides interesting insight. An epizootic of Rift Valley fever (RVF) was formally diagnosed as one of the main causes of this mortality of multifactorial origin. This zoonotic arbovirus (viral disease transmitted by arthropod vectors) that affects humans as well as many domestic and wild mammals is well known in Chad for over half a century. Already in 1967, researchers from the Veterinary Research Laboratory of Farcha (now IRED, Livestock Research Institute for Development) had carried out a field mission to study the epidemiology of Rift Valley fever (RVF) in the region that was later classified as the Ouadi Rimé Ouadi Achim Faunal Reserve (OROAFR). Analysis of their samples in Farcha revealed a 20% RVF seropositivity in the sheep sampled and 46% of the 26 antelopes sampled (Dorcas Gazelles, Dama Gazelles, Red-fronted Gazelles, Scimitar-horned Oryx and Tiang). Notably, two of the three Scimitar-horned Oryx sampled were seropositive. But none of the seropositive antelopes showed signs of disease at the time of sampling, which means that they had indeed been infected with RVF in the past but that they had managed to overcome their infection. Thus, in Chad the oryx has long co-evolved with the RVF virus, acquiring natural resistance to the disease, a resistance that necessarily disappeared when the species disappeared in the wild.

In 2018, the oryx found to have died of RVF (confirmed by very high RVF viremia detected by PCR) were obviously not resistant to RVF, thus revealing that their lineage had lost its resistance over the generations born and raised in captivity in the UAE in an environment devoid of the pathogen. They had therefore become "naïve" regarding RVF (*i.e.*, organisms confronted with a situation that is new to them). Thus, the naïve oryx in the UAE were infected with the RVF virus in the OROAFR where the virus is known to have been circulating for more than fifty years.

Another remarkable observation: only the last oryx stationed in the rehabilitation enclosure had been affected by the RVF epizootic. All the other oryx, which had been reintroduced since 2016, had not been affected. How can this be explained since they too were naive to RVF when they arrived in Chad? Having already spent a rainy season in Chad, they had experienced exposure to the bites of RVF vector insects, *Aedes* sp. mosquitoes and other vectors, but a much more moderate exposition than in 2018 with double the normal rainfall having triggered the proliferation of insects including RVF vectors. It is highly likely that they were moderately exposed to the RVF virus and developed a protective immune response, like a sort of natural vaccination. This would provide evidence that the generations spent in the UAE have not lost their ability to develop immune mechanisms that had not been used at all for decades.

Conclusion

One might think that in the absence of shocks, the capacity to resist them gradually erodes until perhaps it even disappears. But that would be without counting on the atavism that resurfaces after multiple generations, revealing an extraordinary resistance to shocks. It seems that the oryx are caught up by their atavism to demonstrate their resilience. Finally, the adaptation of the Scimitar-horned Oryx of the United Arab Emirates in Chad is truly astonishing.

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GNUSLETTER

PORTFOLIO OF IMAGES





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1980, some of the very last wild Scimitar-horned Oryx photographed before the species went extinct in the wild, Air mountains, Niger (©John Newby)



2023, Scimitar-horned Oryx herd in the Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Jaime Dias/Wings for Conservation)



Rock paintings and engravings



Oryx rock art depicted in Iheren, Algeria (©Zboray Andras)



Oryx rock art depicted in Morocco (©Yves Gautier)



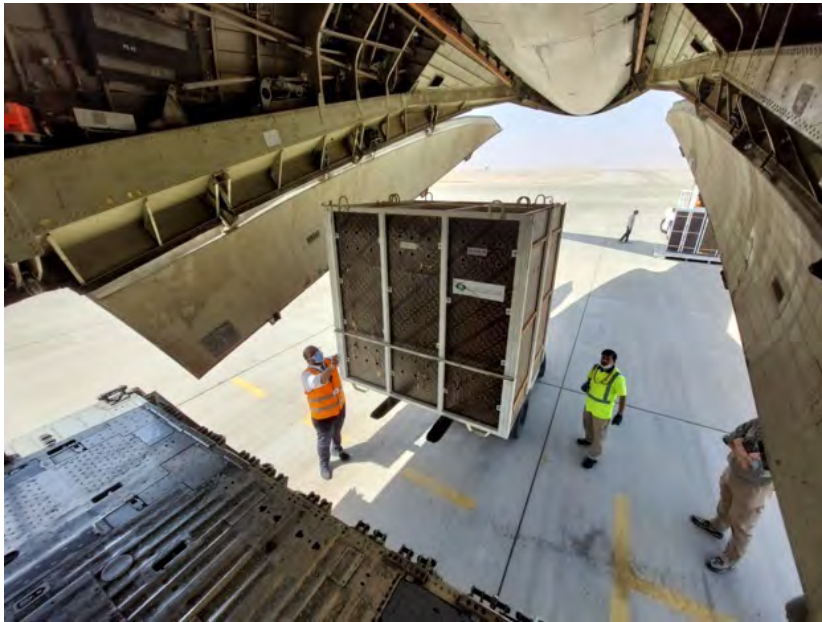
Oryx rock art depicted in Gilf Kebir, Egypt (©Zboray Andras)



Ancient Egyptian wall fresco representing a painted oryx in Luxor, Hajepsud temple (©Koen de Smet)



Reintroduction logistics



Left: Loading oryx in their crates on a plane, Abu Dhabi (©Jon Ll. Minguez)



Right: Flying oryx to their reintroduction site (©Jon Ll. Minguez)



Left: Unloading the crates in the pre-release enclosures, OROAFR, Chad (©Julie Martin)



Above: Setting the oryx free! OROAFR, Chad (©Tim Wachter)



Right: Setting the oryx free! Dghoumes National Park, Tunisia (©Tim Woodfine)



Transporting Oryx



Left: Crates with oryx being unloaded from the plane, Abéché, Chad (©Jon Ll. Minguez)



Right: Trucks loaded with crates, on their way to Oryx base camp, OROAFR, Chad (©Tim Wacher)



Left: Oryx calf manually captured by the ecological monitoring team to be ear tagged, OROAFR, Chad (©Sahara Conservation)



Scimitar-horned Oryx monitoring in the field



Left: Ecological monitoring team observing a Scimitar-horned Oryx herd in OROAFR, Chad (©John Newby)



Right: Collared Scimitar-horned Oryx, OROAFR Chad (©Sean Viljoen)



Left: Ecological monitoring vehicle approaching a Scimitar-horned Oryx during a monitoring routine visit, OROAFR, Chad (©John Newby)



Veterinary work



Left: Clinical examination and sampling of a diseased oryx under physical restraint, Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR), Chad (©Sahara Conservation)



Right: Sampling livestock in OROAFR, Chad (©Stephanie Brien)



Above: Treatment of a free-ranging diseased oryx, OROAFR, Chad (©Marc Dethier)



Right: Sampling oryx, OROAFR, Chad (©John Newby)



Physical (non-chemical) capture

1/2 - Physical (non-chemical) capture by netting of free-ranging diseased oryx for examination and treatment, Ouadi Rime - Ouadi Achim Faunal Reserve, Chad (©Marc Dethier)





2/2 - Physical (non-chemical) capture by netting of free-ranging diseased oryx for examination and treatment, Ouadi Rimé – Ouadi Achim Faunal Reserve, Chad (©Marc Dethier)





The life cycle of the Scimitar-horned Oryx



Oryx males and females exhibit frequent social interactions in herds, Sidi Toui NP, Tunisia (©Renata Molcanova)



Males signal status, thrashing vegetation, and controlling herd movements, Sidi Toui NP, Tunisia (©Renata Molcanova)



Only adult males use squatting displays when defaecating, Sidi Toui NP, Tunisia (©Renata Molcanova)



Serious fighting is rare but ferocious and occasionally lethal, Sidi Toui NP, Tunisia (©Renata Molcanova)



Heavily pregnant females often leave herds to give birth, Sidi Toui NP, Tunisia, (©Renata Molcanova)



Frequently, isolated courting pairs form following births, Sidi Toui NP, Tunisia (©Renata Molcanova)



Newborn calves lie-out and hide in the earliest days or weeks, Sidi Toui NP, Tunisia (©Renata Molcanova)



Dams are usually nearby and return to care for the calf at intervals, Sidi Toui NP, Tunisia (©Renata Molcanova)



Young oryx form creches and all oryx tend to rest facing outward when in groups, Sidi Toui NP, Tunisia (©Renata Molcanova)



Horn length is similar to head length at the age of 3-4 months, Sidi Toui NP, Tunisia (©Renata Molcanova)



Sub-adults show exfoliating keratin horn sheaths, Sidi Toui NP, Tunisia (©Renata Molcanova)



Adults have hard very sharp horns; heavier in males but also often shorter from wear, Sidi Toui NP, Tunisia (©Renata Molcanova)



Oryx grazing & browsing



Left: Oryx feeding on *Citrullus colocynthis*, Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR), Chad (©Caleb Ngaba)



Right: Calf investigating *Citrullus* vine selected by dam, OROAFR, Chad (©Tim Wachter)



Left: *Citrullus* melons are an important source of water in the dry season, OROAFR, Chad (©Tim Wachter)



Right: Oryx browsing *Chrozophora brocchiana*, OROAFR, Chad (©John Newby)



Left: A herd of oryx grazing, OROAFR, Chad (©Tim Wachter)



Right: Oryx grazing *Panicum turgidum*, OROAFR, Chad (©Caleb Ngaba)



Left: Oryx 'strimming' *Aristida mutabilis*, OROAFR, Chad. (©John Newby)



Right: Oryx grazing *Panicum turgidum*, OROAFR, Chad (©John Newby)



Current threats to Scimitar-horned Oryx in Chad



Bushfires in the background of the Ouadi Rimé – Ouadi Achim Faunal Reserve, Chad (©Sahara Conservation)



Scimitar-horned Oryx calf killed by jackal, OROAFR, Chad (©Tim Wachter)



Oryx and local communities

Page: Awareness raising among local communities, Ouadi Rime - Ouadi Achim Faunal Reserve (OROAFR), Chad (top: ©John Newby; middle: ©Sahara Conservation; bottom: ©Violeta Barrios)





Page: Consulting transhumant pastoralists about diseases shared by livestock and wildlife, OROAFR, Chad (©Sahara Conservation)





Right: Consulting local communities about the reintroduction of Scimitar-horned Oryx in Gadabéji Biosphere Reserve, Niger

Below: Oryx with camels owned by local communities, Chad (©Jaime Dias - Wings for Conservation)



© Jaime Dias/Wings for Conservation



Scimitar-horned Oryx in Chad



Scimitar-horned Oryx, reintroduced and wild-born, OROAFR, Chad (©John Newby)



Scimitar-horned Oryx herd at sunset, OROAFR, Chad (©John Newby)



Scimitar-horned Oryx, OROAFR, Chad (©Sean Viljoen)



Left: Oryx drinking in OROAFR, Chad
(©John Newby)



Scimitar-horned Oryx grazing in OROAFR, Chad (©Habib Ali Hamit)



Scimitar-horned Oryx in Morocco



Left: Scimitar-horned Oryx in Timokrarine acclimatisation Station, Morocco (©ANEF)



Right: Oryx herd in Souss-Massa National Park, Morocco (©John Newby)



Left: Oryx in Souss-Massa National Park, Morocco (©John Newby)



Scimitar-horned Oryx in Senegal



Left: Scimitar-horned Oryx in Katane enclosures, Ferlo Nord Faunal Reserve, Senegal (©John Newby)



Right: Scimitar-horned Oryx in Gueumbeul Special Wildlife Reserve, Senegal (©Ibrahima Ndao)



Left: Scimitar-horned Oryx in Gueumbeul Special Wildlife Reserve, Senegal (©John Newby)



Scimitar-horned Oryx in Tunisia



Left: Scimitar-horned Oryx in Bou-Hedma National Park, Tunisia (©Marie Petretto)



Right: Scimitar-horned Oryx in Oued Dekouk National Park, Tunisia (©Marie Petretto)



Left: Scimitar-horned Oryx in Sidi Toui National Park, Tunisia (©Tania Gilbert)



Right: Scimitar-horned Oryx in Dghoumès National Park, Tunisia (©Marie Petretto)



Scimitar-horned Oryx in the United Arab Emirates



Scimitar-horned Oryx enclosures in Deleika Wildlife Conservation Centre (Environment Agency – Abu Dhabi), Abu Dhabi (©Julie Martin)



Scimitar-horned Oryx in Deleika Wildlife Conservation Centre (Environment Agency – Abu Dhabi), Abu Dhabi (©Ricardo Pusey)



Scimitar-horned Oryx in a crate before health screening and vaccination in Deleika Wildlife Conservation Centre (Environment Agency – Abu Dhabi), Abu Dhabi (©Julie Martin)



Left: Scimitar-horned Oryx in Deleika Wildlife Conservation Centre (Environment Agency – Abu Dhabi), Abu Dhabi (©Jon Ll. Minguez)



Oryx seen from the air

Page: Scimitar-horned Oryx in OROAFR, Chad (©Jaime Dias / Wings for Conservation)





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