

early 2004 and is ready to be utilized for the restocking program. The release program commences in early 2005.

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Release of Chinkara gazelle in the Cholistan Desert, Pakistan

The Cholistan desert area in the south east part of Punjab, Pakistan is an intriguing habitat for several wildlife species including chinkara gazelle (*Gazella bennettii*). The only established water-course of this desert was the Hakra River which vanished from the region in time immemorial. Its unique centripetal drainage system, once maintained by the chinkara, provided water to the local communities for drinking, bathing and washing. This system occurred only in two deserts of the world, the Cholistan desert and the Kalahari Desert. For long, these graceful slender-bodies animals assembled around the depressions filled with rainwater and loosened the soil with their sharp hooves. The soil dried into loose sand when there was no water and was easily blown away by the strong winds of the early spring, recreating, and maintaining centripetal drainage system stayed in place to serve as water reservoirs only as long as there were chinkara in large numbers.

The chinkara population had decline severely perhaps to the point of extinction, in the desert regions along the eastern border of Pakistan due to excessive hunting, poaching and over-grazing of livestock. On 18th April 2004, Houbara Foundation International Pakistan in

coordination with the Government of Punjab, WWF-Pakistan and the Department of Private Affairs of His Highness the Late Sheikh Zayed bin Sultan Al Nahyan of UAE released a large number of captive-bred chinkara into the wild. The chinkara were released under the restocking program to re-establish a viable, free-ranging population with the renewed hopes that chinkara population will proliferate and the unique centripetal drainage system will come back to life. The chinkara were donated to Government of Pakistan by His Highness the Late Sheikh Zayed bin Sultan Al Nahyan.

The animals were raised under semi-wild conditions in a large enclosure near the eastern edge of Rahim Yar Khan. Before release the chinkara were housed in a pre-release pen established near the release area of Cholistan Desert to enable the animals to adapt to the new surrounding. Twenty water points were made near the release site. All the water points were established along a water pipe line which carries drinking water with the help of sixteen pumping stations installed in the area

Prior to release arrangements were made between Houbara Foundation Pakistan, Punjab Wildlife Department, Pakistan Army and Pakistan Rangers to ensure maximum protection of the released animals. Liaison and coordination was carried out with the Punjab Wildlife Department and District Administration to implement the wildlife law and prohibiting issuing of hunting licenses. Sixteen protection teams were formed for post-release monitoring and patrolling of the vast desert area to prevent illegal hunting and poaching.

The release of chinkara has been a big step forward for conservation in Pakistan. However, success of re-establishment of a viable free-ranging population will not be possible without a safe habitat.

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Re-introduction of Arabian oryx in the Kingdom of Saudi Arabia: up-date on population size in two protected areas

The Arabian oryx (*Oryx leucomyx*) formerly occurred throughout Arabian Peninsula deserts but was extirpated from the wild by hunting in early 1970's. In 1986 an intensive captive-breeding program was started at the National Wildlife Research Center (NWRC) of Taif, Saudi Arabia, with the aim of re-introducing Arabian oryx back into the wild (see also www.arabian-oryx.com). So far, the captive bred herd has provided nearly 200 oryx to two re-introduction sites, namely Mahazat as-Sayd and 'Uruq Bani Ma'arid.

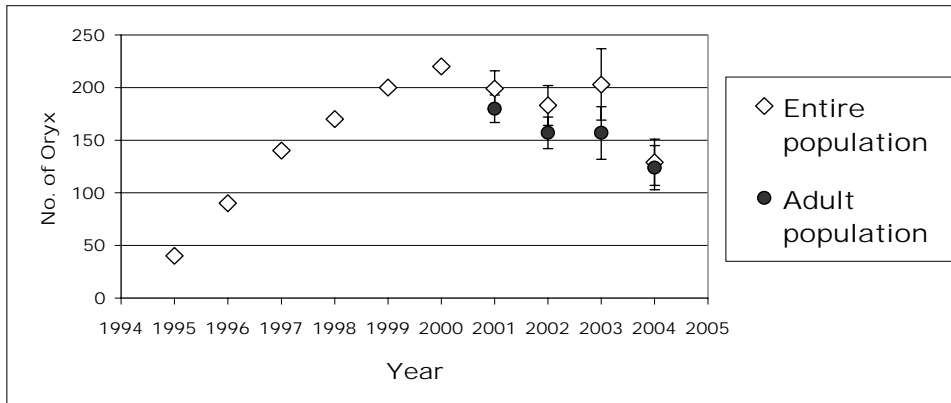
Mahazat as-Sayd Protected Area

This area was the first site considered for the re-introduction of oryx in Saudi Arabia. The area consisted of a 2,244 km² tract of flat, arid steppe desert in west-central Saudi Arabia (28°15'N, 41°40'E). After being designated

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Figure 1. Arabian oryx population size estimates in the 'Uruq Bani Ma'arid Protected Area



as a protected nature reserve in 1988, Mahazat as-Sayd was surrounded by a fence in 1989 to exclude domestic livestock.

Re-introduction: Between 1990 and 1993, 72 Arabian oryx from the NWRC and foreign collections (e.g. San Diego Wild Animal Park, USA) were moved to the reserve, held within a 200-ha enclosure, and then released into the protected area. Since that time, we did not reinforce the population through new re-introductions, and animals were never supplemented with food or water.

Population size: The re-introduced population has been monitored yearly since 1990. However, the low numbers of ungulate sightings during the transect count surveys, carried out between 1995 and 2003 (Seddon *et al.*, 2003), impaired the level of precision of the population size estimates. Indeed, the coefficient of variation of estimates was most often above 30% (Mésochina *et al.*, 2003a). For the second consecutive year, we carried out a total count survey during summer. The aim of this survey was to record as many oryx as possible. To achieve this goal, we spent more than 50 hours in the field between the 1st and 3rd September 2004, using a combination of haphazard transects, scanning from vantage points, checking of *Maerua* trees and favored sites where oryx tend to rest during daytime in summer. Results of summer 2003 and 2004 surveys confirmed that the total count method is the most precise census technique so far tested on the oryx population of Mahazat as-Sayd, with coefficient of variation of the population size estimate under 10%.

Between 1990 and 1997, the population increased steadily up to about 400 individuals. Then in 1998 and 1999, because of severe drought conditions, the population leveled off around 350-400 individuals. Between 2001 and 2004 good rainfalls, and resulting good forage conditions allowed the population to recover and increase to an estimated 800 individuals (95% confidence interval: 655–950) in September 2004. The Mahazat as-Sayd protected area therefore currently holds the highest wild population of Arabian oryx in the world. Using data-driven assumptions we developed a computer model that evaluated the probability of extinction of the oryx population under different management strategies (Treydte *et al.*, 2001). According to the assumptions of the model we have estimated the carrying capacity (Kmax) of the Protected Area at 816 oryx under good forage

conditions. Our present estimate of population size is close to Kmax, predicting that from now the population is likely to face a significant decline whenever food resources will decrease (e.g. drought period). Among others management strategies, removing annually 15% of the current population would significantly reduce the probability of extinction of the population. Whatever the management option applied, human intervention seems ineluctable to maintain the long-term viability of the Arabian oryx population re-introduced in

Mahazat as-Sayd. Rehabilitation of the Arabian oryx in Mahazat as-Sayd Protected Area has been completed in a decade, however nowadays the new challenge concerns its long-term survival.

'Uruq Bani Ma'arid Protected Area

Although situated in one of the driest regions of the world, on the western fringe of the Rub' al-Khali desert, the 'Uruq bani Ma'arid protected area (12,500 km²) was once home to the Arabian oryx before its extinction in the 1970's. Some nine years after the first oryx re-introduction into the reserve, and despite regular subsequent releases, reinforcement of the population was still considered necessary in 2004.

Re-introduction: The translocation was scheduled in May 2004, as important rainfall occurred in the core area of the reserve in April 2004, inducing excellent vegetation growth. On 25th May, we brought seven oryx (2 males: 5 females) aged 14 to 46 months to the reserve, following a procedure based on boma-training or long-acting tranquilizers. This method proved to be reliable and efficient in the past, and all animals arrived safely at their destination. The oryx were released into the wild after spending an acclimatization period of 45 days in a pre-release enclosure, where they were provided with water and Rhodes grass hay. During ca 10 days, the animals explored an area of approximately 80 km² and were seen alone, in groups of 2–4, or, less frequently, in mixed groups with settled individuals. One month after release, the newly released cohort's dominant male was found dead, the carcass bearing puncture marks typical of horning during fights. In addition, the youngest female rapidly lost condition around mid-August, showing signs of haemorrhagic diarrhea, and died shortly after. The remaining released oryx seem to have adapted to their new habitat relatively well. By the end of August, they had individually explored territories of ca 100 – 200 km², and were seen either alone, or integrated in groups of settled oryx. Although the presence of experienced individuals on or close to the release site is thought to be beneficial to naïve oryx in terms of transfer of learned foraging behavior (Tear *et al.*, 1997), the newly released individuals were observed obviously in poorer body condition compared to settled animals, stressing the need of above average grazing availability in order to achieve successful acclimatization.

Population size: Since 2001, the oryx population size at 'Uruq Bani Ma'arid has been estimated once a year in summer by the means of a total count, and using Chapman's modified Lincoln-Peterson Index and Seber's formula for the calculation of variance and 95% confidence interval (see Bedin & Ostrowski, 2003 for site-specific details, and Seddon *et al.*, 2003 for methodological details). Results have been in agreement with crude estimates based on routine monitoring, and consistency in the methodology now allows to compare estimates across years. This year's total count was carried out on 11th-15th August. Few calves and sub-adults were observed, and the entire population was estimated at 107-151 individuals (1 male: 1.2 female), nearly identical to the estimate of the adult population only (103-145 oryx) (see Figure 1). Since the first release in 1995, a total of 156 oryx have been re-introduced in the reserve, and we estimate that 56 of them are still alive and present in the protected area. After an initial phase of increase due both to continued releases and natural recruitment, the oryx population of 'Uruq Bani Ma'arid has not significantly increased or decreased between 2001 and 2003 (see also Bedin & Ostrowski, 2003).

However, according to this year's estimate, the entire population has sensibly diminished. As regards adults only, the population has also decreased compared to 2001, but not significantly compared to 2003. Potential reasons to this decline are several, including deaths related to environmental stress and conspecific fights, an undetected emigration trend, a bias in the method due to the presence of unmarked wild-born animals in areas not surveyed, illegal hunting, or a demographic fluctuation in response to exceeded habitat capacity (see also Bedin & Ostrowski, 2003). Of these reasons, poor range condition and poaching appear to be predominant (Mésochina *et al.*, 2003b). Indeed, the low number of sub-adults observed in 2004 despite the birth of about 70 calves in 2003 suggests an important rate of mortality among juveniles, probably due to the absence of rainfall in 2003 and resulting poor grazing. Likewise, all ten oryx released in July 2002 perished during the last four months of 2003. Concurrently, the impact of poaching is considerable on the already fragile population of 'Uruq Bani Ma'arid, presently accounting for 23% of recorded deaths since its onset in 1998. Despite past measures taken to deter hunters (new ranger camps and increased ground patrolling), an estimated 5 – 10 % of the adult oryx population has been killed over the last 12 months. Fortunately, decisions were made by the NCWCD in September 2004 to reinforce both air and ground surveillance of the protected area.

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Twenty years of rhino re-introduction in Dudhwa National Park, Uttar Pradesh, India

The first rhino re-introductions in India took place from the Pabitora Wildlife Sanctuary, Assam and The Royal Chitwan National Park, Nepal into their former range in Dudhwa National Park (DNP) in two phases during 1984 and 1985. The last rhino in the lowland grassland area known as *terai* in Pilibhit district, close to DNP, was killed in 1878. The Indian one-horned rhinoceros (*Rhinoceros unicornis*) roamed over the Indus, Gangetic to Brahmaputra flood plains of the Indian sub-continent and in the relics of Mohenjo-Daro era, some rhino seals were found which are preserved in the Indian National Museum, New Delhi. The records say that the invading Emperor Timor hunted and killed many rhinos on the frontier of Kashmir in AD 1398 and there are evidences that rhino existed in parts of the west of sub-continent as far northwest as Peshawar until the 16th century. Babur, the founder of the Mughal Empire in India in his famous memoirs, the Baburnamah, described how he hunted rhino in bush country near the Indus as late as 1519.

Out of the three species of rhino that roamed over the Indo-Gangetic and Brahmaputra floodplains, two species, the Javan rhinoceros (*Rhinoceros sondaicus*) which was once "fairly common" in the Sundarbans became extinct in India about 1900 and the Sumatran rhino (*Didermoceus sumatrensis*) disappeared from the Lushai hills of Assam in about 1935. The only species of Asiatic rhinoceros that exists in Indian subcontinent is the great Indian one-horned rhinoceros (*Rhinoceros unicornis*). The causes of disappearance of *Rhinoceros unicornis* from much of its former distribution range and population decline were primarily:

- Destruction and fragmentation of habitat primarily for agriculture.
- Sport-hunting during the Mughal period and the early days of British rule in India.
- Poaching of horns and other parts.

In Assam Col. Pollock a Military Engineer engaged in laying of roads in Brahmaputra Valley almost shot a Rhino