Reintroduction of the Arabian oryx (O*ryx leucoryx*) in Jordan[1]

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Running head: Oryx in Jordan

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Abstract

Following the Arabian oryx's (O*ryx leucoryx*) extinction in the wild in 1972, the Hashemite Kingdom of Jordan began a reintroduction programme in 1978 with 11 founding animals. When the herd size reached 31 in 1983, most were released from captive breeding pens into the 342 km^2 Shaumari Nature Reserve, part of which (22 km^2) was fenced the following year to protect the oryx and exclude livestock. The herd grew initially (1979 to 1986) at about 23% per year. In 1990, when the herd numbered 79, its management was preparing to release it into the wild outside of the fenced reserve. However, Bedouin families fleeing the Gulf War in Kuwait and Iraq brought 1.6 million sheep, goats, camels, and donkeys into Jordan. These livestock so overgrazed potential oryx habitat throughout the arid rangelands that reintroduction was impossible. Overcrowding within Shaumari became apparent by 1995, when the population was 186. The herd's rate of increase began to decline as productivity and recruitment decreased and mortality increased. In 1997, to reduce overcrowding, the herd's management began dispersing them to other Middle Eastern countries and to another nature reserve in Jordan. By February 2006, 43 oryx remained at Shaumari. In 2005, however, the prospects improved when the United Nations Compensation Commission awarded Jordan the cost of environmental damages resulting from the 1990-1991 Gulf War. Part of this award is designated for renewal of the captive breeding and reintroduction programme.

Keywords: Oryx leucoryx, Gazella subgutturosa, reintroduction, Jordan, rangeland, desert, captive breeding, war, environment

Introduction

The Arabian oryx originally occurred in Jordan, Syria, Iraq, Israel, Sinai, and the Arabian Peninsula, but was extirpated from the wild in 1972 (Henderson, 1974). It has been on the Convention on International Trade in Endangered Species (CITES) Appendix I since 1975 and is listed by the World Conservation Union (IUCN) as Endangered (last assessed in 2003).

Currently there are five reintroduced populations in large areas of natural habitat, although all have some degree of protection: Oman (Oryx Sanctuary, 27,500 km²); Saudi Arabia (Mahazat as-Sayd Reserve, 2,244 km² and the unfenced Uruq Bani Ma'arid Reserve, 12,500 km²); and Israel (Northern Arava and Negev Desert) (Jungius, 1978; Clark, 1987; Abu-Jafar & Hays-Shahin, 1988; Ostrowski *et al.*, 1998; Bedin & Ostrowski, 2003).

In Jordan, oryx originally occurred throughout the northern steppe grasslands and eastern desert (the "*badia*"). They were hunted intensively after 1932, when the construction of the Baghdad–Haifa oil pipeline was accompanied by "massive mechanized shooting" of oryx (Quemsiyeh *et al.*, 1996). Some oryx were also killed by pesticides applied across wide areas of the badia to control locusts in the 1950s (Hatough & Al-Eisawi, 1988). The last wild oryx in Jordan was shot in the early 1960s near Qatraneh, about 75 km south of Amman (Mountfort, 1965).

In 1978, the Royal Society for the Conservation of Nature (RSCN, a non-governmental organization), began the world's first oryx reintroduction programme. It obtained 11 oryx from the San Diego Wild Animal Park in the United States (four males and four females) and the Royal herd in Qatar (one male and two females) (Table 1). In 1984, the Zurich Zoo in Switzerland provided three males. The founders were from two separate bloodlines: those from San Diego and Zurich were of Yemeni-Saudi stock, while those from Qatar were considered a separate stock. They were placed in a captive breeding enclosure consisting of pens and a fenced, brushy compound occupying a small portion of the 342 km^2 Shaumari Nature Reserve in eastern Jordan (Fig. 1).

In 1983, the RSCN began releasing oryx out of the captive breeding enclosure into the whole reserve, shared with other large grazers and occasional predators. This was considered a reintroduction "into the wild" because the reserve outside of the captive breeding enclosure is native habitat in a natural state and the herd was managed with minimal human interference (Bauman, 1979; Abu-Jafar & Hays-Shahin, 1988; Hatough & Al-Eisawi, 1988). Oryx are "nomadic," however, ranging over a large area while using a series of separate, suitable areas mostly 100–300 km^2 in size for one to 18 months at a time (Price, 1986). Spalton (1993) found a mean size of 5.8 individuals among 18 breeding herds, in addition to 10 solitary bulls and a bachelor herd with largely separate territories. The situation at Shaumari was therefore transitional to a truly wild, free-ranging population that the RSCN planned to eventually establish (Mountfort, 1969; Clarke, 1977, 1979).

Since Jordan's captive-breeding/reintroduction programme was the first for Arabian oryx, its demographic history is the longest on record. The purpose of this paper is to provide vital statistics of this population from its early, rapid expansion through eventual decline to provide a foundation for further reintroductions within and outside of Jordan.

Methods

Study Area

The Shaumari Nature Reserve is in semi-arid desert with temperatures frequently above 42° C in summer down to -10° C in winter. Rain only falls in winter and averaged 62.2 mm/year (10.1 to 149.0 mm/year) from 1967 to 1997 at nearby Azraq (Government of Jordan data). The habitat is "*hammada*," a flat, treeless terrain covered by flint or limestone pebbles, with many "*wadis*," or ephemeral run-off channels. Wadi vegetation may contain shrubs up to 2 m tall and small trees (e.g., *Tamarix spp*.), in contrast to hammada, which is virtually bare for most of the year.

In 1984, 22 km^2 of the Shaumari Nature Reserve was fenced completely to exclude domestic livestock and to contain the oryx and other large wildlife, which include Persian onagers (*Equus hemionus onager*), goitered gazelles (*Gazella subgutturosa*), and blue-necked ostriches (*Struthio camelus austrellus*). By the mid 1980s, the protection from grazing had allowed the development of a structurally complex and species-rich plant community that supports a much more diverse community of mammals, reptiles, and birds than outside the reserve (Al-Eisawi & Hatough, 1987; Hatough-Bouran & Al-Eisawi, 1990). Water is provided from a well and mature tamarix and planted eucalyptus trees provide shade.

Population Data

We examined the oryx log (a record of every oryx born at the reserve) for internal consistency and compared it with independent reports of the population at Shaumari. Finding that a few of the records prior to 1995 were incomplete, we made the following adjustments:

(1) For five of 87 (6%) death records prior to 2000, the year of death was missing. To approximate these five death dates, we used either the median age of death for that cohort or the date of last observation.

(2) For eight of 403 (0.02%) births for which the sex of a calf was not recorded, or was recorded as unknown, these were omitted from the population calculations on the assumption that they died before their first year (in all such cases, there was no further mention of those individuals).

Another inconsistency in the oryx log was the number of calves born, compared to published reports. For example, a visiting ornithologist mentioned that 18 oryx calves had been born at Shaumari by the end of 1981 (Conder, 1981), but the oryx log lists only nine up to that date. Also Buderi (1995) reported that 328 calves had been born, although the oryx log only listed 272 by the end of 1995. Presumably, some calves were not entered into the database because they died as neonates and the staff at Shaumari felt that they had not been recruited to the population and therefore should not be recorded.

Analysis

We reorganized the oryx log data to list the founding population, number of new male and female calves born, number of male and female calf deaths, and number of male and female yearling and adult deaths, by year. Yearling recruitment was calculated as the number of the previous year's female and male calves less the previous year's male calf and female calf deaths, per 100 adult females. Each year's population of yearlings and adults was therefore the previous year's yearling and adult males and females plus the number of male and female yearlings recruited, plus the new acquisitions, minus the number of male and female yearling and adult deaths, and minus the dispersals of adult oryx to other locations. The total population (N) was these plus the number of calves surviving at the end of the year. We calculated annual increase in the population, lambda (λ), using the exponential model given by Formula 1:

$$\lambda = \left(\frac{N_t}{N_0} \right)^{\frac{1}{t}} \quad (1)$$

where N_0 = initial population size, N_t = population at time t, and t = years.

To represent the population increase when density-dependent effects became apparent at Shaumari, we used a generalized logistic model (Verhulst, 1838) in which the rate of increase is a function of the population size relative to the maximum population as shown in Formula 2:

$$N_{t+1} = N_t + R_0 \left[1 - \left(\frac{N_t}{K} \right) \right] \quad (2)$$

where N_t = population at time t, N_{t+1} = population size at the end of the next interval (year), R_0 = the initial, discrete rate of population growth, and K = maximum population (assumed to be equivalent to carrying capacity).

To express annual population growth in terms of population size, we used the per capita growth rate, or instantaneous rate of increase, (r) for continuously increasing populations because of the non-seasonal breeding of oryx:

$$r = (N_{t+1} - N_t)/N_t \quad (3)$$

We tested for the Allee effect (Courchamp *et al.*, 1999) or other hormesis relationships (a U-shaped trend line indicating a reversal of the dependent variable with continued increase of an independent variable) with quadratic models (c.f. Treydte *et al.*, 2001). All curve estimations and statistical analyses were performed with SPSS®.

Results

Population Growth

The oryx log records 454 births and 166 deaths at Shaumari. During 1984–1989, four females and five males from Shaumari were sent to captive breeding centres in Oman, Saudi Arabia, and Iraq (Table 1). In 1990 there were 69 adult oryx at Shaumari, but deteriorating range conditions outside of the wildlife refuge prevented further reintroductions. By 1996, the oryx log recorded 273 births at Shaumari and the adult population stood at 206. In 1997, to reduce overcrowding within Shaumari, the RSCN began dispersing oryx to other countries and to a newly created nature reserve in Jordan, the Wadi Rum Protected Area (Abu-Eid, 2001) (Table 1).

By autumn 2003, six adults had survived at Wadi Rum, the other four having died, probably of old age. A female calf born at Wadi Rum also did not survive, and may have succumbed to snakebite. After initially keeping them in a large, fenced enclosure, the management of the Rum Protected Area released the oryx into the wild. However, when the entire herd wandered south and were about to cross into Saudi Arabia, they were captured and returned to the enclosure. From 2003 to 2005, another five died, leaving one old male at Wadi Rum. In February 2006, the RSCN transferred five more oryx to Wadi Rum. We saw all six there in March 2006.

Growth Rates

The oryx population grew initially (1979 to 1986) at about R_0 = 23% per year ($\lambda = 1.2336$) inside the reserve (Fig. 2). Thereafter, they apparently began to suffer density-dependent effects indicated by increasing aggression among males (Budieri, 1995) and a declining rate of increase commensurate with decreasing productivity and increasing mortality. The per capita growth rate declined linearly with increasing population ($r^2 = 0.283$; $F = 10.3$; $P = 0.004$). When the analysis was limited to the 1984–2005 (after most of the herd was released into the reserve from the captive breeding pens) the relationship weakened, but was still statistically significant ($r^2 = 0.232$; $F = 6.1$; $P = 0.023$) (Fig. 3). The quadratic model did not show a decrease at low populations, as would have been consistent, for example, with an Allee or other negative founder effect.

Reproduction and recruitment

Although the overall calf sex ratio was 0.91 male per female, there was no significant difference (paired t test, $P > 0.05$) in the numbers of female and male births per year. They were highly correlated ($P < 0.001$), with both genders increasing as the population rose until 1995, and then declining (Fig. 4). The possibility of some births and neonatal mortality not having been recorded, as noted above, may mean that births rates are underestimated. The regression for number of calves over time fit a quadratic equation ($r^2 = 0.471$, $F = 10.7$, $P < 0.001$), confirming the obvious rise and then fall in the number of births per year. After 1983, when the oryx were released from the captive breeding facility into the reserve, the birth rate (b, the number of births during the time period, t, divided by the total number of mature females) generally declined as population (N) increased. The trend approached statistical significance ($P = 0.055$) (Fig. 5).

Recruitment of yearlings (male and female calves that survived their first year) increased rapidly until 1983, reaching a maximum of 61.5 yearlings per 100 adult females. From 1984 on, after most oryx had been released from the captive breeding facility into the reserve, recruitment declined (quadratic model, $r^2 = 0.529$, $F = 10.7$, $P = 0.001$) (Fig. 6). There was no difference in recruitment of males and females per year (paired t test, $P > 0.05$) and the two were highly correlated ($P < 0.001$).

Neither the birth rates (b) nor annual recruitment were related to rainfall ($P > 0.05$), a major correlate of forage availability and hence of ungulate productivity in Middle

Eastern deserts (Orshan, 1985). Above-average rainfall occurred during 1981, 1983, 1988–1991, and 1995; otherwise, rainfall was less than the long term average.

Survival and Mortality

Calf survival, although often above 90%, occasionally dropped to below 80%, in addition to 2 catastrophic years, 2000 and 2002, when floods killed 100% and 92% of calves, respectively (Figure 7). Male and female calf survival (and, conversely, mortality) were not statistically different ($P > 0.05$). The possibility of some births and neonatal mortality not having been recorded, as noted above, may mean that calf survival was overestimated.

Yearling and adult survival varied from 93% to 100% for females and 75% to 100% for males (Figure 7). Yearling and adult mortality did not change over time ($P > 0.05$) and was not correlated with population size ($P > 0.05$). The numbers of yearling and adult female and male deaths (and, conversely, survival) were not statistically different ($P > 0.05$).

The leading mortality factor was predation, accounting for 15% of deaths (Fig. 8). Syrian jackals (*Canis aureus syriaca*), Arabian wolves (*Canis lupus arabs*), red foxes (*Vulpes vulpes*), Ruepelli's sand foxes (*Vulpes rueppelli*), caracals (*Caracal caracal*), sand cats (*Felis margarita*), wild cats (*Felis sylvestris tristrami*), and Syrian striped hyaenas (*Hyaena hyaena syriaca*) occur in that area (Bunaian *et al.*, 2001). Caracals, which could easily kill a young oryx, were seen within Shaumari several times during the late 1990s, coincident with a period of high neonatal mortality, and in 2002.

Floods, although infrequent, were the second highest cause of death in the oryx at Shaumari. Flash floods combined with cold weather were responsible for most of the 19 deaths in 2000 and 30 in 2002. It also is possible that some oryx escaped during floods, as did seven gazelles during a flood in 1994 that damaged the fence. If so, it could account for the five oryx whose death dates were not recorded.

Diseases (including food poisoning, intestinal parasites, and infections) were the third highest mortality factor. Until 1993, veterinarians provided monthly medical care, performed pathological examinations on deceased individuals, and treated accidentally injured oryx. Serological analysis was carried out for possible carriers of antibodies to major zoonotic diseases such as bluetongue, *brucellosis*, and *Pasteurellosis*. Faecal samples were taken regularly to check for parasites. After 1993, veterinary care became less regular. Diseases and parasite infestations were likely responsible for some of the deaths from undetermined causes. If so, then diseases might have been the highest or second highest source of mortality.

Poisonous snakes killed two to three oryx per year (8% of the total mortality) and this factor seemed to the herd's management to be associated with the plant cover that provided hiding places (Budieri, 1995). Hatough *et al.* (1986) also reported that high reptile diversity was associated with increasing plant cover following protection from grazing at Shaumari.

Other causes of death included cold intolerance (7%), birth difficulties (7%), intraspecific aggression (males fighting, 6%), "old age and weakness" (6%), infanticide (males goring neonates with their horns, 5%), anaesthesias during veterinary procedures (3%), and accidents resulting in bone fractures (2%). The herd's management at

Shaumari attempt to reduce infanticide by isolating females with calves from the rest of the herd.

Life Span

Males lived up to 18 years and females, 16. Of those that survived their first year, the mean life span was 6.9±4.5 SD years for males, 8.8±4.8 SD years for females and 7.7±4.7 SD years for both (Fig. 9).

Discussion

This study shows the value of setting up a good record-keeping system at the outset of captive breeding and reintroduction programs, and then ensuring continuity and standardization to facilitate retrospective analyses.

The initial growth rate (R_0) observed at Shaumari, about 23% per year ($\lambda = 1.2336$), was similar to those of other reintroduced oryx populations. In 1990, 72 Arabian orxy were reintroduced into a 2,244 km^2 wildlife reserve in Saudi Arabia and increased to 350 by 1998 (Seddon *et al.*, 2003), an annual rate of 22% (λ=1.22). After 1998, however, the annual growth rate there declined to about 15% per year (λ=1.15). In Oman, 35 oryx introduced from 1982 to 1989 grew to 100 in 1990 and 450 in 1996 (Spalton *et al.*, 1999); the 1990–1996 annual growth rate was 28% (λ=1.28). On the other hand, an oryx herd reintroduced into a small reserve in Israel experienced a rate of increase of only 7.7% from 1978 to 2003 (Saltz, 1998; EPAA, 2003).

These data — the overall population trend, declining per capita birth rate, increasing mortality, declining recruitment — show a classic example of a population approaching and exceeding the carrying capacity of the small nature reserve. It is not certain, however, whether the carrying capacity was a function of the habitat quality or intrinsic density-dependent population controls, such as male aggression to each other and to calves, both of which were sources of mortality. The sharp drop in productivity after 1995 was reportedly in response to deteriorating browse availability within the reserve (Boef, 1996; Budieri, 1995). Although no quantitative measurements were made after 1990, this decline is consistent with the carrying capacity estimate of about 180 oryx (Hatough & Al-Eisawi, 1988), based on the abundant vegetation and forage in 1986 (Al-Eisawi & Hatough, 1987). Probably both extrinsic and intrinsic factors were involved. The inconsistent availability of professional wildlife expertise in several areas was another factor in poor productivity in the early 1990s, not only of oryx, but of other species held at Shaumari (Budieri, 1995).

The gazelle population, for example, began with a founding population of 11 in 1980, increased by 12% per year to a high of 34 in 1990, and then declined precipitously to 14 in 1994 (L. Harding, unpubl. data). By 2003, the gazelle population was down to two — both males — at Shaumari. Since their decline preceded that of the oryx by five years, it was probably not caused by a lack of forage that would have affected both species simultaneously. In fact, floristic surveys in 1990 showed the vegetation to be abundant, diverse, and well developed structurally (Hatough-Bouran & Al-Eisawi 1990). Rather, the herd’s manager at the time thought that the gazelles failed to reproduce at higher densities because of improperly designed captive breeding pens, behaviour unsuited to captivity in pens, and high rates of mortality due to diseases brought in by domestic livestock (Budieri, 1995). (Sheep and goats are not allowed into the reserve, but commonly graze at its edge, and occasionally get inside.)

A small flock (~20 individuals) of ostriches is maintained at Shaumari. Ostriches feed on green annual grasses and forbs when available, otherwise leaves, flowers, and fruits from succulents and woody plants, and can be destructive to rangeland when confined and stocked at high densities (Milton *et al.*, 1994). Similarly, the few (< 10) onagers at Shaumari may compete with the oryx for forage. Onagers, predominately grazers, browse a large portion of their diet during dry the season in drier habitats (Feh *et al.*, 2002). These other herbivores could have reduced the amount of forage available to the oryx.

There also may have been other sources of declining productivity in oryx, such as genetic inbreeding or outbreeding depression, both of which affected juvenile survival of oryx in Oman (Marshall & Spalton, 2000). The genetics of the Shaumari herd have not been investigated, but calf survival trends gave no evidence of such effects. The RSCN attempted to reduce genetic effects by obtaining its founders from two separate stocks, but in later years was unable to obtain "fresh blood" due to political instability in the Middle East.

Although there were problems inside the reserve, the most severe difficulty facing the RSCN was overgrazing outside of it. Jordan's arid rangelands have been overgrazed and subject to declining levels of rangeland productivity since the 1970s (Hatough *et al.*, 1986). The RSCN and its predecessor, the Royal Jordanian Hunting and Shooting Club, had been seeking to establish new, much larger reserves in the eastern desert since 1965, including one of 950 km^2 at Burqu (Mountfort, 1965; Clarke, 1979), a permanent water body near the Syria and Iraq borders (Fig. 1).

During 1990–1991, however, Bedouins fleeing Kuwait and Iraq during the Gulf War brought 690,000 sheep and 580,000 goats into Jordan, approximately doubling the livestock population (Hashemite Kingdom of Jordan, 1991; Dutton, 1998; CC/EVS/ERM, 2002). After walking up to 1000 km from Kuwait, these animals were starving. They also had higher disease and parasite loads than local animals (Jones, 1995; Kamhawi *et al.*, 1995; Allonby, 1996; Aldomy *et al.*, 1997; Aldomy & Wilsmore, 1998) and were the probable source of at least one outbreak — of *Pasteurellosis* — among the oryx during 1990–1991. This livestock influx greatly increased the severity of overgrazing throughout the Badia, but especially around water sources such as Burqu. Burqu was drained dry in 1991 for the first time ever by excessive livestock watering (CC/EVS/ERM, 2002). Therefore, the RSCN was forced to defer the oryx release plans and the new reserve at Burqu was still "under establishment" in 2000 (Budieri, 2000). These events also precluded the expansion of the Shaumari Nature Reserve from its current 22 km^2 to the 342 km^2 that had originally been allocated.

In 2005, the United Nations Compensation Commission recognized the environmental damages from the 1990 Gulf War and awarded Jordan compensation (UNCC, 2005). Some of these funds are to be directed at rejuvenating the oryx reintroduction programme. With a renewed reintroduction program, Jordan may begin releasing oryx into the wild within a few years, completing a project started 28 years ago.

Notwithstanding its setbacks, Jordan's captive breeding program produced enough surplus oryx for dispersals to other countries (Table 1), contributing to the increase in the world oryx population and its genetic heterogeneity. In 2003, there were about 4000 oryx outside of zoos, a 13.5% increase compared to 2001 and a 38.4% increase compared to 2000 (Ostrowski & Anajariyah, 2003).

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Biographical Sketches

Lee Harding has degrees from the University of California (USA) and Gifu University (Japan). He worked as a wildlife biology consultant for five years before joining Environment Canada in 1976. After early retirement in 1998, he returned to consulting in wildlife and marine ecology.

After graduating from Jordan University in 1996, Omar Abu-Eid was involved in the RSCN's captive breeding programmes in several positions, starting with Captive Breeding Programmes Officer in 1999, culminating as Nature Reserves Section Head from 2001-2004. He continued to follow the captive breeding programmes during his work with RSCN, in close cooperation with Mr. Nashat Hamidan. He currently is the Programme Assistant and the Environment Focal Point at the European Union delegation to the Hashemite Kingdom of Jordan.

Nashat Hamidan received his science training in Jordan and the UK. Since 2000 he has been central ecologist with the Royal Society for the Conservation of Nature in Amman and responsible for providing technical advice on management of the Arabian Oryx herd at Shaumari. His research interests include fish, birds, and reptiles in desert oasis ecosystems.

Ahmad Sha'lan was educated in Amman and now lives at Azraq Oasis. He is currently the longest-serving employee of the RSCN. He began working at the Shaumari Nature Reserve in 1984 and has been the Reserve manager since 1998. His professional focus is oryx and their captivity.

Figure Legends

Fig. 1. Location of the Shaumari Nature Reserve, the Rum Protected Area, and the proposed nature reserve at Burqu.

Fig. 2. Oryx population (N) at Shaumari Nature Reserve, Jordan, 1978–2005. The logistic model had an initial growth rate (R_0) of 23% as observed at Shaumari and an assumed maximum population (K) of 200. The sharp decline after 2000 reflects (a) floods that killed 69 oryx in 2000 and 48 in 2002, and (b) a planned dispersal of 119 adult oryx to other Gulf countries and 10 to another nature reserve in Jordan.

Fig. 3. Annual per capita growth rate (r) in relationship to population for the oryx population at Shaumari Nature Reserve, Jordan, 1984-2005, the period after most of the herd was released from the captive breeding pens. The linear trend line (solid line) is statistically significant at $P \leq 0.05$.

Fig. 4. Annual number of calves born per year at Shaumari Nature Reserve, Jordan, 1979–2005. The fit line is a statistically significant quadratic model.

Fig. 5. Annual birth rate (b) in relation to the oryx population at Shaumari Nature Reserve, Jordan, 1984–2005, the period after they were released from the captive breeding facility into the reserve. The linear regression approaches statistical significance at the 5% level.

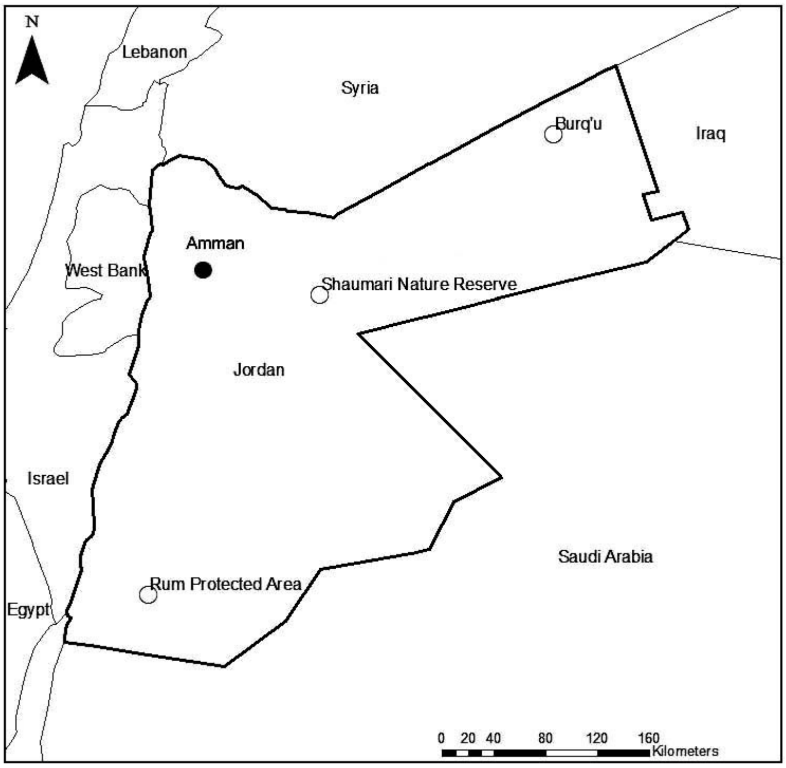
Fig. 6. Recruitment (calves that survived their first year) per 100 adult oryx females for 1984-2005, the period after the oryx were released from the captive breeding facility into the Shaumari Nature Reserve, Jordan. The quadratic fit line is statistically significant.

Figure 7. Annual survival of calves and adults + yearlings at Shaumari Nature Reserve in Jordan, 1979–2005.

Fig. 8. Frequency of mortality factors for the oryx at Shaumari Nature Reserve, Jordan, 1979–2005.

Fig. 9. Frequency distribution of life span of oryx at Shaumari Nature Reserve, Jordan, 1979–2000.

Figures



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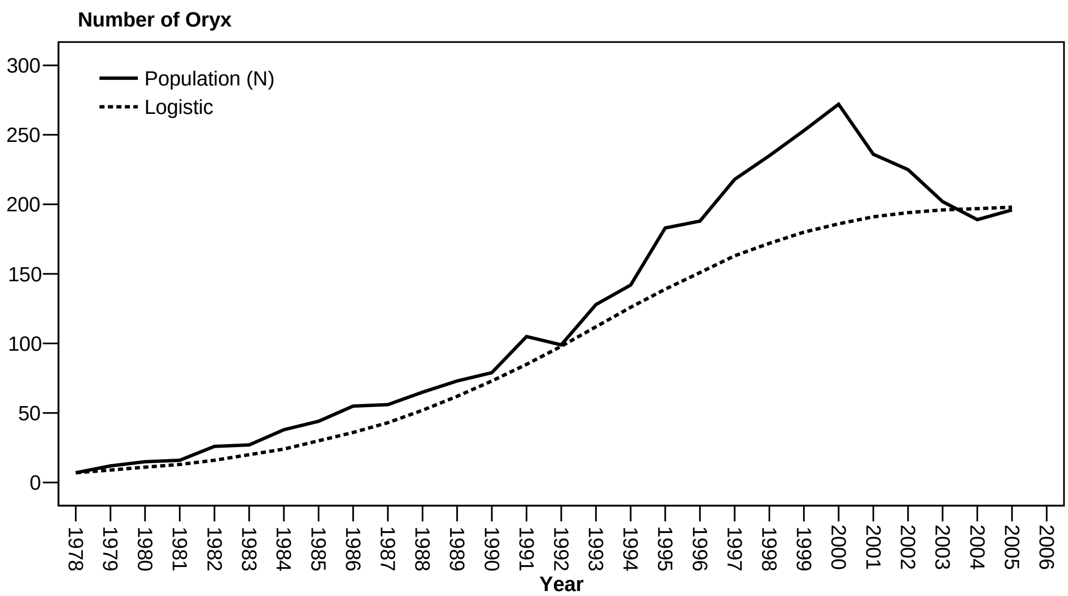

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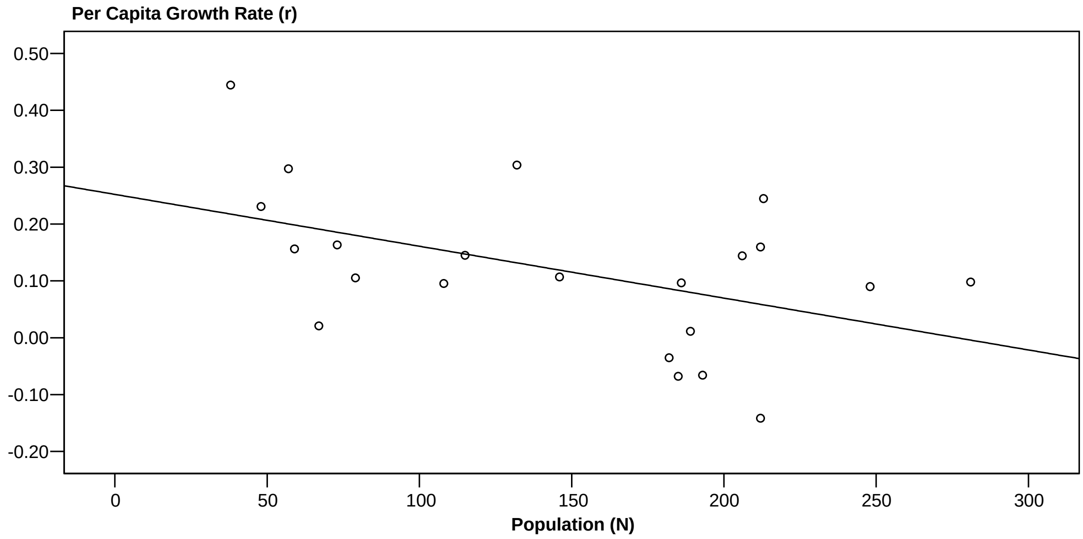

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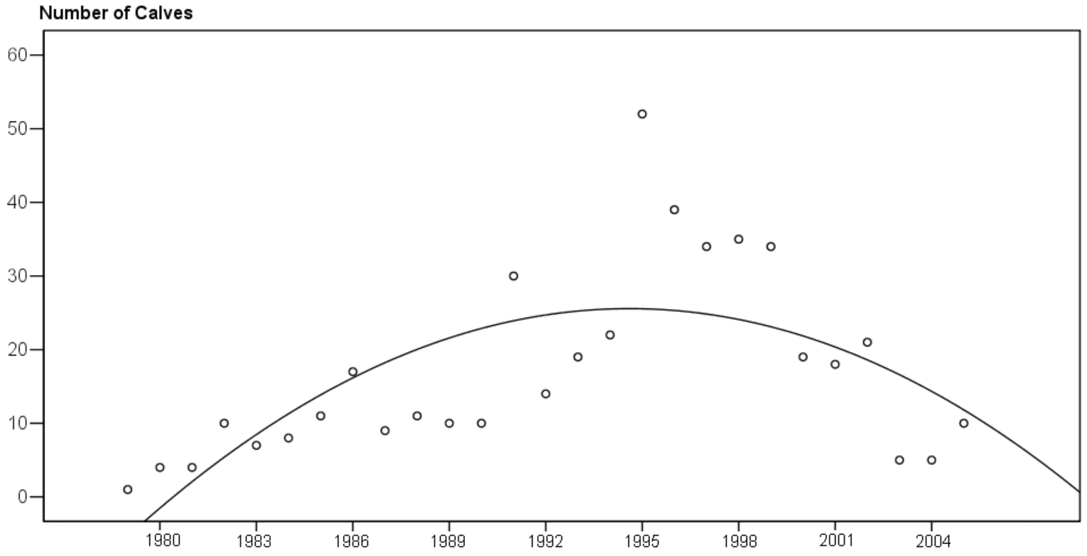

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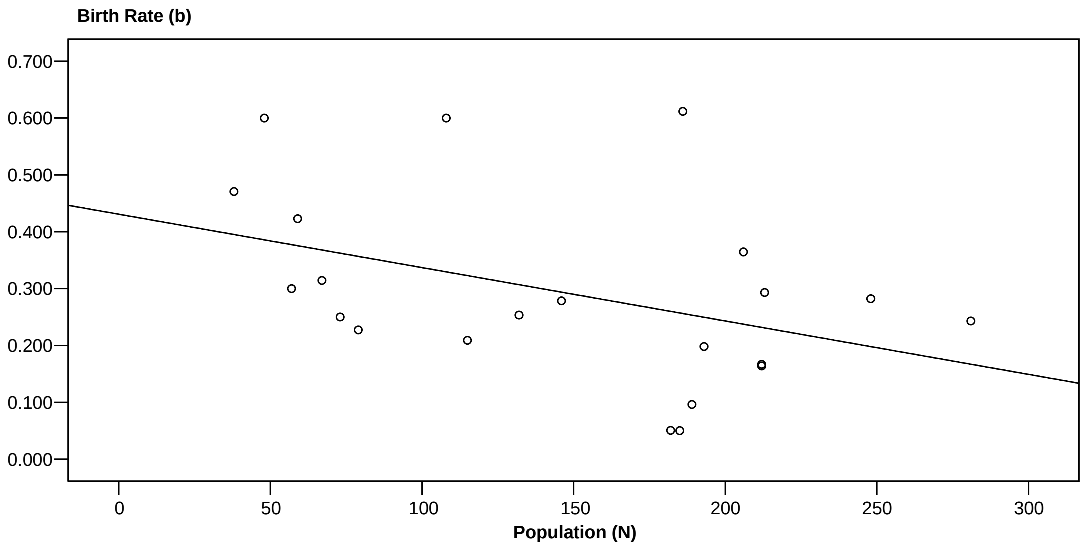

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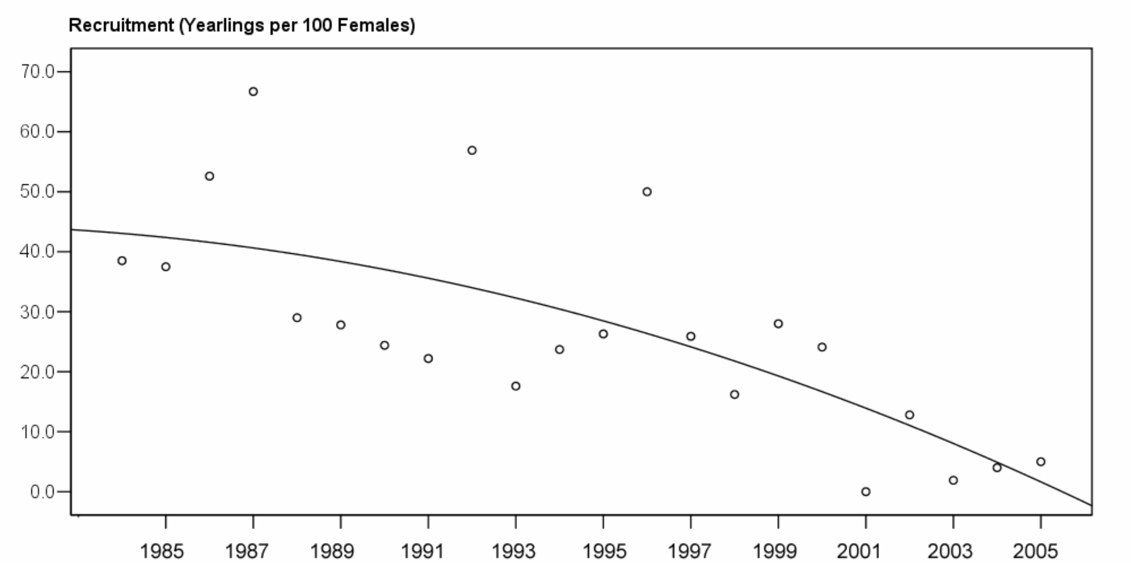

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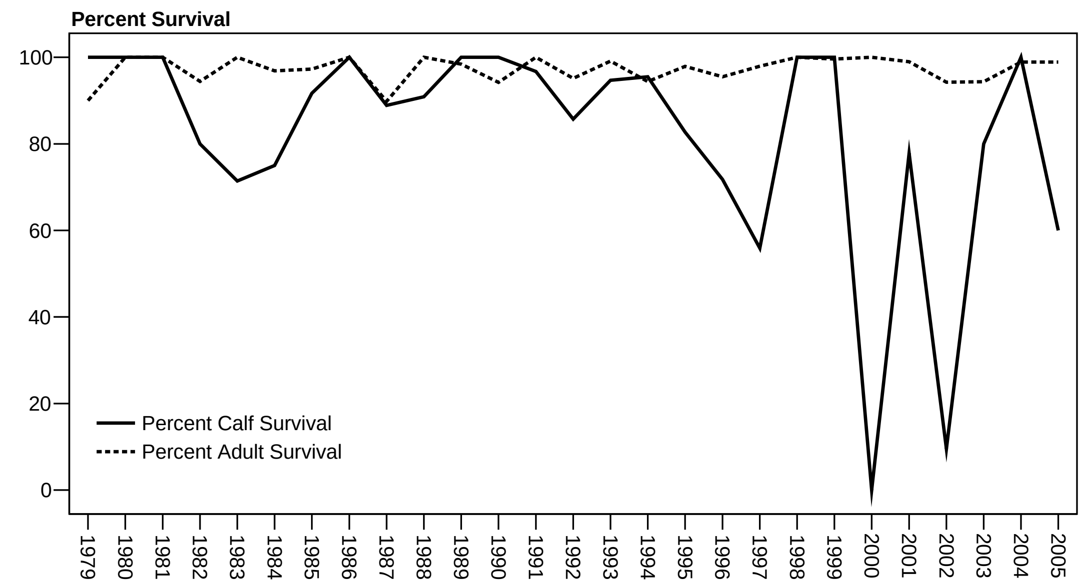

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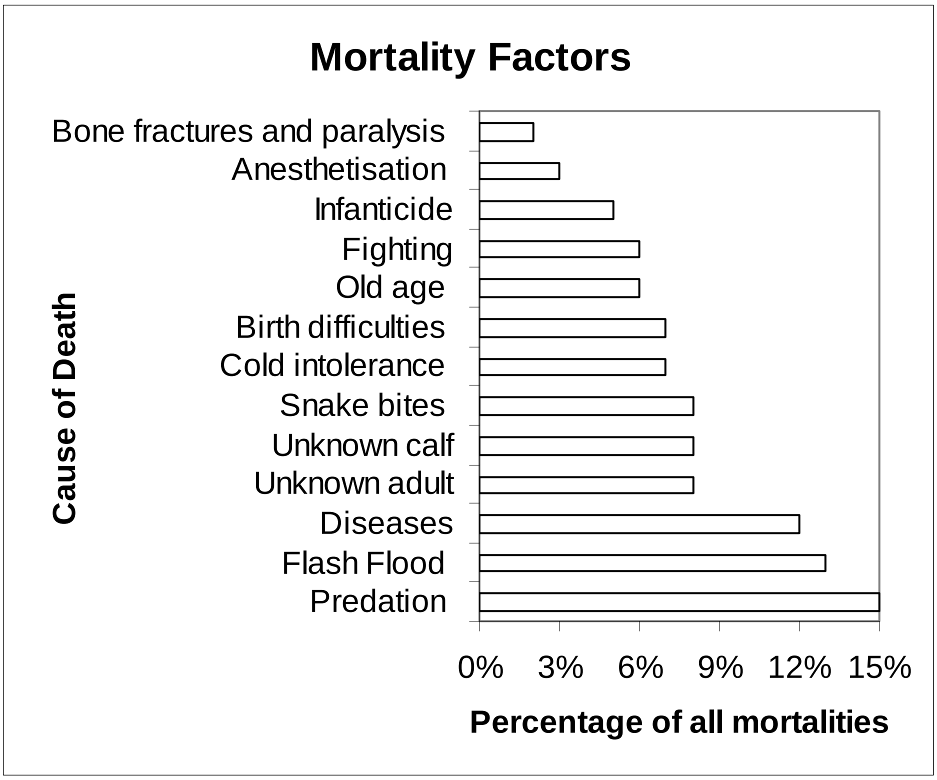

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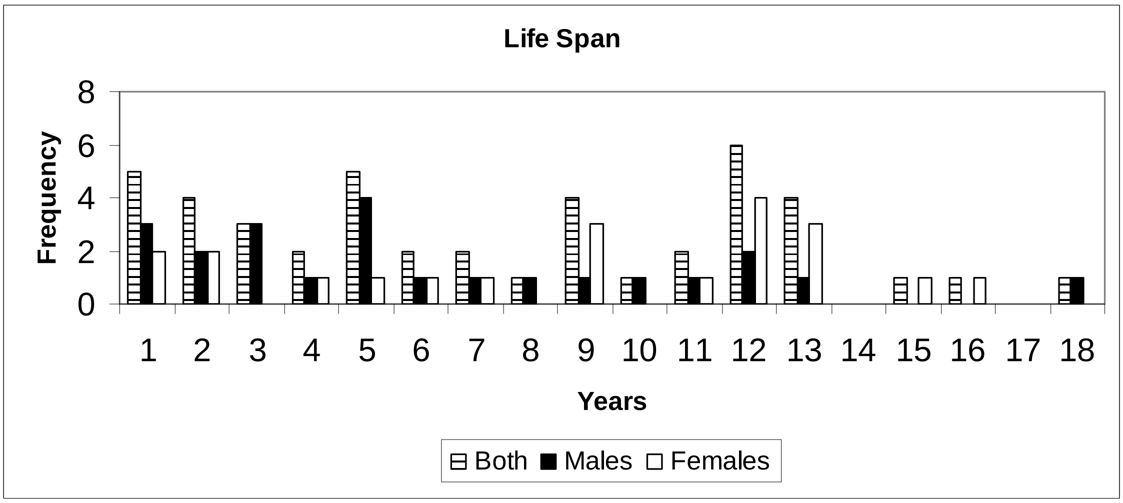

Fig. 9. Frequency distribution of life span of oryx at Shaumari Nature Reserve, Jordan, 1979–2000.

Tables

Table 1. Provenance or disposition of Arabian oryx brought into or sent out from the Shaumari Nature Reserve.

Year	Females	Males	To/From
		Brought In	
1978	4	4	USA
1979	2	1	Qatar
1984		3	Switzerland
Total	6	8	
		Sent Out	
1984	1		Oman
1987	2	2	Oman
1987		1	Iraq
1989	1	2	Saudi Arabia
1997	4	4	Syria
2000	20	12	Qatar
2000	14	11	United Arab Emirates
2000	7	5	Saudi Arabia
2001	4	4	Saudi Arabia
2002	2	2	United Arab Emirates
2002	3	7	Wadi Rum, Jordan
2006	4	2	Wadi Rum, Jordan
Total	62	52	