

Chapter 8

Does the Ethiopian Wolf Need Captive Breeding?

Introduction

The pace of wildlife habitat destruction and species extinctions has increased worldwide. During the last 400 years nearly 500 described species have become extinct and the rate of extinction is escalating. An increasing number of species, particularly those occurring in small, isolated populations, now require conservation action. Wildlife management measures used by species' recovery programmes include captive breeding, or a combination of *ex situ* and *in situ* efforts. *Ex situ* efforts can be defined as occurring outside the species' natural range, whereas *in situ* conservation occurs within the species' natural range.

In addition to the captive breeding of endangered species for their eventual reintroduction to the wild, translocation of surplus animals between populations may be used to reestablish the species after a local extinction or to supplement small populations. In this section we review the literature available on the merits of captive breeding, reintroduction and translocation in wildlife conservation, with particular emphasis on canid species. In the following section we will consider metapopulation management and examine how these complementary approaches may be applied in an Ethiopian Wolf Recovery Programme.

The following definitions are used in the context of these two chapters (after Wilson and Stanley Price 1994, Kleiman *et al.* 1994): 'captive breeding' concerns the preservation in captivity of species at risk of extinction in the wild, to eventually supply animals for reintroduction. A 'reintroduction' is an attempt to re-establish a species (or subspecies) in an area which was once part of its historical range, but from which it has disappeared. An 'extirpation' refers to the disappearance of a species from a limited part of its range. A 'translocation' involves movement of wild-born individuals or populations from one part of the range to another. Thus a translocation to an area from which the species has been extirpated is a reintroduction. 'Restocking' involves the release of either captive-born or wild-born animals into an already occupied habitat, with the intention of building up population numbers and/or increasing genetic variation.

Captive Breeding

The aims of breeding rare and endangered species in captivity are to maintain genetically viable populations safe from the threats faced by wild populations and to produce founder populations for eventual release into the wild in reintroduction programmes (Seal 1986, Kleiman 1989). This captive population may help to preserve genetic variability and, in some cases, to protect the species' gene-pool from hybridization with related species. This may be of particular importance for large carnivores whose small population sizes make them susceptible to hybridization with closely related, sympatric species (Jenks and Wayne 1992, Hubbard *et al.* 1992, Gottelli *et al.* 1994).

In terms of species conservation the maintenance of viable populations of rare species is important for the following two purposes (IUCN 1987a): a) as an insurance population for the survival of an endangered species regardless of crises in its natural habitat, and b) as a source of new genetic material to infuse diversity into depleted wild populations. Captive populations can also serve as latter-day 'arks' (gene banks) if wild populations become extinct (Ginsberg 1993). However, Snyder *et al.* (1996) have warned that this ark paradigm is built on a misconception and may result in domesticated forms with low re-establishment potential. Critics point to the cost of captive breeding (*ex situ* conservation), and the potential diversion of funds and attention away from the *in situ* conservation of habitats.

The World Conservation Union (IUCN) has recognized the potential contribution of zoos that keep endangered animals in captivity and recommends that vertebrate taxa numbering less than 1,000 individuals in the wild should be considered for captive breeding (IUCN 1987a). Obviously, captive breeding specialists and field conservationists need to integrate their efforts, with the ultimate goal of recreating a self-sustaining wild population.

Most current captive breeding programmes are done *ex situ*, particularly in western zoos. *In situ* captive breeding would have the benefits of access to appropriate habitat and environmental conditions, and reduced exposure to exotic diseases (Ginsberg 1993). Therefore support for local captive breeding facilities in

range countries should be increased, possibly within the framework of global captive breeding programmes.

Captive breeding programmes need to be established before species are reduced to critically low numbers or substantial genetic variability is lost, and, thereafter, need to be coordinated internationally (IUCN 1987a). Captive breeding for conservation should be a step in the following sequence:

- planning a conservation strategy;
- captive breeding;
- reintroduction to the wild;
- management of metapopulation.

Limitations of Captive Breeding in Recovery Programmes

The use of captive breeding for recovering endangered species has grown enormously in recent years. However, until recently its limitations tend to have been underestimated. Balmford *et al.* (1996) questioned the criteria used by zoos to decide which endangered taxa to breed; while reintroduction should be the ultimate aim of captive breeding, zoos show no tendency towards those species for which continued availability of habitat makes reintroduction a realistic prospect. Snyder *et al.* (1996) listed the following problems affecting captive breeding as a species recovery measure:

- difficulty in establishing self-sufficient captive populations;
- poor success in reintroductions;
- high costs;
- domestication;
- preemption of other recovery techniques;
- disease outbreaks;
- maintaining administrative continuity.

Ex-situ captive breeding programmes have now lost much of their appeal for the above reasons, so much so that the Noah's Ark Paradigm is now widely questioned. Additional criteria to be considered have been suggested by the Born Free Foundation:

- loss of natural immunity;
- psychological effects of captivity;
- unnatural selection process;
- potential weakening of cultural importance.

In summary, a distinction should be drawn between captive breeding in the *ex-situ* zoo based model and specialized *in-situ* captive breeding programmes which may significantly negate many of the effects and problems cited by Balmford, Snyder and Born Free Foundation.

With these difficulties in mind, careful evaluation of the costs and benefits of all alternatives available for the recovery of a species is necessary before launching into captive breeding. Furthermore, the decision to pursue a programme of captive breeding should generally be taken as a last resort in species recovery and not viewed as a long-term solution – not least because of the dramatic genetic and phenotypic changes that can occur in captivity (Snyder *et al.* 1996). On the other hand, captive breeding may prove crucial when effective alternatives are unavailable in the short-term.

Captive breeding should run in parallel with ecosystem protection, not as an alternative, and is doubtfully useful in the absence of efforts to maintain or restore populations in the wild. In addition to breeding efforts, zoological institutions can help support *in situ* conservation, and indeed there is a trend in the zoo community toward becoming more closely involved with *in situ* wildlife conservation. They recognize captive populations as a support, rather than a substitute, for wild populations. While breeding centres are important to maintain viable captive populations, refine reproduction technology and provide animals for reintroduction, they have a more immediate role to play by increasing their role in field research, professional training, and most importantly, public education and direct financial support.

Reintroduction

The ultimate objective of a reintroduction is the establishment of a viable, self-sustaining population. For each species, reintroduction poses unique problems. For most taxa, release strategies and post-release monitoring techniques are still being refined (Wilson and Stanley Price 1994). The IUCN has produced guidelines for reintroductions (IUCN 1992), providing a practical framework.

Mammals constituted 31% of 126 species reintroduced from captive-bred stock reviewed by Beck *et al.* (1994). Of these, 26% of all mammal reintroduction projects involved Carnivora. Captive breeding of endangered species, followed by reintroduction, has mostly been undertaken in reaction to imminent extinction in the wild. For instance, the black-footed ferret (*Mustela nigripes*), North America's rarest mammal, was reduced to 18 individuals before action was taken. The surviving animals were captured, have been breeding well in captivity and are now being reintroduced (Miller *et al.* 1994).

Correlates of Reintroduction Success

Reintroducing an endangered species is a long-term, expensive, and very often impractical operation (Kleiman 1989, Stanley Price 1989). Economic factors or political problems in the intended country of release have resulted in several reintroduction projects being suspended (Wilson and Stanley Price 1994). There is an argument that reintroductions stand a higher chance of success if made into a country with a relatively high standard of living and political stability. Beck *et al.* (1994) reviewed some characteristics of 145 reintroduction projects, including five mammal species, of which 16 were considered successful. A proportion of the remaining 129 projects were at too early a stage to judge definitively their success. The following are abstracts from the review by Beck *et al.* (1994), highlighting the features of each stage of the reintroduction process relevant to carnivores:

Pre-release training: Includes searching for hidden and spatially dispersed food and experience in finding and killing prey in large outdoor enclosures. Prior to release animals may be harassed by humans or trained dogs, presumably teaching fear and avoidance of potential predators.

Acclimatization: Reintroduction candidates are held at or near the release site in a cage, pen or man-made enclosure for a period of time, in order to allow the animal to become familiar with climatic conditions, landmarks, natural foods or other features of the environment.

Medical screening: Is the choice of reintroduction candidates based at least in part on veterinary considerations? It may include certification of freedom from certain infectious diseases, quarantine, vaccination, deparasitization, freedom from debilitating injury or deformity, reproductive viability. Vaccination of canids could include rabies, distemper, canine parvovirus, hepatitis, leptospirosis, corona-virus and parainfluenza, but the vaccine virulence for other species in the range should be considered (Woodford and Rossiter 1994).

Genetic screening: Is the choice of reintroduction candidates based on genetic or pedigree considerations? Potential founders should preferably be chosen from the geographically closest population to the release site.

Post-release training: May consist of active presentation of natural foods or inducing the animals to approach suitable shelter or denning sites.

Provisioning: Released animals may be given food, water, shelter or nest-boxes.

Monitoring: An active attempt to determine the size of the reintroduced population, the occurrence of births and cause of deaths, observation of behaviour and formation of social groups. Monitoring may involve direct visual contact with the animals, radio-telemetry or indirect evidence such as faeces, footprints and dens (Appendix 3).

Local employment: Involves providing salaries to local people in the release site in exchange for working in the project. This may include building enclosures or participating in guarding or community education projects.

Professional training: A project may offer training opportunities to field assistants and graduate students.

Community education: Project personnel may present lectures, provide posters, leaflets, T-shirts, hats, participate in community meetings, cultural events, visit schools or households, or help to prepare releases for radio, television or newspapers.

Release year: The number of years in which the project released animals to the wild. Excludes time of preparation or captive breeding or years when no releases took place.

Success: The reintroduction project is considered successful if the wild population subsequently reaches a population that will be self-sustainable.

According to Beck *et al.*'s (1994) study, successful projects received more pre-release training, acclimatization, and post-release monitoring than unsuccessful projects. Medical screening and post-release provisioning did not seem essential for success. Successful projects were of longer duration and released more animals than did unsuccessful programmes. They also more frequently provided local employment and community programmes. When attempting the reintroduction of captive animals, these correlates must be taken into account. Additionally, staggered releases seem to be more successful than single ones, a reasonable number of potential founder animals and subsequent supplementation will improve the probability of establishing a self-sustaining population (Stanley Price 1989).

We also acknowledge the possibility of indirect benefits of reintroduction even where a self-sustaining population may never be established, insofar as the exercise resulted in increased public awareness and support for conservation, professional training, enhanced habitat protection, and increased scientific knowledge (Kleiman *et al.* 1994).

Any reintroduction project should do everything possible to foster a good relationship between GOs, NGOs and the local people. To a large extent this may

be done by giving employment to people living in or near the range, so that these people can appreciate that it is in their interest to protect the animals and their habitat.

Translocation

The IUCN (1987b) definition of 'translocation' is the movement of living organisms from one area with free release in another, and includes both reintroductions and restocking. It does not however, distinguish between the provenance of animals for release, although this is likely to have a major impact on the outcome (Kleiman *et al.* 1994). Here we restrict the definition of translocation to the movement of wild-bred animals used to restock depleted wild populations or for reintroduction into areas where the species has been extirpated. However, with populations in very fragmented habitat it may be effectively impossible to distinguish between restocking and reintroduction.

Wild-to-wild translocations have historically been more successful than releases of captive-bred animals. Similarly, the method of release, hard or soft, may affect survival. Soft release techniques involve a period of acclimatization to the environment into which the animals will eventually be released, and there is a degree of food provisioning. In hard release the animals are introduced straight into the wild with no transitional phase. Carbyn *et al.* (1994) studied the survivorship of reintroduced swift foxes (*Vulpes velox*) in Canada and found that wild-caught, hard-released animals survived better than captive-bred hard-released ones. Overall soft released animals were slightly less successful than hard released ones.

Similar examples come from African wild dogs (*Lycan pictus*) and grey wolves (*Canis lupus*) where translocation of wild animals away from 'problem' areas and into reserves proved more successful than reintroduction of captive-bred animals (Scheepers in Ginsberg *et al.* in press, Fritts *et al.* 1985). Therefore it seems probable that wild-to-wild translocations would be a more successful management measure than the reintroduction of captive-bred animals. On the other hand the use of captive-bred animals is preferable insofar as it avoids interference with the wild stock.

Wild-born animals may be taken into captivity and bred with captive-born animals. For the Canadian swift fox, notable differences have been observed in the behaviour of such offspring with one wild-born parent compared with offspring from both captive-born parents. For example, the former showed greater tendencies towards denning in their enclosures and

greater aversive behaviour towards potential predators (C. d'Sa, pers. comm.). Such behaviour would be advantageous following release into the wild.

Wildlife Reintroductions and Disease

Insufficient attention has been given to the role of infectious disease in conservation biology (Thorne and Williams 1988, Chapter 4). Diseases are important when considering the conservation of endangered species (Macdonald 1993, 1996) and the impact on wildlife of infectious diseases introduced by animal translocations have been largely neglected (Woodford and Rossiter 1994, Cunningham 1996). While disease is a component of the maintenance of biodiversity and natural selection (Chapter 4), disease transmission through translocations may nullify or have an overall negative effect on wildlife conservation (Cunningham 1996).

Captive Breeding and the Conservation of Canids

For canid species in particular, captive populations provide a temporary safe haven from human persecution, disease or genetic introgression with closely related species. Previous attempts to breed and reintroduce canid species have been reviewed by Ginsberg (1994). Thirty-two of the 34 canid species have been bred in captivity at some time during the last three decades. There are no records of the Tibetan fox (*Vulpes ferrilata*) and the Ethiopian wolf ever breeding in captivity. To our knowledge the latter has never been kept in captivity. Most of those species bred in captivity are relatively common and most of the breeding effort has concentrated in three very common species, the grey wolf, the dingo (*Canis familiaris dingo*) and the red fox (*Vulpes vulpes*). The IUCN Canid Action Plan lists 18 canid species as threatened, only two of these, the African wild dog and the maned wolf (*Chrysocyon brachyurus*), are among those species frequently breeding in captivity (Ginsberg and Macdonald 1990). Four species were recommended in the Action Plan for reintroductions (maned wolf, Ethiopian wolf, grey wolf and red wolf (*Canis rufus*)).

Attempts to reintroduce or translocate endangered canids are uncommon; four species have been involved in at least six separate projects (Wilson and Stanley Price 1994). Relative success has been achieved in reintroducing captive-bred canids to the wild (red wolf, grey wolf, swift fox). Given adequate funds, appropriate

habitat and adequate numbers of potential founder animals reintroduction could be a useful tool for the conservation of endangered canids (Ginsberg 1994). However, public and government support are vital for the success of any reintroduction. The successful reintroduction of the red wolf in southeastern USA is a pioneer in the reintroduction of canids (Cohn 1987, Phillips and Parker 1988), but was accompanied by extensive public relations exercises. Encouraged by that achievement the grey wolf is now being reintroduced in Yellowstone, and there are plans to reintroduce the Mexican wolf (an endangered subspecies) to New Mexico. The Yellowstone reintroduction however, has met fierce opposition from sheep and cattle ranchers even though it has strong support from the general public.

Projects to reintroduce captive-bred African wild dogs in southern Africa has met with little success (Woodroffe *et al.* 1997). While relatively successful in the Umfolozi Game Reserve in South Africa, it failed in Namibia (Ginsberg 1994). However, the success of the reintroduction of wild-born, translocated swift foxes in Canada, and subsequent modelling of survival data from the study, suggest that reintroduction of once relatively common canid species to areas where they have been extirpated can be effective, at least in the short term.

Several lessons emerge from Ginsberg's (1994) review. First, a large number of animals for release are required to attain long-term success. Second, reduced mortality of wild-caught canids suggests that translocation from wild populations may be preferable to reintroduction of captive-bred animals. Finally, the reintroduction of social canids is far from simple. Their need to acquire hunting skills and more complex social behaviour may explain the difficulties observed in earlier canid reintroduction programmes. Furthermore, confirmation of the success of a reintroduction programme will take many years. Whether these



reintroductions are to succeed remains to be seen; ultimately this depends on whether sufficient suitable habitat remains and on the public goodwill and government support.

Does the Ethiopian Wolf Need Captive Breeding and Population Management?

Each of the remaining Ethiopian wolf populations could swiftly be extirpated due to further destruction of habitat, inbreeding, hybridization, a disease epizootic or any combination of these threats (Chapters 3, 4 and 5). Ethiopia and the world stand in extreme likelihood of losing the species if action for its recovery is not taken swiftly. Detailed information on the status of some wild populations, Ethiopian wolf biology, habitat requirements and genetics is now available (Gottelli and Sillero-Zubiri 1992, Gottelli *et al.* 1994, Sillero-Zubiri and Gottelli 1994). Based upon recommendations arising from these studies, a captive breeding programme was proposed in 1992 (Sillero-Zubiri *et al.* 1992). A resolution supporting a captive breeding programme for the Ethiopian wolf was signed by IUCN/SSC and the AAZPA members during the Canid, Hyena and Aardwolf Conservation Assessment and Management Plan (CAMP) meeting held in 1992 (Appendix 5), and a captive programme of level 90/100 I recommended (Grisham *et al.* 1994). Technically, a 90/100 I level requires a captive population sufficient to preserve a minimum of 90% of the average heterozygosity of the wild gene pool for 100 years developed within 1–5 years (Grisham *et al.* 1994). Subsequently, the New York Zoological Society submitted proposals to establish a breeding nucleus in the USA (Doherty *et al.* 1992), but neither initiative prospered. The major obstacle met by both proposals was the reluctance shown by the Ethiopian authorities to allow the export of breeding specimens to start the captive nucleus.

In view of the persisting human impact on the overall distribution of the Ethiopian wolf in Ethiopia and the species' vulnerability to extinction, a metapopulation management strategy should be considered (Chapter 9) within which a captive breeding programme is essential. However, assurance of long-term government support and funding is crucial if this programme is to succeed. Experience from captive breeding and reintroduction programmes elsewhere shows that the most effective and successful have all been comprehensive efforts

involving a large team and considerable resources.

Captive breeding with the aim of reintroduction is feasible only when accompanied by an analysis of causes of the species' decline and steps to reduce continued threats to its survival (Kleiman 1989, IUCN 1987b). Even when the forces driving extinction can be reversed, appropriate habitat for reintroduction must be available. Few areas within the Ethiopian wolf's former range, excluding BMNP, offer sufficient undisturbed habitat, limited human influence, and few or no domestic dogs. Conservation of BMNP and Simien Mountains National Park areas is under the responsibility of EWCO and the Regional Governments. EWCO is sporadically supported by several international NGOs. A new afroalpine conservation area has been proposed for the Menz Highlands in north-east Shoa where a Darwin Initiative (UK) programme has just begun.

After evaluating the costs and benefits of all conservation alternatives available for the recovery of the Ethiopian wolf we conclude that population management is essential, with a captive breeding operation one of the measures required. This captive population is essential to a) develop a genetically pure wolf population as a last resort against extinction, safe from the threats faced by the wild populations, and b) produce potential founder individuals for the eventual release into the wild in reintroduction and restocking programmes. While we anticipate that a full-scale reintroduction will not be feasible in the foreseeable future (see Chapter 9), a limited captive population would help save a representative sample of the existing

genetic variability in the wild, currently being lost as a result of small population sizes and genetic introgression.

Grisham *et al.* (1994) recommended a captive programme of level 90/100 I for the species. This objective would require a large-scale operation and we doubt its usefulness in the light of the current low reintroduction potential. Furthermore, such a large scheme would require substantial funding, and thus might result in competition for resources with *in situ* conservation. Pragmatically, therefore, we favour a more modest captive program of level Nucleus I. This would serve the purpose of an insurance programme to allow the continuity of the endangered species regardless of crises in its natural habitat. A level Nucleus I captive population requires a captive nucleus (50–100) individuals to represent always a minimum of 98% of the wild gene pool. This type of programme requires periodic, but in most cases modest, immigration of individuals from the wild population to maintain the high level of genetic diversity (Grisham *et al.* 1994). A detailed proposal for this approach is given in Chapter 9.

With the support of the Born Free Foundation, a proposal is being developed to set up and manage an *in-situ* long-term naturalistic captive breeding facility or facilities within Ethiopia dedicated to the Ethiopian wolf. The initial proposal will cover construction and a two year operating plan together with budget. Ongoing costs will also be identified.

Approval will be sought from the Ethiopian authorities for the construction of such a facility within Ethiopia, which is the preferred option.