FALCO

The Newsletter of the Middle East Falcon Research Group
Issue No.32 Autumn 2008 ISSN 1608-1544

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MEFRG Objectives:

To provide:
A central body for the co-ordination of research activities related to falcons and falconry.
A common forum for the exchange of information and for promoting collaborative research programmes.

To promote:
Research on health and disease in falcons, falcon moulting in the Middle East, falcon nutrition, domestic breeding.
Field studies on falcon migration, taxonomy, morphometrics, reproductive biology and behaviour.
Improved management conditions for captive falcons through educational awareness programmes.
Greater understanding of falconry as a part of Arab cultural heritage.

To hold:
International workshops and conferences on veterinary aspects, falcon biology topics, falconry and conservation issues.

To publish:
Papers on aspects of falcon conservation, falcons and falconry.
A biannual newsletter/journal containing contributions on medical, biological and conservation topics of common interest, new developments and recent medical advances.

Membership:
Membership is open to any veterinary surgeon, biologist, conservationist or falconer working in the Middle East or any other person interested and contributing in the fields of medical, biological and conservation aspects of falcons and falconry worldwide.

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also see Saker Conservation information portal:

www.savethesaker.com

Sooty Falcons at nesting site, Red Sea islands. (A. Dixon)

Photographs:
Front Cover: Saker Falcon in Mongolia (Gabor Papp)

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Contributions can be sent to the Editors of FALCO:
Dr Andrew Dixon and Dr Tom Bailey

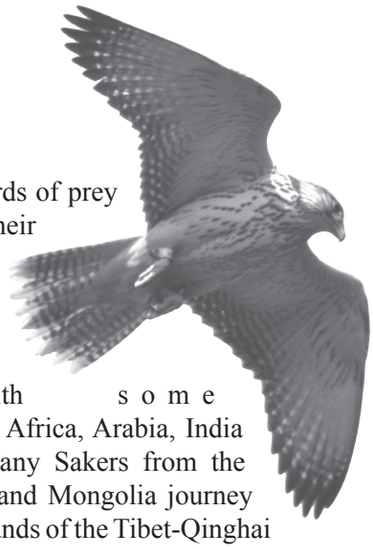
Editorial address:

Dr Andrew Dixon
International Wildlife Consultants Ltd
P.O. Box 19, Carmarthen
SA33 5YL, Wales, UK
Tel: (0044) 1267 233864
Fax: (0044) 1267 233864
E-mail: falco@falcons.co.uk

Veterinary contributions:

Dr Tom Bailey
Dubai Falcon Hospital
P.O. Box 23919
Dubai, United Arab Emirates
Tel: 00971 4 3377576
Fax: 00971 4 3379223
E-mail: tom.bailey@dfh.ae

Editorial



It's autumn and many birds of prey will now be migrating to their winter quarters. Arctic Peregrines migrate from the Siberian tundra to spend the winter at more southerly latitudes, with some venturing as far south as Africa, Arabia, India and Southeast Asia. Many Sakers from the central Siberian steppes and Mongolia journey to the high altitude grasslands of the Tibet-Qinghai plateau for the winter, whilst others remain in their breeding ranges. Such long-distance movements take migratory birds of prey across national borders and over a variety of different habitats, each with its challenges and/or benefits. Landscape topography, typically a pass through a mountain range or a narrow coastal strait, can funnel migratory birds of prey into areas where thousands congregate as they move through a 'bottleneck' point. However, the migratory patterns of birds of prey are varied, some migrate in flocks others singly; for some species the whole population is migratory but for others only a part, mainly juveniles, migrates; some species embark on migration in synchrony whereas the timing of migration for others is staggered; some migrate along regular 'flyways' but others have dispersed routes and, furthermore, some of these variations can be exhibited by different populations of the same species. It is no surprise therefore that we still have much to learn about the biology and ecology of migratory behaviour in birds of prey.

The application of new technologies, especially satellite telemetry, is rapidly increasing our knowledge of migration routes and behaviour, though our understanding of the proximate and ultimate factors underlying migratory behaviour in birds of prey lags behind. Why do some individuals in the same population migrate and others do not? What triggers migration in individuals? To what extent is migratory behaviour inherited? There are many unanswered questions for raptor biologists to unravel. Satellite telemetry enables us to obtain survival data and accurate migration routes, which can be used to identify important stopover sites and regions of high mortality risk. Whilst the conservation of migratory birds of prey is informed by biological studies its implementation relies on international co-operation. In Abu Dhabi (20-22 October 2008) delegates from over 40 African and Eurasian countries with gather to conclude a *Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia*. This MoU, developed under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS) at an initial meeting held in Loch Lomond, Scotland (October 2007; see www.cms.int/raptors), has an associated Action Plan with specific Activities to direct its implementation.

At *Falco* we hope that the forthcoming CMS meeting in Abu Dhabi results in a successful conclusion and the conservation of African-Eurasian migratory birds of prey will be enhanced. In order to be successful, the adoption of the MoU must be a first step and not an end in itself. It is vital that Activities listed in the Action Plan are undertaken and this will require action from governments, conservation NGOs and research organisation. The implementation of these actions requires not just political will but also money - financing will be crucial to the success or failure of this MoU to achieve any real conservation benefits for birds of prey.

In this issue of *Falco* we have articles on two migratory birds of prey identified as *Category 1* in the Action Plan for the *MoU on the Conservation of Migratory Birds of Prey in Africa and Eurasia*: the Saker Falcon and Cinereous Vulture. We give information on experimental trials to develop artificial nesting sites for use by Sakers in the Mongolian steppes, which could have potential applications in forming the basis of a truly sustainable wildlife trade and also in the biological control of rodent pests. Continuing with EAD-funded research on Sakers we report on the preliminary work to assess the feasibility of reintroducing Sakers to Bulgaria, whilst Anatoliy Levin describes his monitoring of the Saker in eastern Kazakhstan. Nayambayar Batbayar describes some results of studies on Cinereous Vultures in Mongolia, noting the importance of the Korean peninsula as a wintering area. The exclusion of the Korean peninsula and Japan from the *MoU on the Conservation of Migratory Birds of Prey in Africa and Eurasia* is a little surprising considering their importance for *Category 1* species such as Cinereous Vulture and Steller's Sea Eagle respectively.

Shahid Khan *et al*., report on a survey of Ospreys in Abu Dhabi and the use of artificial nesting platforms by this species. The Sooty Falcon is another coastal bird of prey found breeding on the islands around the Arabian Peninsula; Junid Shah and colleagues report on a survey of the species breeding on the coastal islands of Abu Dhabi whilst Malcolm Nicholl and others introduce their study to determine the status of the species on islands off northern Oman.

In light of concerns for Asian vulture populations Marc Driscoll and others describe a health monitoring protocol developed for the Black Vulture in Trinidad.

Our other veterinary articles focus on captive falcons. The conditions that hunting falcons are subjected to during trade and training such as starvation, water restriction, renal diseases, stress or over-exercise can alter the acid-base balance. Arca-Ruibal and colleagues

report reference ranges for blood-gas parameters in falcons. Such information is useful for vets who must choose appropriate fluid therapy.

Artificial insemination (AI) is used to overcome some of the difficulties of managing captive avian populations, as well as to increase the production of commercially valuable species, such as falcons. Sperm preservation combined with AI and the establishment of genetic resource banks is an important tool in preserving variation in valuable genetic stock. Bailey and colleagues describe a demographic and genetic analysis on a New Zealand Falcon captive breeding programme to determine demographic and genetic imbalances that will be useful for the management of the species. In addition, the feasibility of a practical methodology for semen cryostorage was investigated with a view to assessing whether this technique could support the captive management of raptor species.

Kinne and colleagues describe a recent outbreak of salmonellosis in captive falcons. The falcons were thought to have contracted the disease from food items and the authors recommend regularly vaccinating pigeons and quails against salmonellosis to protect hunting and breeding falcons from this disease.

We would like to thank Luke Halpin for his assistance in editing and collating this issue of *Falco*.

Short Notes

Wild Steppe Eagles at the Breeding Centre for Endangered Arabian Wildlife (BCEAW), Sharjah.

Breeding Centre for Endangered Arabian Wildlife, P.O. Box 29922, Sharjah, UAE

In late September two adult Steppe Eagles (*Aquila nipalensis*) were seen resting on the rocks of our display area where Greater Flamingos, Arabian Oryx, Gazelles and Nubian Ibex are kept. One of the eagles tried to land at the fresh water stream to drink, but was chased away first by an Oryx and later by the entire herd of Ibex.

Both birds remained close to the Centre during the rest of the day and were seen trying to steal food through the mesh of the Griffon Vulture enclosure the next day. Pieces of meat and chicken were offered outside the enclosure, which were readily accepted by one bird. The other bird, however, was very weak and hardly moved around. The bird could easily be hand caught and was brought into the surgery for a check up. Apart from being weak and exhausted no lesions or abnormalities could be detected. A quick test for Avian Flu was performed to make sure the bird was not carrying the infection. The Eagle was then placed in a quarantine cage with food and water with several perches close to the ground since it was unable to fly.

After several days the Eagle was much more active and started to use the higher perches. One week later the bird had regained its health. The bird was then released. An aluminium identification ring was placed on one leg and the bird was set free in the mountains above Khor Khalba, facing the Indian Ocean and in the natural migration path of this species. The bird immediately found a good thermal and was soon out of sight, closely followed by a pair of wild falcons, which appeared as soon as the eagle was airborne.

Steppe Eagle at Sharjah Breeding Centre (A. Pas)

Peregrine with Arabic jesses found breeding in Russian Arctic

In 2008, whilst working on an Arctic Predators project (see www.arctic-predators.uit.no/index.cfm), Alexander Sokolov and Nicolas Lecomte discovered a female *calidus* Peregrine, which was wearing Arabic-style jesses (*sabuq*) breeding at a nest site on the Yamal Peninsula, Russia.

Peregrine with Arabic jesses, Yamal Peninsula (A. Dixon)

This is the third report of *calidus* Peregrines breeding in the Russian arctic that have been found wearing *sabuq*. They have obviously been lost by Arabian falconers whilst hunting. Presumably all these birds were trapped on passage or in their wintering areas.

Migration and Movement Patterns of Cinereous Vultures in Mongolia

Nyambayar Batbayar[1,3], Richard Reading[2], David Kenny[2], Tseveenmyadag Natsagdorj[3], Paek Won Kee[4]

[1]Wildlife Science and Conservation Center, Bldg., Institute of Biology, room #305, MAS, Ulaanbaatar 210351, Mongolia. bnyamba@magicnet.mn
[2]Denver Zoological Foundation, City Park, E. 2300 Steele St., Denver, Colorado, USA.
[3]Ornithology Laboratory, Institute of Biology, Mongolian Academy of Sciences, Ulaanbaatar 210351, Mongolia.
[4]Korea National Science Museum, 32-2 Guseong dong, Yuseong-gu, Daejeon 305705, South Korea.

Background Information

The Cinereous Vulture **(***Aegypius monachus),* also known as the Eurasian Black Vulture, is the largest bird of prey in the Old World. Today the species ranges from Spain in the west to southeastern Siberia, Mongolia, and China (Clark, 1999; Ferguson-Lees & Christie, 2001).

Photo 1. *Black Vulture and chick at a nest in Erdenesant, Central Mongolia. (N. Batbayar)*

There has been very little systematic study of the migration and ecology of Cinereous Vultures beyond Western Europe, although limited research was recently undertaken in Mongolia and Georgia (Batbayar, 2004; Reading *et al.,* 2005; Batbayar *et al.,* 2006b; Gavashelishvili & McGrady, 2006). Research indicates that present and future threats to Cinereous Vultures in Asia may be quite distinct from those encountered in Europe. For example, despite serious declines elsewhere in their range, Mongolia supports a healthy population of Cinereous Vultures that is probably the largest breeding population of the species in the world (Batbayar, 2004).

In 2002 and 2003, researchers initiated two complimentary and cooperative research projects in Mongolia to study ecology, dispersal, and migration of Cinereous Vultures (Batbayar, 2004; Reading *et al.,* 2005). This research program was initially designed to understand ecological factors affecting Cinereous Vulture breeding success, distribution, abundance, and movement patterns in Mongolia and Asia.

Initial results demonstrated that the population of Cinereous Vultures in Mongolia depends on nomadic pastoralists' livestock and nesting habitat was not limiting. Over 80% of Mongolian arable land is used as pastureland for five main stock animals: horses, cattle, sheep, goats, and camels (Sheehy, 1996; MNE, 2001; Reading *et al.*, 2006), which, we hypothesize, represent the primary food source for vultures in the country. These pasturelands cover the largest contiguous area of common grazing lands that remain in the world (World Bank, 2003). Therefore, we presume that the large number of breeding population of Cinereous Vulture in Mongolia exists largely because of extensive breeding habitat and plenty of food.

Movements

Dispersal, movement patterns, and possible migration of Cinereous Vultures in Asia has not been studied until recently. Some researchers state that Cinereous Vultures do not migrate (Meyburg & Meyburg, 1983; Ferguson-Lees & Christie, 2001). In Mongolia, many adults and fledglings appear to migrate in autumn from their breeding grounds to South Korea (Batbayar, 2004; Batbayar *et al.,* 2006b). Although good data are scarce, re-sighting data of birds marked in Mongolia suggest that at least some Cinereous Vultures migrate between Mongolia and South Korea (Nyambayar *et al.,* 2007; Kenny *et al.,* In press).

The Old World vultures are primarily scavengers and they fly in great distances within relatively short distances. Therefore satellite tracking provides an important tool for following these birds' seasonal movements, dispersal, and possible migration patterns. Because of their large range, large body size, and unpredictable destinations, vultures are particularly well suited for satellite tracking.

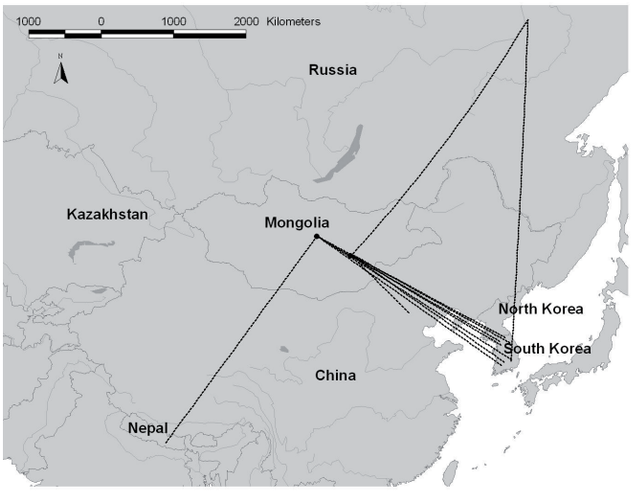


Figure 1. *Recorded migratory movements of Cinereous Vultures from Mongolia.*

Our research

In 2006 we began to study long distance movement patterns of birds that breed in Mongolia using satellite telemetry. Between June and October 2006, we obtained a total of 1605 global position system (GPS) platform transmitter terminal (PTT) locations associated with four adult vultures using satellite telemetry. The usual distance traveled within a day from the nest site was 30-50 km, and the farthest distance was 240 km. The 100% minimum convex polygon (MCP) home range size of four adult Cinereous Vultures differed greatly among birds, ranging from 540.2 to 2653.3 km^2. Such dramatic differences in home range size might be related to vultures scavenging behavior. But the transmitters stopped working before the dispersal and migration would normally begin. Therefore, home range sizes were incomplete and not necessarily representative of the full home range size of this species while nesting. During the summer of 2008, we deployed 2 more solar powered, satellite GPS transmitters on birds. One transmitter is not working and we are just beginning to get data on the other bird. These transmitters should last a minimum of 5 years and provide better data on movement patterns.

Photo 2. *Black Vulture with a patagial tag (N. Batbayer)*

Our patagial tagging effort began in 2002 and revealed important information about the movement patterns of the species. Each fledgling receives a pair of uniquely numbered vinyl patagial tags, using similar pattern size and application techniques to those used for California Condors (*Gymnogyps californianus)* (Wallace *et al.,* 1980) and we permanently marked each bird with aluminium leg bands as well. Since then our wing tagging effort has expended to other parts of Mongolia (Reading *et al.,* 2006; Kenny *et al.,* In press; Stubbe, personal comm.). So far, we have wing tagged over 150 Cinereous Vultures have been wing tagged and leg banded in Mongolia. Re-sightings of these marked birds tells us that at least some Cinereous Vultures disperse from Mongolia in winter and travel to the Indian subcontinent, China, the Russian Far East, Yakutsk, and South Korea (Kenny *et al.,* In press). Wing tagging represents a valuable method for marking large birds such as the Cinereous Vultures; it provided us with a relatively high rate of re-sightings. We received re-sighting information of one out of 5-6 wing tagged birds. Also, we observed some individual wing-tagged birds in consecutive years in South Korea, suggesting that at least some birds returned to the same wintering areas seasonally (Nyambayar *et al.*, 2007).

The longest distance travelled by a bird from the nesting area was an individual sighted in Yakutsk, Russia (minimum distance = 2,742.5 km) . It was the first record of this species far north in Siberia. This bird first travelled to South Korea 2,147.2 km from its nesting area for first winter, where it was sighted twice (1/7/07 & 1/22/07). It then travelled to Yakutsk in Siberia (2,710.5 km from its last sighting in South Korea), where it was sighted on 7/11/07. This bird travelled a minimum of 4,905.9 km straight line distance between the three sightings after fledging. Later, this bird was captured and placed in the Yakutia Zoo, where it survived only one month. This suggests that at least one bird that wintered in South Korea traveled to Russia in summer. A second tagged bird was sighted in Russia with this bird, but that second individual has not yet been sighted in South Korea. At this time, we cannot tell whether birds that travel to Russia fly directly from South Korea or typically meander through Mongolia. Perhaps, more birds may be traveling to Siberia but the remoteness and fewer observers may account for the paucity of re-sightings when compared to South Korea (Kenny *et al.,* In press).

In addition to our effort to understand movement patterns of Cinereous Vultures, Gavashelishvili and McGrady (2006) recorded long range movements of a single bird using satellite radio-telemetry that fledged in Georgia and then travelled south to Saudia Arabia before travelling north into Russia. Other researchers noted that at least some birds appear to migrate from their breeding grounds to winter in Tajikistan (Abdusalyamov, 1971) and another researcher reported vultures appearing during the winter in Russian Far East (Shibnev, 1989).

Conservation, Issues and threats

Every year a number of Cinereous Vultures suffer habitat loss, food shortage, poisoning, shooting, electrocution, and lack of suitable habitat in the wintering grounds in South Korea, China, and the Russian Far East (Lee *et al.,* 2006; and sources from Phoenix Fund in Russia; Beijing Bird Rescue Center in China). One bird that we wing tagged in southeastern Mongolia was exhausted during migration and ended up being

captured by farmers in a suburban area of Beijing. This bird was sent to a rehabilitation center to recover from starvation, released several months later, and not re-sighted since its release.

In Korea, vultures tend to congregate at few known locations where feeding sites are located. Undoubtedly, the artificial food at these sites attracts vultures to these areas at least seasonally. The availability of this food may be the reason that numbers of Cinereous Vultures have increased in Korea over the last decade (Lee *et al.,* 2006; Lee and Lee, 2005). Until now, the real benefits and consequences of artificial food supplementation remain unstudied.

Furthermore, heavy metal contamination is recorded in Cinereous Vultures on their wintering ground. Elevated levels of heavy and toxic metals, such as lead and cadmium, were found in liver and kidney tissues of vultures wintering in South Korea (Lee, 2003). However, which country represents the main source of heavy metal contamination remains unclear.

Photo 3. *Cinereous Vultures at wintering areas in Cheolwon, South Korea. (C. Moores/Birds Korea).*

In conclusion, many aspects of the Cinereous Vulture ecology still require substantial additional study. In particular, more satellite tracking study is required to further understand the movement patterns, dispersal, and possible migration of the largest raptor in the Old World. We are beginning to do just that. As we gather more data, we hope that many conservation issues related to vulture movement will be revealed.

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Development of the Artificial Nest Project in Mongolia

Andrew Dixon[1], Nyambayar Batbayar[2], Mark Etheridge[3], Gankhuyag Purev-Ochir[2,4] and Gombobaatar Sundev[4]

[1]International Wildlife Consultants Ltd., PO Box 19, Carmarthen, SA33 5YL, UK; [2]Wildlife Conservation and Science Center, Bldg. Institute of Biology, Room 309, Mongolian Academy of Sciences, Ulaanbaatar 21035, Mongolia; [3]Institute of Biological Sciences, Edward Llwyd Buildling, Aberystwyth University, Ceredigion, SY23 3DA; [4]Department of Biology, National University of Mongolia, Ulaanbaatar 210646, Mongolia;.

Introduction

Saker Falcons (*Falco cherrug*) usually breed in nests built by other species, either in trees, on cliffs or on human artefacts such as electricity pylons and buildings, though they sometimes lay eggs in a bare scrape on a ledge. The adoption of buildings and other anthropogenic sites by breeding raptors has been well documented (e.g., Bird *et al*., 1996), and this habit has enabled many species to extend their breeding range into regions where few natural nesting sites exist. Since the 1980's, artificial nesting platforms and boxes intended specifically for Saker Falcons have been placed in trees and on electricity pylons in central Europe, especially in Hungary (Bagyura *et al*., 2004). Saker Falcons have readily adopted these sites for nesting, particularly when they are erected in an established territory (J. Bagyura, *pers. comm.*). Saker Falcons also breed in nests built by other species on artificial platforms erected on power poles and pylons in Mongolia (Ellis *et al*., 1998).

In the flat steppe habitats of Mongolia there are few structures available to which artificial nesting platforms can be attached. However, in 2002 Dr. Eugene Potapov and co-workers constructed a grid of 2 m high, flat-topped tripod structures that proved to be suitable substrates for nest-building species such as Upland Buzzard (*Buteo hemilasius*) and Raven (*Corvus corax*). Once built, the nests of these 'founder' species subsequently provided breeding sites for Saker Falcons (Potapov *et al*., 2003). The next development from this original scheme was to create an artificial nesting site that was immediately suitable for use by Saker Falcons and which did not require a 'founder' nest-building species to occupy it first. This article describes the subsequent developments of this initiative to use artificial nest sites to increase the number of breeding Saker Falcons in nest-site limited areas of the Mongolian steppes.

Methods

We conducted the study in two predominantly flat areas of steppe in central Mongolia where there were no raised substrates suitable for use by breeding Saker Falcons and other steppe raptors (Photo 1). In area A, we erected a grid of 99 artificial nesting sites in November 2005; the artificial nesting sites were erected 2 km apart over an area of 9 x 9 km. Each artificial nesting site consisted of a 3 m long metal pole (diameter 12 cm) fixed vertically at a depth of *ca*. 0.5 m using cement. A 25 x 25 cm metal plate was welded to the top of each pole and a nesting box made from a 60 cm diameter steel barrel, with water drainage holes, was bolted on to this plate prior to setting the whole structure in the ground. We then placed a 5 - 10 cm layer of fine gravel and soil in the bottom of each nesting box to provide a suitable nesting substrate for Saker Falcons. In area A, we used four different designs of nesting box, which were randomly positioned across our experimental grid (Photo 2). These designs comprised (i) open shallow-walled box (N = 24), (ii) open deep-walled box (N = 25), (iii) open sheltered-wall box (N = 25) and (iv) closed box (N = 25).

In area B, located *ca*. 150 km from area A, we erected four separate grids each comprising 25 artificial nesting sites in November 2006; the artificial nesting sites were erected 1 km apart over an area of 4 x 4 km in each grid. The structures were the same as those previously described though only one design of nesting box was used i.e., open sheltered-wall boxes. In addition, we erected poles without nesting boxes in another two 4 x 4 km grids and a further 50 boxes were bolted to the poles in these grids in December 2007, all of which were of the closed box design.

Photo 1. *An artificial nest in flat steppe habitat of area A. Adjacent mountain range is ca. 10 km in the distance. (A. Dixon)*

In each year we undertook fieldwork from April to July inclusive. In 2006 we monitored occupancy at artificial

nesting sites in area A and in the nearest adjacent mountain block where Saker Falcons occupied natural nesting sites on cliffs (the nearest Saker Falcon nest site in the mountain block was *ca.* 10 km from the edge of the artificial nest site grid in area A). In 2007 and 2008 we monitored occupancy at artificial nesting sites in areas A and B and in the nearest adjacent mountain block to area B only (the nearest Saker Falcon nest site in the mountain block was *ca*. 15 km from the edge of the artificial nest site grid in area B). The mountain block adjacent to area A was not surveyed in 2007 and only partially surveyed in 2008.

In determining breeding occupancy we only included nest sites where eggs were known to have been laid because Upland Buzzards placed varying amounts of nesting material in virtually every artificial nest site and this species, together with Saker Falcons and Ravens, frequently used the boxes as perches making it difficult to otherwise determine if they were occupied as breeding sites.

Results

In area A, in 2006 i.e., during the first breeding season following establishment of the artificial nest site grid, 17 of the 99 available boxes (i.e., 17%) were occupied by breeding raptors of three species. In subsequent years the level of occupancy increased to 35 and 39% in 2007 and 2008 respectively (see Table 1). Over the three years of study at area A, Saker Falcons and Ravens exhibited a clear preference for closed boxes (Saker = 18/25 and Raven = 15/22 nests in closed boxes), whilst Upland Buzzards preferred open boxes for breeding (40/41 nests in open boxes), with no particular preference for the type of open box. The only Golden Eagle (*Aquila chrysaetos*) to breed in one of our artificial nesting sites occupied an open sheltered-wall box.

Breeding pairs (bp)	2006	2007	2008
SAKER FALCON	2	10	12
RAVEN	5	6	11
UPLAND BUZZARD	10	17	14

Table 1. *Number of breeding pairs of Saker, Raven and Upland Buzzard occupying artificial nesting sites in area A in 2006-08.*

In area B, in 2007 i.e., during the first breeding season following establishment of the four artificial nest site grids, 24 of the 100 available boxes were occupied by breeding raptors of three species. Within these same grids the number of breeding Saker Falcons increased from five to nine pairs in 2008, whilst a further two pairs occupied closed boxes in two more grids (see Table 2).

Breeding pairs (bp)	2007	2008
SAKER FALCON	5	11
RAVEN	2	8
UPLAND BUZZARD	17	18

Table 2. *Number of breeding pairs of Saker, Raven and Upland Buzzard occupying artificial nesting sites in area B in 2007-08.*

There was no decline in the number of occupied Saker Falcon breeding territories at natural nest sites in the hill range adjacent to area B over the study period (see Table 3). However, there may have been some decline in occupied territories at the hill range adjacent to area A, though the area was incompletely surveyed in 2008.

Saker Falcon (bp)	2005	2006	2007	2008
Adj. A (36 km^2)	7	6	NS	4 †
Adj. B (240 km^2)	7 †	11	10	14

Table 3. *Number of breeding pairs of Saker Falcons in natural nest sites in mountain blocks adjacent to artificial nest site areas A and B in 2005-08.*
(† = incomplete survey; NS = not surveyed).

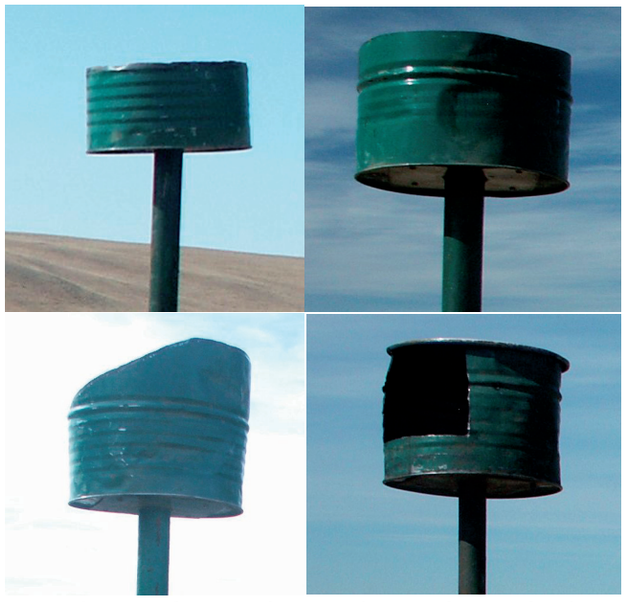

Photo 2. *Four designs of nesting box used at artificial nest site grid in area A. Clockwise from top left: open shallow-walled box, open deep-walled box, open sheltered-wall box and closed box. (M. Etheridge)*

Discussion

This study clearly demonstrates that nest sites are one factor limiting the breeding density of Saker Falcons in open steppe habitats of central Mongolia. There was no evidence to indicate that the breeding Saker Falcons which colonised our artificial nesting grids were birds that had shifted their breeding territories from natural nest sites in adjacent mountain blocks. In nest-site

limited habitats of central Mongolia adult birds from the non-breeding component of the Saker Falcon population can be encouraged to breed by providing them with a suitable nesting site. This evidence that there is a surplus non-breeding population of Saker Falcons in the central Mongolian steppe, indicates that the breeding population of this region is not in decline; if it was, we would not expect a surplus non-breeding population to exist (Newton, 1998).

Little is known about the timing of territory establishment in Saker Falcons, though pairs can opportunistically settle to breed in newly created nest sites within a few days during the early part of the breeding season in April (A. Dixon, *pers. obs*.). Occupancy of breeding territories by adult birds during winter is variable in Mongolia (Sumiya *et al*., 2001) and many breeding territories are occupied year after year, indicating a degree of territory fidelity. Thus, some of the birds breeding in the first season after the artificial nest sites were created probably returned to breed in subsequent years, when their number was supplemented by additional new breeders.

Saker Falcons exhibited a preference for closed nesting boxes with a side entrance. At these sites incubating birds were able to see out of the nesting box, though in one direction only, whereas in the open-topped boxes the falcons could not see out of the box whilst incubating. Upland Buzzards typically filled the boxes with nesting material, consequently they could often see over the rim of the boxes whilst incubating. Ravens were able to do the same but they too showed a distinct preference for closed nesting boxes, suggesting that this preference was not necessarily due to visibility during incubation. The closed nesting boxes provided more shelter from the elements (wind, precipitation and sunshine) than the open boxes; probably an important factor for Ravens and Saker Falcons whose young can often hatch before the end of April in central Mongolia.

The breeding Saker Falcon population could potentially be increased significantly across large areas of nest-site limited steppe habitat through the use of artificial nesting sites. In the central Mongolian steppe there is no conservation imperative to do this at the moment because Sakers are still relatively abundant and the population appears to be stable. However, the Mongolian government licenses an annual harvest of wild Sakers for the Arabic falconry market and this international trade is governed by CITES regulations. One of the challenges faced by the Mongolian government is to make sure that this trade is 'not detrimental to the survival of the species' and in this regard the trade was subject to a Significant Trade Review recently. Artificial nest sites could play an important role in ensuring that the Mongolian falcon trade is sustainable if, in future, harvest quotas are determined by the productivity of Sakers at artificial nest sites created specifically for this purpose.

Future research at the artificial nest area will concentrate on studies of foraging behaviour of Saker Falcons and the diet of birds of prey in order to examine the possibility that artificial nests for predatory birds could play a role in the biological control of rodent pest species in the steppe ecosystem. Population explosions of Brandt's Voles (*Microtus brandti*) can cause significant damage to grazing grasslands.

Acknowledgements

Thanks to following for assistance in the field: Shane McPherson, Mia Jessen, Olya Milenkaya, B. Odkhuu, B. Munkhzaya, Bratislav Grubac, Paul Andreano, Tomas Kunca, Gabor Papp, Nedko Nedyalkov, Amarsaikhan Saruul, Ariunzul Lkhagvajav, Amarkhuu Gungaa, Sarangerel Ichinkhorloo, Sarangerel Altansukh, Tumur Puntsag.

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Long-term Monitoring of Breeding Saker Falcons in Eastern Kazakhstan

[1]Anatoliy S. Levin & [2]Andrew Dixon

[1]Institute of Zoology, Ministry of Education and Sciences. Al-Farabi St. 93, Almaty, 050060, Kazakhstan.
[2]International Wildlife Consultants Ltd., PO Box 19 Carmarthen, SA33 5YL, UK.

Summary

The breeding Saker Falcon (*Falco cherrug*) population on the mountain ridges of eastern Kazakhstan has been monitored since 2000. The monitoring program has revealed an overall population decline over the nine years of study from an estimated 65 breeding pairs in 2000 to 22 in 2008. There was no decline in brood size at successful nests over the same period. The reason for the decline is not known but potential causes are illegal trapping for the Arabic falconry trade and electrocution on power lines; habitat change is not thought to be a significant factor in eastern Kazakhstan.

Introduction

The first Saker survey in eastern Kazakhstan was made in 1997 by Mark Watson, a British biologist who worked in closely with zoologists from Kazakhstan (Watson, 1997). This was the first time that nests had been recorded in Dzhungarsky Alatau, Tarbagatai and the Manrak mountains. Since 1999 the study area has been expanded to include a considerable area of Tarbagatai including its southern and northern foothills as well as the Saur ridge, Kalbinsky Altai Mountains, Kurchumsky and the Narymsky ridges (Altai Mountains). For the first time in 50 years the largest of eastern Kazakhstan's forests were explored with the aim of locating raptor nests. The study located 25 Saker Falcon nests and 49 nests of the Imperial Eagle, whose disused nests are the main source of nesting sites for Sakers. The foothills of the Kalba Mountains were surveyed in 2006 by a Kazakhstan-Russian team; three Saker Falcon breeding territories were recorded there (Smelansky *et al*., 2006).

Before the 1960's the Saker was regarded as common, occupying almost all the mountain ridges and long cliffs of Kazakhstan (Korelov, 1962) and it is believed that this status remained the same up to the 1990's. Following the collapse of the former Soviet Union, the number of Saker Falcons in the wild began to decline sharply in parts of Kazakstan, primarily due to uncontrolled exploitation of the species for the Arabic falconry market with the greatest decline reported in the south-east of the country (Levin, 2000; 2003).

Study Area and Methods

Eastern Kazakhstan has several large and many small mountain ridges that provide a large area of suitable Saker Falcon nesting habitat. The Saker Falcon breeding population of eastern Kazakhstan was monitored in the Tarbagatai Mountains, including its southern foothills of Arkaly and Karabas, and in the Manrak Mountains, which are situated to the north of the Tarbagatai range. The study areas were chosen because relatively high Saker Falcon densities were previously recorded in these regions and human activity is curtailed in this border zone. The Kazakhstani area of the range extends *ca*. 200 km and the eastern part is situated in China. The highest peak of the Kazakhstani Tarbagatai Mountains stands at 2992 m. The southern macroslope, which forms the Alakol valley, is steep with gorges and rivers. The northern slope heads down to Zaisan Lake and is flatter and rockier. The high altitude montane zone of the Tarbagatai range is essentially bare, desert plateau. To the north, south and west from the main ridge are low mountain ridges covered with xerophytic vegetation.

Photo 1. *Brood of 6 chicks in the Arkaly Mountains.* (A. Levin)

Survey routes were covered by 4WD vehicle (Russian UAZ 452) over a period of three months from the beginning of April, when most clutches are laid, until the end of June, when chicks have fledged. Nest locations were recorded with a Garmin GPS unit and recorded in an electronic database which also included a description of the nest site. Nest locations were then plotted on computerized maps and satellite images. Nest contents were recorded wherever possible, though in recent years we have avoided disturbing sitting birds during incubation.

The breeding population of the region was estimated from the survey data obtained from 92 territories that had evidence of occupation in at least one year from 2000-08. For logistic reasons, it was not possible to visit every territory each year and the number of territories checked (*ckd*) ranged from 10 in 2000 to 76 in 2007. Territories were classified as occupied (*ocd*) if: there was an active nest, one or more adults were seen in the territory or signs of recent occupation such as fresh prey remains and mutes were found. Breeding (*brd*) was confirmed within occupied territories if eggs

or young were seen in the nest. In order to estimate the number of breeding pairs at territories that were not visited (*unv*) it was necessary to multiply the number of unvisited territories by the proportion of confirmed breeding attempts at checked territories i.e., *unv* x (*brd*/*ckd*). This estimate was then added to the number of confirmed breeders to produce an overall population estimate for the 92 territories in the survey area.

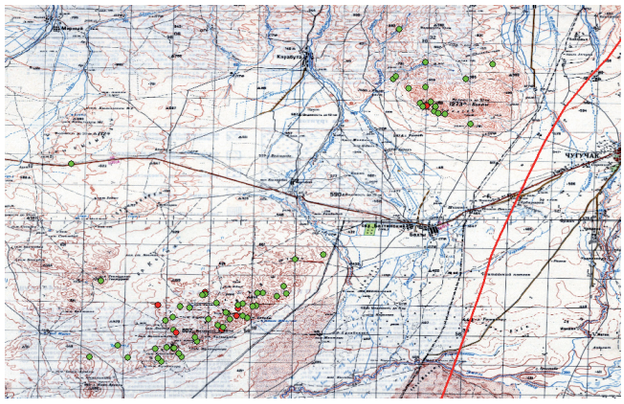

Figure 1. *The distribution of Saker Falcon nest territories in the Arkaly and Karabas Mountains. Red circles denote nests used in 2008, green circles denote nests occupied at least once from 2000-07.*

Distribution and abundance

Over nine years, from 2000-08 inclusive, a total of 92 Saker Falcon breeding territories were recorded in the eastern region of Kazakhstan. In Tarbagatai as well as other large mountain ridges, the density of Saker Falcon nests is low. Two attempts were made to find Saker nests in the montane zone of the Tarbagatai Mountains in 2006 and 2007 but no nests were found and only one Saker was seen in the area. Most breeding Sakers were located on the periphery of the main Tarbagatai mountain range i.e., in the foothills. High breeding densities were recorded in the Arkaly and Karabas Mountains, located close to the Chinese border (Figure 2). A comparatively high density of nests was also observed in the Manrak Mountains, which are located to the north of the Tarbagatai range.

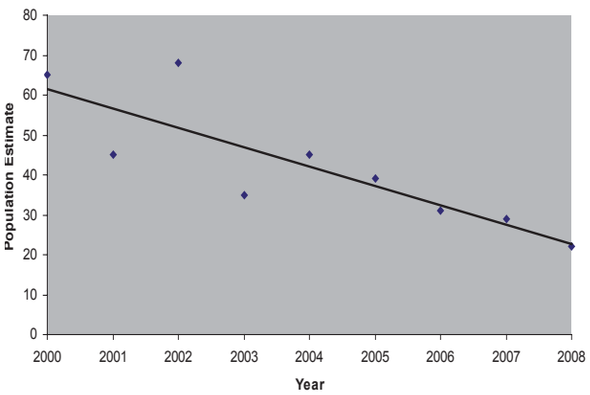

Figure 2. *Decline in the estimated breeding population in the surveyed areas of eastern Kazakhstan over the period 2000-08*

Long-term monitoring of the Saker Falcon breeding population has allowed us to estimate the number of breeding pairs in our survey area over the period 2000-08 (Table 2). Our data indicates that over this 9-year period the breeding population has declined by 65% (Figure 2).

In line with this decline the proportion of territories that are occupied by non-breeding birds has increased (Figure 3). Single males were found at over half the 68 occupied territories where at least one Saker was observed but there was no evidence of breeding (N = 35; 51%), whereas single females were found at only four territories (6%). The remainder (N= 29; 43%) were occupied by pairs that were apparently not breeding. However, there was no evidence that the proportion of single males occupying territories had increased over the study period (Figure 4).

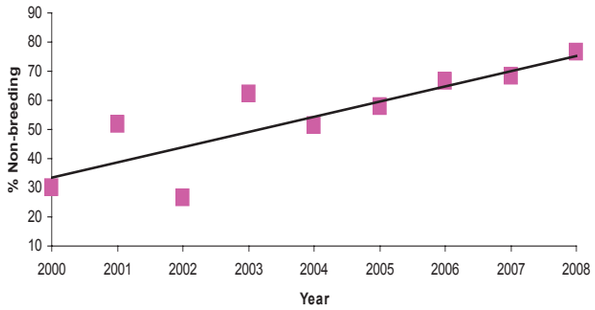

Figure 3. *Increase in the percentage of checked territories that were occupied by non-breeding singletons or pairs of Sakers.*

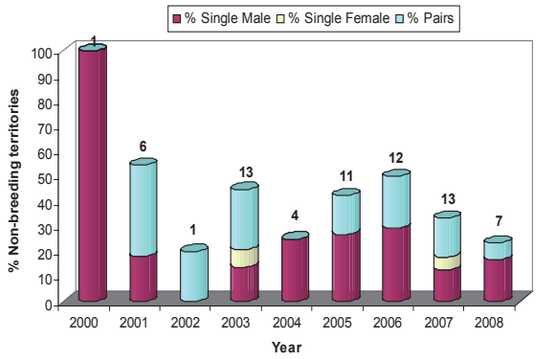

Figure 4. *Occupancy of territories at which there was no evidence of breeding by single males, single females and pairs. Territories that were classified as occupied on the basis of signs only have been excluded. Numbers above the columns refer to total sample sizes.*

Clutch and brood size

The mean and modal clutch size of 23 clutches was 4 eggs (range 3 to 6 eggs), whilst the mean and modal size of 156 broods was 3.7 and 4 chicks respectively (range 1 to 6 chicks). There was no decline in brood size at successful nests over the study period (Figure 5). In the mountains of eastern Kazakhstan Sakers start egg-laying from the middle of March and most pairs have completed clutches by the end of April, with a peak period in the third ten-day period of March

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Checked	10	31	49	50	45	52	69	76	73
Not Checked	83	62	44	43	48	41	24	17	20
Occupied	8	26	41	48	38	49	46	64	47
Bred	7	15	36	19	22	22	23	24	17
Brd/Ckd	.700	.484	.735	.380	.489	.423	.333	.316	.233
***Unv* Estimate**	58	30	32	16	23	17	8	5	5
Breeding Estimate	65	45	68	35	45	39	31	29	22

Table 1. *Breeding data from 93 Saker territories monitored in eastern Kazakhstan from 2000-08. Brd/Ckd is the proportion of checked territories where breeding was confirmed. Unv Estimate is the estimated number of breeding pairs in territories that were not checked (i.e., Not Checked x Brd/Ckd)*

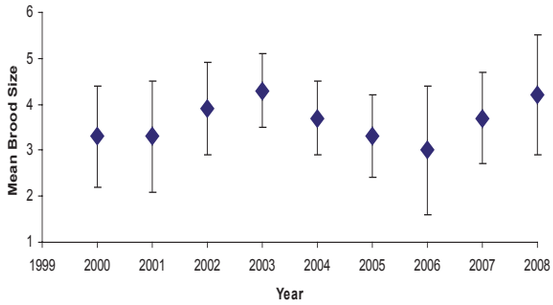

Figure 5. *Mean brood size at monitored Saker nests in eastern Kazakhstan from 2000-08.*

Discussion

The nesting distribution of Sakers in the surveyed area of eastern Kazakhstan revealed that the highest breeding densities are found in the foothills of the mountain ranges of the region, which is no doubt related to the availability of mammalian prey such as Great Gerbils (*Rhombomys opimus*), Red-cheeked Sousliks (*Citellus intermedius*) and Long-tailed Sousliks (*Citellus undulatus*), as well as the availability of suitable nesting sites. The number of breeding pairs was highest in 2002, which coincided with a peak in the number of Red-cheeked Sousliks across the region.

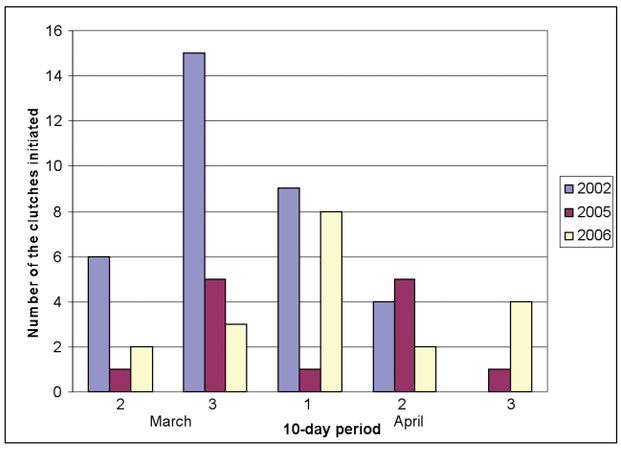

Figure 6. *Clutch initiation dates in 10-day periods for Saker Falcons breeding in Eastern Kazakhstan in 2002, 2005 and 2006.*

Yet despite there being no apparent change to the habitat and no perceptible reduction in food supply the breeding population has steadily declined over the study period and the proportion of non-breeding territory holders has increased over the same period. This current breeding population decline in eastern Kazakhstan mirrors the decline of the breeding Saker population in southern Kazakhstan over the last decade of the 20th Century, which coincided with the collapse of the Soviet Union and an increase in illegal trapping for the falconry trade.

We do not know the cause (or causes) of the current decline in eastern Kazakhstan but it is unlikely to be as a result of local factors in the breeding area. The breeding area is afforded some protection from human interference because of the restrictions on human access due to its close proximity to the Chinese border. Consequently, nest disturbance and trapping of breeding adults in the region is relatively low. However, after the breeding season young Sakers and most of the adult birds move from the Tarbagatai foothills and, around the same time, Sakers arrive in the flat, southern region of the Zaysan Valley where there are the colonies of Yellow Lemming (*Lagurus luteus*), and in the Balkhash-Alakol depression where there are high densities of Great Gerbil. Falcon trappers from Syria and other countries (including Kazakhstan) operate in these regions and catch Sakers from late June to December. Unfortunately, due to its illegality there is no data on the number, age profile or natal origin of the Sakers trapped in these regions, so it is not possible to gauge its impact on the population of eastern Kazakhstan, but with a rapidly declining regional breeding population the illegal trapping and trade of Sakers is certainly not helping the species.

Whilst excessive illegal trapping of birds outside the breeding/natal area is a possible (if not probable) cause of the regional decline of Sakers in eastern Kazakhstan, there are other potential factors that could be implicated such as a decline in food availability in the breeding and/or wintering areas and increased mortality through electrocution on power lines.

In 2007 a reintroduction programme was initiated by the Government in response to the severe decline in the breeding population of southeast Kazakhstan. Under the framework of this program 60 Sakers (30 female, 30 male) were taken on July 10th from "Sunkar" Falcon Facility, Almaty to the Sugaty Valley. They remained in a large pre-release aviary for seven days and were then released. Since 1995 about 600 Saker Falcons were released from this facility into the wild. In 2008 another 50 birds were released and this programme is planned to continue for several years.

Acknowledgements
Thanks also to M. Watson, T. Kunca, S. Buckell and Sergey Shmygalev for their contribution to fieldwork.

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Ospreys in the Abu Dhabi Emirate; current breeding status and role of platforms as an aid to nesting

Shahid B. Khan, Sálim Javed and Junid N. Shah

Environment Agency - Abu Dhabi, PO Box 45553 UAE. sjaved@ead.ae

Summary
The Osprey (*Pandion haliaetus*) is a regional priority and a resident breeding species in the United Arab Emirates. Extensive surveys were conducted during the 2007 breeding season to assess the current breeding status of Ospreys in the Abu Dhabi Emirate. A total of 61 sites were surveyed, which included 46 islands and 15 coastal sites. Altogether 117 nests were recorded out of which 61 were active, 47 inactive and nine were attended by birds that did not breed. Apart from the natural nests, platforms erected to aid Osprey nesting at many sites have been successfully used. Out of almost 27 nests on platforms, 58% were active or attended. Despite increasing levels of disturbance on some of the key Osprey nesting sites, the overall number of Ospreys has remained stable, or possibly increased over the last decade. Better protection on most of the privately owned islands and provisioning of artificial nesting platforms may have contributed to improved status of breeding Ospreys in the Emirate.

Photo 1. *Osprey on Buitnah island. (S. Javed)*

Introduction
The Osprey is a common breeding species in the Arabian Sea, Gulf of Oman and the Red Sea (Khan *et al*., 2008). The United Arab Emirates, Bahrain and Oman host important breeding populations in the Arabian Gulf region (Jennings, 1995). Breeding on numerous off shore islands of the Abu Dhabi Emirate, the UAE's Osprey population is of international importance. However, despite their national and international significance, no recent data was available on the status of the Osprey in the Emirate and from elsewhere in the country. The only previous estimate on Osprey numbers was available from surveys conducted in the Abu Dhabi Emirate in March-April 1993 (Aspinall, 1994) and another survey in June 1994 (Richardson *et al*., 1997). Although these surveys were carried out towards the end of the Osprey breeding season, they provided some baseline information on their status.

To ascertain the current breeding status, surveys were conducted on most of the islands of the Abu Dhabi Emirate and its coastline during the winter of 2006-2007. In this article, we present results from the survey and also discuss the role of artificial nesting platforms in maintaining a healthy Osprey population in the UAE.

Methods
The entire coastline from Ras Ghumeis in Sila to Taweelah in the east was surveyed in addition to most of the islands. Out of the total 61 sites surveyed, 46 were islands and 15 coastal sites (see Figure 1). During the visit, each nest observed was mapped using a GPS unit and all other ancillary information on its status recorded. Nest type was recorded either as natural or on a platform. If nests were on any naturally occurring structure (i.e. rock or ground), it was categorized as

a natural nest and if the nest was on a platform (i.e. electricity poles, water tanks) it was categorized as a platform nest. Nest status was recorded as active (birds breeding), attended (birds present but not breeding) or inactive (no birds present on the nest).

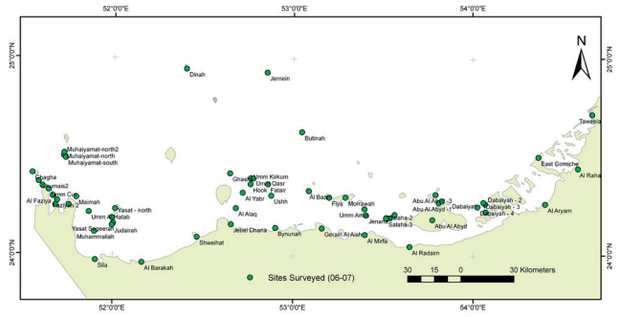

Figure 1. *Map showing locations of sites surveyed for Ospreys in the winter of 2006-2007.*

Results

Altogether 138 adult birds were recorded from the 61 surveyed sites. A total of 117 nests were recorded during the survey, of which, 61 were active whereas 47 were inactive with another nine attended by non-breeding birds (see Table 1 & Figure 2). Nearly 50% of all the surveyed sites recorded breeding Osprey. Of the total 61 active nest sites, 75% were on islands and remaining 25% on coast sites. Of the total nests, 86 (73 %) were natural whereas 31 nests (27 %) were on nesting platforms. Most of the platforms were installed near the shore and are present on both islands as well as on coastal sites (see Fig. 3).

Photo 2. *Osprey nest on artificial platform. (S. Khan)*

Nest condition	Nest type		Number of nests
	Natural	Platform	**Total**
Active	47	14	**61**
Attended	5	4	**9**
Inactive	34	13	**47**
Total	**86**	**31**	**117**

Table 1. *Type of nest, frequency and Osprey presence observed during the survey.*

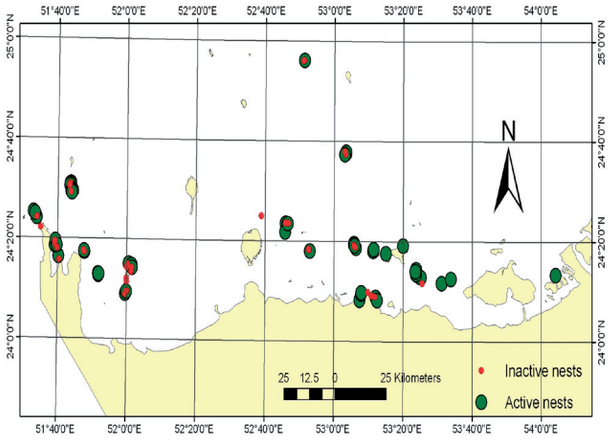

Figure 2. *Locations of active and inactive nests recorded during the survey.*

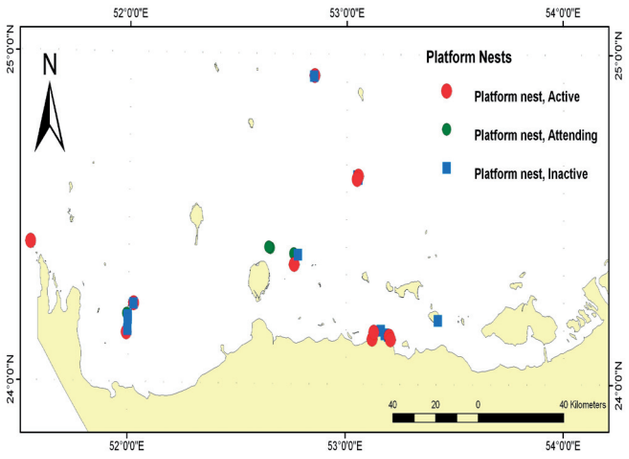

Figure 3. *Locations of Osprey nests, their platforms and reproductive status.*

Discussion

Almost all the breeding Osprey in the UAE are found in Abu Dhabi Emirate and most of them restricted to islands (Aspinall, 1994; 1998; Javed, 2004; Khan *et. al*, 2007 a, b). Out of the 30 sites that had breeding Ospreys, 28 were islands underlining the importance of undisturbed islands for long-term successful breeding.

Platforms erected to aid Osprey nesting have been used successfully in many places around the globe.

Nearly 58% of all the 27% single pole platform nests were active (Khan *et al*., 2007a), underlining their importance as an aid to breeding and maintenance of the UAE breeding population. If sites can ensure low disturbance, particularly during the breeding period and provide nesting material and food it is most likely that installing platforms can attract birds to breed. Sites like Gerain Al Aish, Faziya and Morawwah are some such sites with potential to attract more breeding birds with the installation of platforms.

Although more than half of the nests were active or attended by birds, disuse of nearly 40% of all the nests is possibly due to abandonment of sites as a result of human disturbance. Loss of nearly 80% of active nests from some former key island breeding sites such as Yasat, Judairah and Ghagah (Khan *et al*., 2007 a, b) is mainly attributed to extensive development and continuous human presence.

It is estimated that 70-75 breeding pairs are present in the emirate of Abu Dhabi; given that two sites, known to hold an additional 10-12 breeding pairs were not surveyed during the 2007 breeding season. As no nesting pairs are currently known from other emirates, the Abu Dhabi Ospreys represent the entire UAE population and the species is of significant conservation importance, accounting for more than 75% of the entire Arabian Gulf breeding population. Regular monitoring and improved protection, at least for some sites is important for the species. Sites important for breeding water birds have already been recommended for protection (Javed & Khan, 2003); and our results from the Osprey study provide further evidence to support the designation of protective status on some sites.

Acknowledgements
We thank H.E. Mr. Majid Al Mansouri, Secretary General of Environment Agency – Abu Dhabi and Mr. Abdulnasser Al Shamsi, Director Biodiversity Management (Terrestrial) for their encouragement and support. We also thank Mr. Khalfan Abdul Aziz Al Suwaidi, Manager, Wildlife Conservation and the Marine Protected Area Department in EAD and the management and caretaker staff of all the surveyed sites for their help. Special thanks to the UAE Naval Forces and Coast Guard for their cooperation and allowing the use of Ras Ghumeis Naval Base.

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Sooty Falcon in the United Arab Emirates

Junid N. Shah, Shahid B. Khan, Shakee Ahmed, Sálim Javed and Abdullah Hammadi

Environment Agency - Abu Dhabi, PO Box 45553 UAE. sjaved@ead.ae

Summary
The Sooty Falcon (*Falco concolor*), a migrant breeder in the United Arab Emirates (UAE) has been recorded breeding only from the Abu Dhabi Emirate. EAD undertook an extensive survey in 2007 to document their current status. A total of 22 sites (19 island sites and 3 coastal sites) were surveyed in the Abu Dhabi Emirate. Surveys were conducted three times during the breeding season, at the start, in the middle, with the last survey towards the end of the breeding season. Out of the 21 sites surveyed, Sooty Falcons were recorded from 7 sites and breeding was observed at only 5 sites. The 5 breeding pairs recorded in 2007 represent a decline of 64% compared to the 14-25 pairs that were estimated in 1996. Because all the breeding Sooty Falcons are found in Abu Dhabi, long-term conservation of Sooty Falcons in the UAE depends upon conservation actions taken in Abu Dhabi. Monitoring and ecological studies are essential for the long-term conservation of the Sooty Falcons in the United Arab Emirates.

Photo 1. *Sooty Falcon (Falco concolor). (S. Khan*)

Introduction

The Sooty Falcon (*Falco concolor*), is one of the important breeding birds of the Arabian Peninsula and the United Arab Emirates (UAE) because its global breeding range is largely restricted to this region. The species is present in the region during the hottest months of the year, it is considered threatened in the Middle East where most of the pairs breed on small uninhabited islands. About 5000 birds have been estimated in a 1000 km^2 area in Western Madagascar which is far higher as compared to the low density of species within the breeding range. Breeding populations are still very little understood (Del Hoyo *et al.*, 1994). Sooty Falcons undertake migration between the wintering areas, which are mainly in Madagascar and South East Africa to their breeding areas in the deserts of Northern Africa from Eastern Libya through Egypt, Jordan to the coasts of the Red Sea and Arabian Gulf and east to south western Pakistan (Cramp & Simmons, 1980; Roberts, 1991). There are no good estimates of breeding numbers and Walter (1979) suggested that the main breeding habitats are still to be discovered.

Sooty Falcons are summer breeding visitors to islands and coastal parts of Saudi Arabia, Oman, Yemen and the UAE. Important breeding numbers are found in Saudi Arabia, Oman, and Yemen while small breeding numbers are found in Bahrain and the UAE (Jennings, 1981; Eriksen *et. al*., 2003; Nightingale and Hill, 1993; King, 2006; Richard, 1990; Aspinall, 1994; 1996). About 120 pairs breed along the coast of Oman (Walter, 1979) and a more recently 90 pairs were estimated in Oman (McGrady *et al*., 2007).

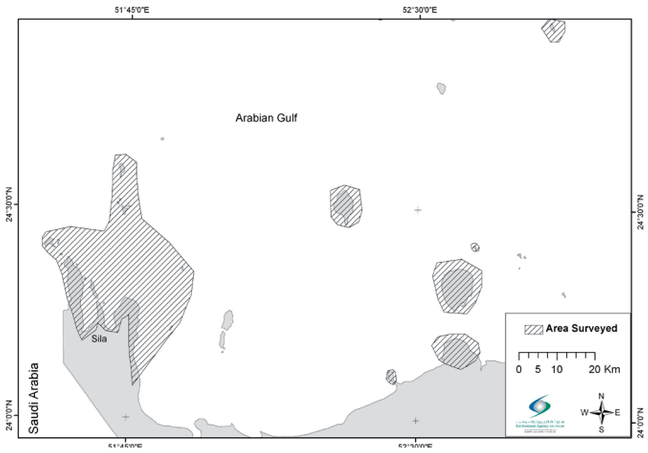

Figure 1. *Areas surveyed for Sooty Falcons in the Abu Dhabi Emirate.*

The birds are present in the UAE from April to October and the western islands support the bulk of the breeding population (Aspinall, 1996; Richardson, 1990). Information on Sooty falcons is limited except for surveys conducted in 1994 (Aspinall, 1994). A survey was carried out in the 2007 breeding season due to the lack of recent information as well as to find out the impacts of recent development along the coast, which includes development on some islands. This article provides a summary of the results from the survey.

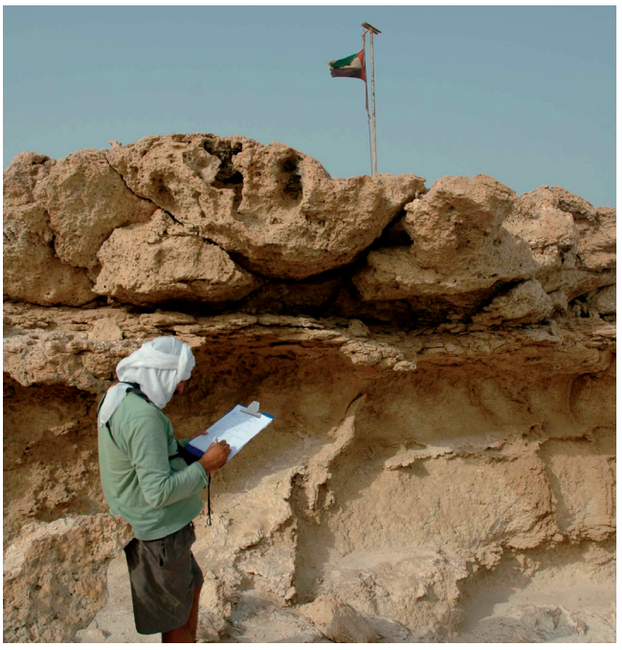

Photo 2. *Recording Sooty Falcon nests.* Photo: Shahid Khan.

Methods

Surveys were conducted at all known sites and all potential nesting areas (see Figure 1) three times during the breeding season. The first survey was conducted at the start of the breeding season (August) while the second was conducted in September at sites where Sooty Falcons were seen during the first survey and most of the eggs had hatched. The third survey was conducted near to the end of the breeding season, in October, to document fledging success. Altogether a total of 21 sites were surveyed, which included 19 islands and the rest were coastal sites. Nests were located by waiting for the birds to settle back once they had flown off on approach. Potential areas with suitable nesting gaps in the cliffs were actively searched for nests or chicks. Information gathered on sites was mainly in relation to the land use and the level of disturbance present. All nest locations were recorded using a GPS and were mapped in ArcGIS 9.

Results

Out of the 21 sites surveyed, Sooty Falcons were observed at 7 sites and breeding was recorded at only 5. All birds and nests were found exclusively on islands and no birds were observed at any of the coastal sites. Birds were seen mainly at sites which were uninhabited and with no disturbance; 48% of the sites surveyed were uninhabited with no land use. Nearly 86% of all sites where birds were seen showed no form of disturbance and no evidence of land use.

Of the 21 sites surveyed, Sooty Falcons were recorded in only 7 sites (see Figure 2). Altogether 11 birds, all adults, were seen during the first survey. During the second survey 26 birds were recorded, which included 14 adult birds and 12 chicks including one dead bird. The sites where Sooty Falcons were found to breed are situated in close proximity to one another. Most of the nests were found in the crevices of cliffs (80%) while only one nest was found on a flat surface under two big rocks. The average nest elevation from sea level was 7.8 ± 6.9 m (Mean ± SD). Mean clutch size was 2.8 ± 0.4 (Mean ± SD) eggs per nest. All the eggs hatched successfully and total of 14 fledglings were observed flying near the nest.

Discussion

During the 2007 Sooty Falcon breeding season, only five breeding pairs of Sooty Falcons were recorded in the Abu Dhabi Emirate. The only other previous estimate for Sooty Falcon numbers was 14-25 breeding pairs (Aspinall, 1996), about three to five times higher compared to our results. In other surveys (Walter, 1979; Frumkin, 1991), most of the recorded Sooty Falcons nests were on cliffs with a north east aspect. No evidence of breeding Sooty Falcons were found at Dinah, Sir Baniyas and Delma islands indicating a possible loss of territories due to disturbance.

As all UAE breeding Sooty Falcons are recorded from the Abu Dhabi Emirate, Abu Dhabi birds represent the entire country. Although the UAE breeding population represents a small fraction (around 1%) of the total number of breeding Sooty Falcons in the Arabian Peninsula, which is estimated at around 500 breeding pairs (Jennings & Sadler, 2006), they are nonetheless important for conservation in a regional context.

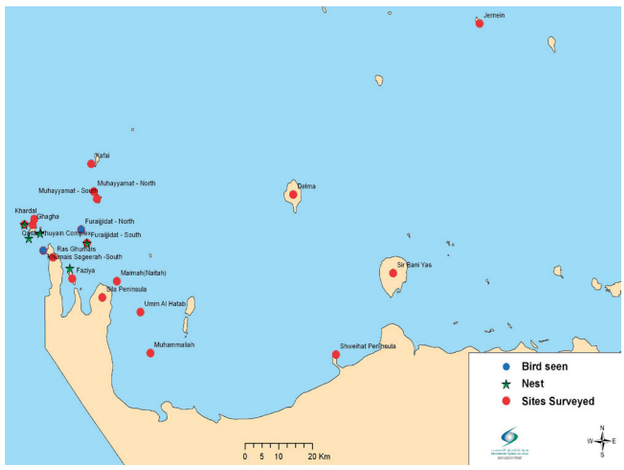

Figure 2. *Survey sites, occupied territories and observed nests of the Sooty Falcon in the Abu Dhabi Emirate.*

Most of the breeding birds are concentrated on the western group of islands, close to the border with Saudi Arabia. A number of factors combined seem to have helped the Sooty Falcon by restricting development: the small size of the islands, the proximity to the international border and also the presence of armed forces. Although a repeat survey is needed in the 2008 breeding season before drawing any far reaching conclusions, it is clear that Sooty Falcon numbers have declined by more than 60% over the last decade, from an estimated 14 pairs in 1994 (Aspinall, 1994). Given this decline and the threats to their breeding habitat, Sooty Falcons can be regarded as one of the most threatened bird species in the UAE. Sooty Falcon nests are confined to few islands within a very small area of around 200 km^2. This is considerably lower than the 1000 Km^2 of breeding area occupied by the species in 1994. Many of the nesting Sooty Falcons have disappeared from the central islands as well as some of the western islands of the Emirate. Any change in the status of the currently occupied sites in terms of land use leading to disturbance and habitat loss will be highly detrimental for the breeding and long-term presence of the Sooty Falcon in the Abu Dhabi Emirate.

Conservation

With a decline of more than 60% in the number of breeding Sooty Falcons between 1994 and 2007 and a substantial reduction in the breeding range of the birds

from >1000 km^2 in 1994 to <200 km^2 in 2007, active conservation is urgently required. Designation of some form of protection to the western group of islands would be a step in the right direction.

Photo 3. *Sooty Falcon chicks*. Photo: Shahid Khan.

Regular breeding surveys and ringing of Sooty Falcons with numbered micro-chips should be undertaken. However, there is a need to launch a regional collaborative research and monitoring programme between the UAE, Oman and Saudi Arabia to further our understanding of the dynamics of the Sooty Falcon. We also urgently need to address key issues related to the conservation of the species. Preliminary discussions have taken place in the UK between collaborators from Natural Research (NR) and the Center for Agri-Environmental Research (CAER).

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Photo 4. *Sooty Falcon nest with eggs. (S. Khan)*

Micro-chipping of Sooty Falcons on Islands off Northern Oman

M. Nicoll[1], M. McGrady[2] & N. Williams[3]

[1]CAER, University of Reading, Reading, UK.
[2]Natural Research, Ltd, Banchory, UK.
[3]DEFRA, Animal Health Agency, Bristol, UK.

The Sooty Falcon (*Falco concolor*) is a little-known migratory falcon, whose breeding grounds are islands in the Arabian Gulf, the Gulf of Oman and the Red Sea and the deserts of Egypt, Israel, Jordan and Libya. Its wintering grounds are along the south-eastern coast of Africa including Madagascar. Information on the status and distribution of Sooty Falcons is limited and variable, with estimates of the global breeding population ranging from 1,000 - 40,000 pairs. Recently the global conservation status has been upgraded to 'Near Threatened' in response to a suspected decline in the population.

One of the earliest extensive surveys of Sooty Falcons was carried out in Oman in 1978 by H. Walter. In August and September of 2007 teams from Natural Research Ltd and the University of Reading undertook a comparable survey of Sooty Falcons on the islands off northern Oman: the Daymaniyat Islands, the Suwaydi Islands and Fahal Island. The survey was supported by Petroleum Development Oman, Diwan of Royal Court, Royal Court Affairs, and the Ministry of Environment and Climate Affairs. The survey is being conducted over two years and aims not just to establish the status of the falcon on these islands, but also to collect baseline ecological data on the breeding biology and feeding ecology of the species.

Our findings from the first survey indicate that the number of Sooty Falcon pairs on the islands is slightly lower than those found by Walter in 1978. On the Daymaniyat Islands we identified 40 territories, 14-16 on the Suwaydi Islands and 41 on Fahal. On the same islands Walter reported 42, 16-18 and 47 territories, respectively. However, as this is part one of a two part survey these are preliminary findings and should be treated as such. We did find some evidence that unintentional human disturbance by fishermen and diving tourists landing on the islands may have caused some pairs to fail.

Sooty Falcon chick with microchipped ring. (M. McGrady)

We hope that our initial work in Oman will generate a long-term programme of monitoring and research, so we are fitting birds with numbered British Trust for Ornithology (BTO) rings and microchip rings or PIT (Passive Induced Transponder) tags. To date we have fitted these tags to 62 chicks in order to understand movement, longevity, recruitment and turnover of breeders. The microchip rings are easily clipped onto the leg opposite to the one on which the BTO ring is fitted, and contain a uniquely coded microchip like those inserted under the skin of pets and hunting falcons. We can recapture these birds electronically in years subsequent to ringing by putting a microchip reader in the nest scrape. This non-invasive technique has the potential to produce more robust data than traditional ringing and has been used to study Merlin (*Falco columbarius*), peregrine falcon (*Falco peregrinus*) and sand grouse (*Pterocles spp*.). We are interested in assembling a network of people who are ringing sooty falcons across their breeding range to fit more with microchip rings. We would provide these for

free, and if individual researchers start marking large numbers of falcons we would lend them an electronic reader when ringed birds start to enter the breeding population. If anyone is interested in participating in the ringing scheme or would like further information on the research we are conducting please contact mike.mcgrady@natural-research.org or m.a.c.nicoll@reading.ac.uk. You can also download a report of our first year's field work at http://www.natural-research.org/news/sooty.htm

Sooty Falcon chicks in a nest cavity. (M. McGrady)

Reintroduction of the Saker Falcon in Bulgaria

Dimitar Ragyov[1] and Andrew Dixon[2]

[1]Central Laboratory of General Ecology, Bulgarian Academy of Sciences, Yurii Gagarin str. 2, Sofia 1113, Bulgaria. Email: dimitar.ragyov@gmail.com

[2]International Wildlife Consultants Ltd., PO Box 19, Carmarthen, SA33 5YL, United Kingdom.

Summary

The Saker Falcon (*Falco cherrug*) was formerly abundant and widespread in Bulgaria. In the 20th Century numbers declined markedly following World War II as a result of changes in agricultural practices that dramatically altered the landscape. In addition government sponsored campaigns to eradicate predatory birds and rodents directly affected the Saker Falcon population and its favoured prey species, the European Souslik (*Spermophilus citellus*). By the end of the 1980's the Saker Falcon population had diminished to an estimated 30-50 breeding pairs. Subsequently, the change of government in 1989 saw an increase in nest robbery and illegal poaching, and now the Saker is believed to be extinct as a breeding species in the country. With the accession of Bulgaria to the European Union and the establishment of a network of Natura 2000 protected sites there is an opportunity to restore the Saker Falcon through a programme of reintroduction. This article describes the feasibility study currently being undertaken to examine the potential and logistics of such a project.

Former status of the Saker Falcon in Bulgaria

Prior to the 1930s the Saker Falcon was a common breeding species in Bulgaria, especially in the northeast of the country and along the lowlands of the Danube River plain. After World War II massive changes in agricultural practices dramatically altered the Bulgarian landscape and in addition there were government sponsored programmes to eradicate birds of prey from the environment. Consequently, in the latter part of the 20th Century the breeding population was reduced to less than 50 pairs.

PERIOD	STATUS
Late 19th Century	**"Widespread & Abundant"**
1900 to 1930	**"Common"**
1960s	**30 – 50 pairs**
1980s and 1990s	**15 – 50 pairs**

Table 1. *History of the status of the Saker Falcon in Bulgaria.*

Reasons for decline

The main reasons for the large scale decline of the Saker Falcon in Bulgaria (from 1945 onwards) are linked to habitat loss, loss of suitable prey species as well as the use of pesticides and direct persecution of raptors. Habitat loss has occurred through abandonment of lowland grazing or conversion to arable crops. This loss of habitat coupled with direct persecution has resulted in a massive decline of the European Souslik (*Spermophilus citellus*), the main prey of Sakers in Bulgaria (Photo 1). In addition, direct persecution of birds of prey and widespread use of agricultural pesticides has dramatically affected raptor populations and their prey species. More recently the nest robberiesy and falcons trapping has had a critical impact on the Saker Falcon population.

Photo 1. *European Souslik (Spermophilus citellus). (M. Vasilev)*

Current status

Recent surveys have failed to confirm any breeding pairs at former nesting sites in the country. The current breeding population is certainly very small if not extinct. The recent decline since the 1990s is possibly attributable to increased mortality of adults through persecution and a reduction in productivity as a result of nest robbery for falconry.

Current conditions in Bulgaria are generally favourable for raptors; Peregrine (*Falco peregrinus*) and Long-legged Buzzard (*Buteo rufinus*) populations are increasing. Harmful pesticides are now banned and persecution is no longer commonplace. In addition, there is now legislation and enforcement to reduce nest robbery (including steps toward DNA certification) and development of captive breeding programmes as well as stronger active nature conservation organisations (both NGOs and others). Suitable habitat is now available in new protected areas (National Parks, Nature Parks, NATURA 2000 network). Suitable prey is now also available for raptors, especially medium size birds and voles.

Reintroduction

There is a low chance of natural recolonisation by Sakers in Bulgaria. The nearest population centres are in the Pannonian Basin of Hungary, Slovakia and Serbia to the northwest and the Ukrainian steppe in the northeast.

The Saker Falcon is an ideal candidate as a 'flagship' species for developing public awareness of conservation issues related to direct human persecution and wider landscape changes. It is well suited to promote protected sites within the NATURA 2000 network. Bulgaria lies between the Saker population centres in central Europe, Ukraine and Turkey. By reintroducing the species we also aim to connect fragmented west Eurasian populations of Saker Falcons.

Reintroduction feasibility study

The aim is to:-

Identify potential donor stock

Potential donor stock could come from breeding centres or via translocation of wild birds from neighbouring countries with healthy populations. This includes genetic analysis of potential donor stock to compare with museum specimens from Bulgaria and neighbouring populations.

Identify suitable release sites

In 2008 protected areas that support other raptor species with broadly comparable ecological requirements to Sakers, suitable prey and nesting sites will be identified. These sites should be part of NATURA 2000 network with an established management regime.

Develop a strategy for reintroduction

The 'hacking technique' has been successfully used to release several raptor species. An estimate of the number of Sakers required for release will be established using available survival data. The strategy also includes identification of the number of release sites as well as post-release monitoring.

Establish working partnerships

In 2008 we will continue to develop working partnerships with various stakeholder groups including national and international conservation NGOs, government agencies and falconry groups. We have begun training personnel for falcon breeding and release.

Concluding remarks

The loss of the Saker from Bulgaria is undoubtedly a result of human activities and the reintroduction of the species could have potential wider benefits for conservation in the country. Careful planning, implementation and monitoring is the key to a successful reintroduction programme and the feasibility study currently being undertaken in Bulgaria is the first step along this road.

Development of a Health-monitoring Protocol for the Black Vulture using Non-invasive Samples from a Population in Wallerfield, Trinidad

Marc A. Driscoll, Renee C. Lezama, Adana N. Mahase

School Of Veterinary Medicine, The University of the West Indies, Eric Williams Medical Sciences Complex, Champs Fleurs, Trinidad, West Indies.

Abstract

In recent years various populations of wildlife, in most parts of the world, have come under scrutiny by conservationists and others as a result of concerns over global declines. Veterinarians have become involved because of concerns about the health of populations and the possibility that in some species infectious and non-infectious diseases could be playing a part in their decline.

Asian populations of Old World vultures have plummeted over the past decade (Bird and Bildstein, 2007). There are also growing fears that New World vultures might also decline. Various monitoring systems have therefore been devised and implemented to monitor the health status of these and other birds of prey (Cooper, 2002).

Photo 1. *This is the team on our first site preparation visit. From left to right is Marc Driscoll (myself), Adana Mahase, and Renee Lezama.*

This project sought to devise a health-monitoring protocol for the Black Vulture (*Coragyps atratus*) geared towards taking non-invasive samples to develop a health profile for a specific group of birds (Cooper, 1998). The population studied was situated in Wallerfield, North Trinidad, and estimated to comprise 500 birds. The samples collected were naturally-voided feathers, droppings (faeces and urates) and castings (pellets), all in the area frequented by the vultures. Over a three-week period, ninety samples of each were collected and processed following a carefully formulated protocol.

Photo 2. *The site itself is called Wallerfield, a former American air base during World War II.*

Analysis of the feathers indicated that the birds in the population were subject to a consistently moderate to high plane of nutrition (25.5% prevalence of fault bars), had relatively low ectoparasite numbers (13.3%), apparently normal moulting patterns, and a low frequency of traumatic injuries. The analyses of the droppings and castings suggested that the birds had bacterial flora and probably gastrointestinal function that were in keeping with those observed in healthy birds of prey, including vultures, in previous studies.

The findings also indicated that the droppings and castings of the black vulture population could present public health risks. Several species of bacteria pathogenic to humans were isolated, including a *Bacillus spp*. (23.8% of droppings, 5.1% of castings) and *Proteus mirabilis* (17.5% of droppings, 5.1% of castings).

The methods used both to collect samples in the field and to process them in the laboratory proved satisfactory and readily replicated. It was therefore concluded that the protocol devised for this study is an effective non-invasive method of performing health-monitoring of the Black Vultures at Wallerfield, Trinidad and could be applicable to research on this species elsewhere.

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Severe Outbreak of Salmonellosis in Hunting Falcons in the United Arab Emirates

J. Kinne[1], M. Joseph[1], A. Sharma[2] and U. Wernery[1]

[1]Central Veterinary Research Laboratory, P.O. Box 597, Dubai, United Arab Emirates, cvrl@cvrl.ae
[2]Emirates Falcon Hospital, P.O. Box 53986, Dubai, United Arab Emirates

Summary

Over a period of 5 weeks 18 out of 20 hunting falcons from the same collection died suddenly. Gross pathology of eight of these falcons revealed mild fibrinous peritonitis and swollen liver and spleen in most cases. The first 5 cases showed numerous miliary yellowish spots in the liver, similar to herpes-virus hepatitis. The later cases had few, but smaller lesions (submiliary) irregularly distributed across the liver and spleen. Histology revealed in the first cases numerous acute necrosis without inclusions and severe interstitial suppurative hepatitis. In the later cases microabscesses with giant cells were found in liver and spleen. *Salmonella (S.) subspecies 1* was isolated from organs and intestine from 6 out of 8 necropsied falcons. However, *S. typhimurium* and *S. infantis* were isolated from 2 out of 3 pigeons from the feeding stock. So far the source of infection was not detected.

Introduction

Salmonellosis has never been reported to produce an epizootic in raptors, as it does in other avian orders (Williams, 1972). Although, salmonella infections are occasionally reported in birds of prey (Keymer, 1972), very little is known about the pathogenicity of salmonella organisms in falcons. Sykes *et al*., (1981) reported a *S. typhimurium* infection in a captive Peregrine Falcon (*Falco peregrinus*), but despite the isolation of this serovar from the liver, it remains unclear if the salmonella isolate was responsible for the death of the falcon.

Heidenreich (1995) believes that in most cases with miliary liver necroses herpes virus infections might have been involved. Different salmonella serovars have been isolated from cloacal swabs from healthy falconiform birds (Tabken, 1972; Kirkpatrick, 1986). The relation of salmonella infections in captive falcons to other infectious diseases like clostridiosis, chlamydophilosis and pox was analysed by Wernery and Joseph (1997), Wernery *et al*., (1998) and Gierse (2001). This paper describes a recent outbreak of salmonellosis in captive falcons in the U.A.E.

Material and Methods

Over a period of 5 weeks in spring 2006 eighteen (18/20; 90%) hunting falcons (1 to 6 year-old) from the same collection died suddenly. Eight of these falcons (6 female pure Gyrfalcons and 2 female Gyr-hybrids) were sent to CVRL, Dubai for necropsy. Most of the falcons were bred in Denmark and Germany and were between 1 to 6 years old (Table 1). They were fed quails and pigeons and were regularly vaccinated against PMV1.

Fatalities occurred only in one cage, housing 20 birds. No disease was seen in the next cage (side by side), housing as well 20 falcons, even so a common entrance to both cages was used and a common feed processing station existed. Both aviaries were air-conditioned with limited access to sunlight. The food provided in both aviaries was sourced from one place only and handled by the same attendants.

Organ samples were taken from all eight necropsied birds for bacteriological, virological and histological examinations. Salmonella suspicious colonies were identified by their appearance on the selective agars and their biochemical properties in the Enterotube and API 20E (bioMérieux) systems. Strains identified as *Salmonella spp*. were then sent for typing to the Salmonella Identification Centre of the Robert Koch Institute in Wernigerode, Germany. Furthermore, 3 pigeons from the feeding stock were tested for the presence of salmonella bacteria using the above-mentioned method.

Figure 1. *Swollen liver with numerous miliary yellowish foci (herpes-hepatitis-like).*

Results

Three to five days before death all falcons had shown anorexia, fatigue and dehydration. Greenish coloured droppings were passed during their illness. Necropsy performed on all 8 falcons revealed different degrees of yellowish discolouration and slight enlargement of the liver, which was accompanied by a soft consistency and subcapsular haemorrhages. The liver of the falcons showed different numbers of miliary white-yellowish spots under the pleura, which were also scattered throughout the parenchyma. Numerous miliary yellowish foci (herpes-hepatitis-like) were seen in the first cases (Fig. 1). The later cases revealed only few submiliary yellowish foci (Fig. 2). The spleens were swollen and subcapsular and parenchymatous haemorrhages were evident. Haemorrhagic enteritis was also seen in 5 falcons.

Figure 2. *Swollen liver with few submiliary yellowish foci.*

In the first four cases histology revealed numerous acute hepatic necrosis without inclusions and severe interstitial hepatitis. In the later cases microabscesses with giant cells were found in the liver and spleen.

Salmonella subsp. 1 was isolated from liver, spleen and the small intestines of all 6 necropsied Gyrfalcons (Table 1). However, the 2 Gyr-hybrids from the same aviary were negative for salmonella. Beside the detection of salmonella strains, *Clostridium (Cl.) perfringens* type A was cultivated from small intestines of 6 cases. No virus was isolated from any of the birds.

Salmonella species were isolated from organs and intestines from 2 out of 3 pigeons from the feeding stock. These isolates were typed *as S. typhimurium* and *S. infantis*.

Discussion

Over a period of 5 weeks 18 out of 20 hunting falcons from the same collection died suddenly. Gross pathology of eight of these falcons revealed mild fibrinous peritonitis and swollen liver and spleen in most cases. The first 5 cases showed numerous miliary yellowish spots in the liver, similar to herpes virus hepatitis. The later cases had few, but smaller lesions (submiliary) irregularly distributed across the liver and spleen. The lesions resemble alterations caused by *S. typhimurium* infection and herpes virus infection (Heidenreich, 1995; Wernery *et al*., 2004). The first suspicion was inclusion body hepatitis, however, no herpes virus but *S. subspecies 1* was isolated from the liver, spleen and intestines of all six investigated pure Gyrfalcons. In addition to the infection with salmonella bacteria, five falcons had contracted also a *Cl. perfringens* type A enterotoxaemia.

Histology revealed in the first cases numerous acute hepatic necroses without inclusions and severe interstitial hepatitis. In the later cases microabscesses with giant cells were found in liver and spleen. Liver and spleen were the main target organs, however, from all six salmonella positive falcons the bacteria were isolated from the organs as well from the intestine. It was interesting to note, that Salmonella was only isolated from pure Gyrfalcons, not from the 2 hybrids, most probably due to previous antibiotic treatment. Haemorrhagic enteritis due to clostridiosis was seen in 6 falcons (5 pure Gyrfalcons and 1 hybrid). However, double infection was not proofed in 3 cases, most probably due to previous antibiotic treatment.

Wernery *et al*., (1998) and Gierse (2001) observed salmonellosis in captive falcons mainly in spring, which is also true for this outbreak. During a routine check up of 48 healthy falcons, 12 salmonella strains including, S. typhimurium, were isolated by Wernery *et al*., (1998). The authors also showed that *S. typhimurium* infection turned into a salmonellosis when in combination with concurrent infections. In addition to the infection with salmonella bacteria, 4 falcons had contracted also a *Cl. perfringens* type A enterotoxaemia. This was exactly the same situation in our cases, where 5 out of 8 necropsied birds contracted both infections. However, this double infection was not proofed in the 3 remaining cases, most probably due to previous antibiotic treatment.

Wernery *et al*., (1998) assumed that falcon salmonellosis caused by *S. typhimurium* originated from quails and pigeons from which *S. typhimurium* has been regularly

Case-no	Species	Origin	Age in Years	Salmonella from Intestine	Salmonella from Organs	Salmonella typing	*Cl. perfringens* from intestine
1	Pure Gyr	Denmark	3	pos	pos	*S.subsp.1*	high numbers
2	Pure Gyr	Denmark	2	pos	pos	*S.subsp.1*	high numbers
3	Pure Gyr	unknown	2	pos	pos	*S.subsp.1*	high numbers
4	Pure Gyr	Germany	2	pos	pos	*S.subsp.1*	high numbers
5	Hybrid	Denmark	3	neg	neg	-	high numbers
6	Hybrid	Germany	6	neg	neg	-	neg
7	Pure Gyr	Siberia	1	pos	pos	*S.subsp.1*	high numbers
8	Pure Gyr	Denmark	3	pos	pos	Not typed	neg

Table 1. *Bacteriological results of 8 falcons lost over a 5-week period.*

isolated. Battisti *et al*., (1998) could link embryonic and neonatal death in captive breeding raptors to frozen 1-day-old chicks, on which adult and young raptors were fed, since *S. havana* and *S. livingstone* isolates with similar biochemical and drug susceptibility patterns to those isolated from raptors were identified from the chicks. However, in the recent outbreak no link between pigeons from the feeding stock and the falcon salmonellosis was established. The isolates form the pigeons were typed as *S. typhimurium* and *S. infantis*, whereas the falcon strains were identified as *S. subspecies 1*. The source of infection remained obscure.

It was also surprising, that no disease was seen in the second cage, even so a common entrance to both cages was used and the same food was provided in both aviaries by the same attendants. In conclusion the falcons may have contracted the disease either from contamination due to droppings of free flying pigeons roosting on the aviaries netting or from small rodents caught by the falcons inside the cage. However, it is highly recommended to regularly vaccinate pigeons and quails against salmonellosis to protect hunting and breeding falcons from this disease.

Acknowledgements

The authors are very grateful to the Salmonella Identification Centre of the Robert Koch Institute in Wernigerode, Germany for serotyping the salmonella-strains. An earlier version of this paper was published in the 2007 Proceedings of the European Association. Avian Veterinarians, Zurich, March 2007. J. Kinne, M. Joseph, A. Sharma and U. Wernery. Severe Outbreak of Salmonellosis in Hunting Falcons in the United Arab Emirates. Pp 94-100.

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The Management of Small Populations of Falcons in Captivity and the Results of a Pilot Study to Cryopreserve Semen from *Falconidae* Using Field Techniques

Tom Bailey[1,2,3], William Holt[1], Peter Bennett[1], Nigel Barton[4] and Nick Fox[4]

[1]The Zoological Society of London, Regents Park, London, UK.
[2]The Royal Veterinary College, London, UK.
[3]Dubai Falcon Hospital, PO Box 23919, Dubai, UAE. [4]Falcon Research Institute, Carmarthen, Wales, UK.

Abstract
A demographic and genetic review of the New Zealand Falcon (*Falco novaeseelandiae)* captive breeding programme was conducted using the SPARKS studbook program. Additionally, a practical method for semen cryostorage in *Falconidae* was assessed with a view to developing a genetic resource bank to support the captive management of threatened raptors, such as the New Zealand Falcon.

Introduction
Assisted breeding techniques or 'scientific aviculture', including artificial insemination (AI), are being used to overcome some of the difficulties of managing captive avian populations as well as to increase the production of commercially valuable species, such as falcons. Sperm preservation combined with AI and the establishment of genetic resource banks (GRBs) is an important tool in preserving variation in valuable genetic stock (Bennett, 2001). The Falcon Research Institute (FRI) is a centre in the UK that breeds hybrid hunting falcons for the falconry market using AI techniques. In addition, the FRI co-ordinates the international breeding programme of the New Zealand Falcon (NZF) (*Falco novaeseelandiae)* and since 1974, captive breeding efforts have established a small captive population. The free-living population of this species has declined in New Zealand due to habitat destruction, persecution, and pesticides, but it is currently considered to be stable at 3,000-4,500 pairs (Fox and Fox, 1991). The captive population is considered to be a good insurance policy for the species and retention of genetic variation in this population is a pre-requisite for their future survival. This means that conservation efforts on this population should include demographic and genetic management, integrated with planned GRBs. The creation of studbooks and banking of genetic material from valuable pedigree falcons are also areas of interest to commercial falcon breeders.

The objectives of this work were to conduct a demographic and genetic analysis on the captive breeding programme (CBP) of the NZF, using studbook analysis software to determine demographic and genetic imbalances that will be useful for the management of the species. In addition, the feasibility of a practical methodology for semen cryostorage, recently used in golden eagles (*Aquila chrysaetos*) (Knowles-Brown and Wishart, 2001), was investigated with a view to assessing whether this technique could support the captive management of species, such as the NZF.

Photo 1. *Photograph of imprinted male falcon, Magic, ejaculating on a copulation hat.*

Materials and Methods
The research was carried out in two parts; 1) analysis of studbook records; and 2) assessment of a novel method for the cryopreservation of semen. The cryopreservation samples were collected at the FRI in March 2002 and were assessed at the Institute of Zoology (IOZ) in August 2002.

Captive New Zealand Falcon Population Analysis

Collection and Analysis of Studbook Data
Avicultural records at the FRI from 1974 to 2002 were reviewed. Each individual NZF was given a studbook number and data entered into SPARKS included identity and origin of parents, sex, hatch date, death date, cause of death and transaction history. The SPARKS (Single

Population Analysis and Records Keeping System) computer program by ISIS (International Species Inventory System, USA) enables zoo staff to enter and edit population data, organise data into specific subsets, produce detailed reports on a given population and finally conduct demographic and genetic analysis (Wilcken and Lees, 1998). Demographic and genetic parameters were analysed to ascertain the viability and sustainability of the captive NZF population. Data from SPARKS was also exported to the GENES programme. GENES uses pedigree data to analyse the level of relatedness within a population as well as the extent to which the original genetic material has been retained within a captive population.

Photo 2. *'Mr Frosty' cooling container for semen.*

Studbook Analysis Scenarios

The captive population of NZFs at the FRI was based on six wild-caught birds from New Zealand, which have all died and the current living population is derived from only five of these birds. The relationships between these birds are not known and the founders were meant to have been caught from different locations. In 1990, DNA fingerprinting at the University of Nottingham of the NZFs indicated that four of the founders had as much genetic complement with each other as if they were siblings (Fox and Fox, 1991). In order to assess the difference that this founder situation would make to the CBP two scenarios for genetic analysis were used; firstly that the six wild caught birds were unrelated (**five founder model**, because only five birds produced living descendents) and secondly that four of the wild-caught birds were siblings (**three founder model**, because it is the two wild parents of the four siblings that are defined as founders and only one of the other wild birds produced living descendents).

Genetic Resource Banking

Semen Donors and Semen Collection

In addition to the captive NZF population, a collection of over 200 breeding falcons consisting of Saker (*Falco cherrug*), Peregrine (*Falco peregrinus*), Gyrfalcons (*Falco rusticolus*) and hybrid falcons are managed at the FRI. One male NZF was being trained to become a voluntary semen donor, but unfortunately it did not provide samples for this study. Instead a total of nine adult male imprinted falcons (3 Peregrines, 5 Gyrfalcons and 1 Gyr-Saker hybrid) provided semen. Ejaculated semen was collected in a copulation hat from a trained voluntary donor falcon. The ejaculate was transferred to a micropipette tube. After cooling to 5°C, the semen was diluted with the same volume of a glutamate-based solution (Lake and Stewart, 1978) in a cryovial. Aliquots of diluted semen were used for either fresh semen analysis or cryopreservation.

Fresh Semen Analysis

Sperm concentration was calculated according to standard methods described by Bailey (2002). Semen was also assessed for motility; 5 µl was diluted 20 fold in diluent and transferred to a haemocytometer chamber. After 5 minutes, a number of fields of view were video-recorded using a negative-high phase contrast microscope equipped with a warm stage. Fields of view were chosen at random until at least 100 sperm could be analysed for motility.

Cryopreservation and Semen Storage

Diluted samples were equilibrated at 5°C for 15 min and then mixed with the same volume of diluent, containing 18% DMA (82 parts Lakes diluent with 18 parts dimethylacetamide) in a cryovial. Three different cryopreservation protocols were used.

1) Samples were inserted into a 'Mr Frosty' (5100 Cryo 1°C Freezing container, Nalgene), placed inside a freezer (–20°C) for 1.5-2 hours and then plunged into liquid nitrogen.

2) Samples were inserted into a 'Mr Frosty', placed inside a domestic freezer (–12°C) for 1.5-2h and then plunged into liquid nitrogen.

3) Samples were plunged directly into liquid nitrogen.
Samples were returned to the IOZ in a dry shipper and frozen in liquid nitrogen until analysis 3-4 months later.

Photo 3. *Temporary laboratory established at the FRI to assess fresh semen.*

Thawing and Motility Assessment of Frozen-thawed Semen

Samples from all freezing protocols were thawed by immersing the cryovials in a bath of warm (37°C) water for one minute, to bring the temperature to ~0-5°C. Microdialysis was carried out at 5°C for 15 minutes to reduce the concentration of DMA of the sample. The proportion of motile spermatozoa was estimated by freeze-framing a video-taped field of view and then forwarding the tape for 3 seconds to reveal the motile sperm (Hartley *et al.,* 1999).

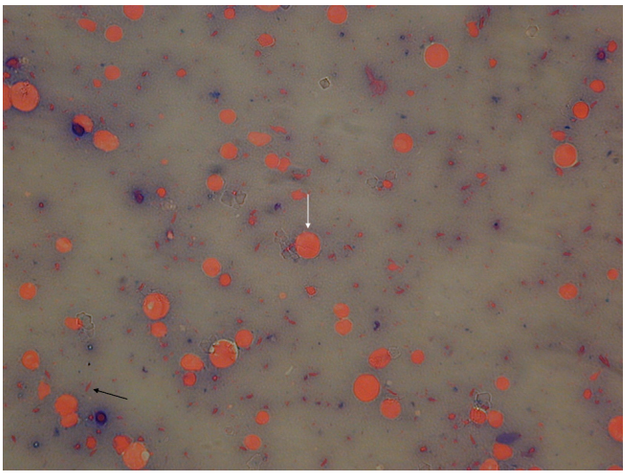

Photo 4. *Aniline-eosin preparation (x20) showing round bodies (white arrow) and spermatozoa (black arrow).*

Spermatozoa Viability Assessment

SYBR14 is a permeable compound that penetrates both intact and damaged membranes, producing green fluorescence in the sperm nucleus (Haugland, 1996). Ethidium homodimer-1 (Ethd-1) stain only permeates through damaged membranes, producing red fluorescence. When semen is incubated with these two stains, live sperm with intact membranes fluoresce green, whereas sperm with damaged membranes fluoresce red. Standard IOZ protocols using SYBR14 and Ethd-1 were followed (Bailey, 2002). Using fluorescent microscopy 200 sperm were counted and the proportion of non-viable (red) and viable (green) frozen-thawed spermatozoa was determined. Unfortunately it was only possible to assess frozen-thawed samples at the IOZ and data on the viability of fresh semen using this method was not available for comparison.

Microbiology Screening of Frozen-thawed Semen Samples

Microbiology screening of 12 frozen-thawed semen samples for bacterial, yeast and filamentous fungi isolation and identification was conducted at the IOZ.

Results

Studbook analysis

The dataset of the NZF CBP (1974 - 2002) was 74 males, 37 females and 10 birds of unknown sex. The age distribution and sex ratio for the current living FRI population is presented in Table 1. It can be seen that the age distribution and sex ratio are imbalanced, with low numbers of young birds and 2:1 males to females.

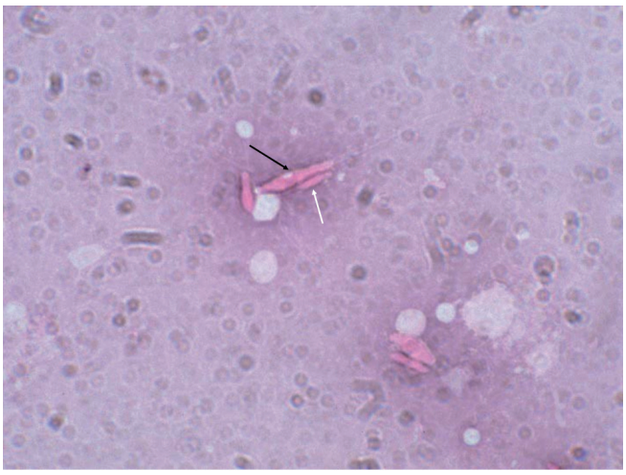

Photo 5. *Aniline-eosin preparation (x100) showing pleiomorphic sperm with large (black arrow) and small (white arrow) heads.*

Analysis of founder allele retention in 10,000 Gene Drop computer simulations was conducted with the two scenarios (five and three founder models). Three measures of founder gene retention were analysed: mean retention, founder genomes surviving, and fraction source gene diversity retained. The Gene Drop results (summarised in Table 2) indicate that a significant proportion of the founder genetic diversity has been lost. Within the current living NZF population, 94% (range F 0.0 – 0.34) and 72% (range F 0.0 – 0.16) of individuals have an inbreeding coefficient (F) above the 0.1 level for the three and five founder simulations respectively. The mean inbreeding coefficients in the current living population for both the three founder (0.276) and the five founder (0.093) simulations are

high. Levels of inbreeding in the next generation of NZFs was estimated to be high (range 0.09 - 0.48) and careful pairing of birds will be essential to keep this to a minimum.

Definitions:

Founder: An individual obtained from a source population that has no known relationship to any individuals in the derived population (except for its own direct descendants) and which contributes genetically to the descendant population by reproducing.

Mean allelic retention: The fraction of a founders genes that are present in at least one copy in the living descendant population.

Founder genomes surviving: The sum of allelic retentions of the individual founders (i.e, the product of the mean allelic retention and the number of founders).

Founder genome equivalents (fge): The number of equally represented founders with no loss of alleles (retention = 1) that would produce the same gene diversity as that observed in the living, descendant population. Equivalently, the number of animals from the source population that contain the same gene diversity as does the descendant population. The gene diversity of a population is 1 - 1 / (2 * fge).

Gene diversity: Same as expected heterozygosity.
Fraction source genetic diversity retained: the gene diversity (or expected heterozygosity) of the captive population relative to the wild population from which the founders were taken.

Inbreeding coefficient (F): The measure of how inbred an animal is. Inbreeding coefficients range from 0.00 to 1.00; the higher its coefficient, the more inbred an animal is.

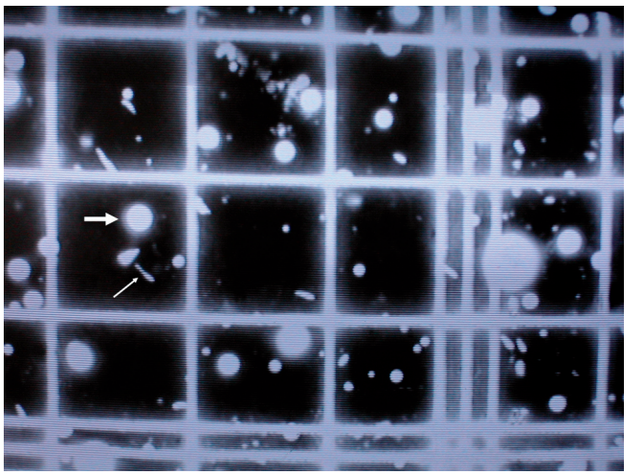

Photo 6. *Photograph of the video monitor of a diluted fresh semen sample in a counting chamber for motility assessment. Spermatozoa (thin arrow) and round bodies (large arrow) are visible.*

Genetic Resource Banking

This study provides information on motility and viability of fresh and frozen-thawed semen. The mean spermatozoa concentration was 14.50 $x10^9$ per ml (11.80 - 17.83 $x10^9$ [a]; [a]95% CI) in fresh samples of all the species combined. There were significant differences between peregrines, hybrids and gyrfalcons for concentration (ANOVA test; F_{42df}=22.78; p=0.014) and specifically spermatozoa concentration in hybrid semen was lower than Peregrines and Gyrfalcons.

Summary statistics for the percentage motility of spermatozoa in fresh diluted semen and frozen thawed semen from the combined cryopreservation methods are presented in Table 3. There were significant differences between individual birds in the motility of frozen-thawed spermatozoa (Kruskal Wallis test; H=12.97; 6 df; p=0.042). There was no significant difference between the motility of frozen-thawed spermatozoa for the three cryopreservation methods (Kruskal-Wallis test; H=2.37; 2 df; p=0.31).

Summary statistics for the SYBR-14/Ethd-1 percentage viability of frozen-thawed spermatozoa are also presented in Table 3. There was no significant difference between the three cryopreservation methods and the viability of frozen-thawed spermatozoa (Kruskal-Wallis test; H=2.12; 2 df; p=0.35). There was a significant difference between individual birds and the frozen-thawed viability of spermatozoa (Kruskal Wallis test; H=13.34; 6 df; p=0.037).

Bacteria (*Enterococcus faecalis* [2] and *Staphyloccus* sp. [1]) were isolated from two of 12 (17%) semen samples.

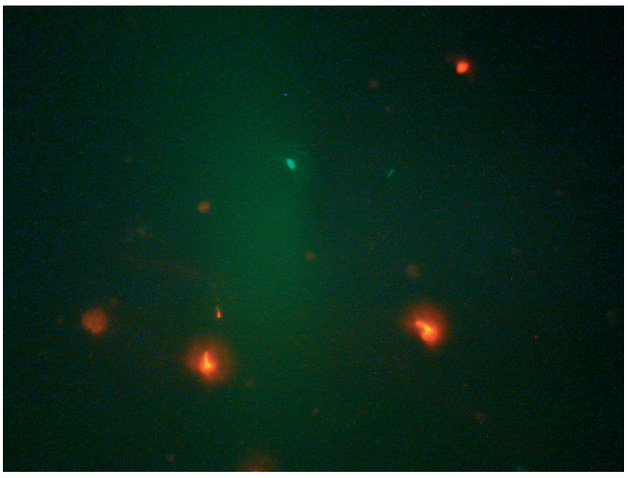

Photo 7. *Photomicrograph (x40) showing non-viable (red) and viable (green) spermatozoa using fluorescent microscopy.*

Discussion

This analysis of the NZF studbook demonstrated the existence of a number of demographic and genetic

problems that are commonly proposed to influence the success of CBPs for threatened bird species, but have rarely been documented due to the paucity of equivalent studies. Studbook analysis in this study demonstrated: 1) imbalanced age and unequal sex ratios (2□:1□); 2) unequal founder representation; and 3) high inbreeding coefficients.

Although the NZF breeding project was based on what were thought to be six wild founders, only five of these birds became genetic founders of the current living captive population and some of the wild founders may have been siblings (Fox and Fox, 1991). The genetic analysis demonstrated that the mean inbreeding coefficients in the current living population for both the three founder (0.276) and the five founder (0.093) simulations are high. Studbooks aim to guard against inbreeding by monitoring the inbreeding coefficient (F) of proposed breeding pairs (Stewart, 1999). An ideal score of F=0.0 indicates that the two birds are totally unrelated, whilst a score of F=0.25 indicates that the birds are siblings. The inbreeding coefficients for surviving NZFs are high, ranging from 0.09-0.34, which are, for example, higher than values presented in the Pink Pigeon (*Columba mayeri*) studbook (Stewart, 1999).

Captive breeding programmes with low founder genome equivalents (FGE) such as the NZF can increase the FGE by increasing the genetic contributions of poorly represented founders. In the current investigation the initial NZF founders were inadequate in number and the unequal and often, minimal contribution to future generations by some birds has led to founder equivalents and FGEs that may be too low to sustain a long term captive propagation programme for the species. Ideally, more NZF founders should be acquired to alleviate impending genetic problems, but with the development of cryopreservation techniques in the future it may be feasible for semen to be collected from wild NZFs and used to augment the captive population.

The problems of imbalanced age and sex ratios, unequal founder representation and high levels of inbreeding will need to be addressed if the future of the NZF in captivity is to be secured. This project shows the benefits of having well maintained scientific records in identifying problems in CBPs. It is likely that many of the problems identified in the NZF occur in other raptor species being produced by private breeders from small populations, and in situations where record keeping is minimal and lineage's are poorly known. Indeed, there is concern that an increase in the number of raptors such as Harris Hawks (*Parabuteo unicinctus*) or hybrid falcons, bred for falconry may be responsible for an increase in the number of congenital lesions being presented to veterinary clinicians in the UK (Boydell and Forbes, 1996).

While the levels of post-thaw spermatozoa motility (4.3%; 3.06–5.47[a]) and viability (16.4%; 12.07–20.65[a]) were low, the results demonstrated that semen can be successfully frozen using simple techniques. The best assessment of fertility in cryopreserved semen is by inseminating females and assessing the fertility of eggs and/or production of chicks. Unfortunately this was not possible and AI using semen cryopreserved according to the protocols described in this study would be a valuable follow-up. The isolation of bacteria from frozen-thawed semen samples also shows that transfer of diseases is a real risk with cryopreserved falcon semen.

In the future, conservation strategies will ideally incorporate both captive and wild populations that are interactively managed for mutual support through regulated interchange of animals or at least genetic material (e.g. sperm). Currently the use of frozen semen in the captive production of falcons for falconry is considered uneconomical, but even with the comparatively poor sperm survival in frozen samples, semen cryopreservation represents a complementary option for the preservation of important genetic lines.

Acknowledgements

This work was conducted by the senior author as partial fulfilment of the MSc in Wild Animal Health at the Royal Veterinary College and the Zoological Society of London in 2001-2002. We thank the many people at ZSL and FRI who helped with this study and also H.H. Sh. Hamdan bin Rashid al Maktoum and Mr Humaid Obaid al Muhairi, Dubai Falcon Hospital Director, for their support of the senior author. An earlier version of this paper was published in the Proceedings of the European Association. Avian Veterinarians, Tenerife, March 2003: Bailey, T.A., Holt, W., Bennett, P., Barton, N. & Fox, N. (2003) The Management of Small Populations of Falcons in Captivity and the Results of a Pilot Study to Cryopreserve Semen from *Falconidae* Using Field Techniques. European Association of Avian Veterinarians Conference, Tenerife. April 22-26. 104-112.

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Age class (years)	Male	Female	Age class (years)	Male	Female
15-16	1	0	5-6	1	2
13-14	1	1	3-4	2	0
11-12	1	0	1-2	5	2
9-10	1	1	0	0	0
7-8	0	0	**Total**	**12**	**6**

Table 1. Age pyramid data of living male and female New Zealand Falcons in March 2002.

	Three founder model	Five founder model
Number of founders	3	5
Mean allelic retention	0.765	0.735
Founder genomes surviving	2.294	3.673
Founder Genome Equivalents	1.415	2.404
Fraction source gene diversity retained	0.647	0.792
Fraction wild source gene diversity lost	0.353	0.208
Mean inbreeding coefficient	0.276	0.093

Table 2. *Genetic summary of descendant population according to the three and five founder scenarios (performed with Gene drop computer simulation).*

Fresh motility (%)	Frozen-thawed motility (%)	Frozen-thawed viability (%)
Fresh diluted	**Methods 1, 2 and 3**	**Methods 1, 2 and 3**
61.89[a] [62.5][b] (18[c]; 55.22 – 68.55)[d] (41.0 – 85.0)[e]	4.26 [2.99] (44; 3.06 – 5.47) (0.0 – 12.78)	16.36 [15.78] (44; 12.07 – 20.65) (0.0 – 49.26)

Arithmetic mean[a]; [median][b];(number of samples[c]; 95% confidence interval for the mean)[d]; (range)[e]

Table 3. *Summary statistics of spermatozoa percentage motility in fresh and frozen-thawed falcon semen and percentage viability in frozen thawed semen.*

Blood Gas Values in Venous Blood of Captive Hunting Falcons in the United Arab Emirates

[1]*B Arca-Ruibal, V Aguilar-Sanchez, C Silvanose, T Bailey, & A Di Somma*

[1]Dubai Falcon Hospital, P.O. Box 23919, Dubai, United Arab Emirates. barbyarca@yahoo.es

Summary

Acid-base disturbances have been described in avian patients. Assessment of acid-base status is a valuable tool in the evaluation of critically ill and stressed falcons. Normal reference ranges for pH, partial pressure of carbon dioxide (pCO2), partial pressure of oxygen (pO2), saturated oxygen (SO2), haematocrit (Hct), haemoglobin (Hb), sodium (Na+), potassium (K+), chlorine (Cl-), ionized calcium (Ca++), base excess of extracellular fluid (BEecf), base excess of blood (BEb), bicarbonate (HCO3-) and total carbon dioxide (TCO2) for three species of captive hunting falcons are presented. Venous blood samples were taken from 59 anaesthetized healthy adult females: Sakers (*Falco cherrug*), Peregrines (*F. peregrinus*) and Gyrfalcon (*F. rusticolus*) hybrids. These were analyzed within one minute of collection with an in-house blood gas analyzer (pH Ox plus C Critical care analyzer; Nova Biomedical). A statistically significant difference between the three species was found for Hb, Cl- and Ca++.

Introduction

The conditions that hunting falcons are subjected to during trade and training such as starvation, water restriction, infectious and renal diseases, stress or over-exercise can alter the acid-base balance. References for blood-gas parameters in avian species are scarce; therefore the aim of this study was to obtain reference values for hunting falcons using a blood-gas in-house analyzer.

Results

A statistically significant difference between the three species was only found for Hb, Cl- and Ca++. Descriptive statistics are summarized in Table 1.

Parameter		N	Media	Median	SD	Min	Max	Percentiles%		95%CI	
								2.5	97.5		
pH		59	7.491	7.488	0.047	7.375	7.621	7.385	7.602	7.478	7.503
pCO2 mmHg		55	27.0	27.1	4.5	18.2	43.6	18.4	40.3	25.8	28.2
pO2 mmHg		54	100.9	86.0	48.0	30.8	214.6	33.2	212.6		
SO2%		59	92.7	96.7	10.0	57.1	99.8	59.5	99.8		
Hct %		59	45	45	6	30	60	33	58	44	47
Na+ mmol/L		58	151.0	151.1	3.1	142.8	162.6	143.5	160.8		
K+ mmol/L		59	3.78	3.70	0.91	1.94	9.33	2.15	7.43		
Beecf mmol/L		55	-3.0	-3.3	2.0	-6.8	1.4	-6.6	1.2	-3.5	-2.4
Beb mmol/L		55	-0.5	-0.6	1.7	-3.8	3.2	-3.7	3.1	-1.0	0.0
HCO-3 mmol/L		55	20.6	20.1	2.0	16.0	25.7	16.4	25.2	20.0	21.1
TCO2 mmol/L		55	21.4	20.9	2.1	16.5	27.1	16.9	26.4	20.9	22.0
Hb g/dL	Saker	28	15.7	15.9	1.0	13.8	17.6	13.8	17.6	15.3	16.1
	Peregrine	16	16.9	16.8	1.4	14.8	19.9	14.8	19.9	16.2	17.7
	hybrid	15	16.1	15.7	1.9	11.9	19.8	11.9	19.8	15.0	17.1
Cl- mmol/L	Saker	28	118.3	117.8	3.7	104.6	125.9	104.6	125.9	116.9	119.8
	Peregrine	15	121.0	121.2	2.1	117.7	124.7	117.7	124.7	119.9	122.2
	hybrid	15	121.3	121.5	5.7	112.7	130.1	112.7	130.1	118.1	124.4
Ca++ mmol/L	Saker	25	1.28	1.30	0.11	0.83	1.40	0.83	1.40	1.24	1.33
	Peregrine	11	1.26	1.26	0.06	1.18	1.36	1.18	1.36	1.22	1.29
	hybrid	7	1.16	1.20	0.14	0.85	1.28	0.85	1.28		

Table 1. *Blood gas parameters in captive hunting falcons in the UAE.*

Materials and Methods

Blood samples from 59 anaesthetized healthy adult female falcons (28 Sakers, 16 Peregrines, 15 Gyrfalcon hybrids) were collected at the Dubai Falcon Hospital as part of routine health checks. Anaesthesia was induced with a combination of 50 µg/kg medetomidine (Domitor; Novartis Australasia Pty Ltd) and 5 mg/kg ketamine (Ketavet 100; Delvet Pty Ltd) IM and maintained using a face mask and open circuit with 0.5-2% isoflurane (Forane; Abbot Ltd) and 1L/min oxygen. The effect of medetomidine was reversed with 250 µg/kg atipamezole (Antisedan; Novartis Australasia Pty Ltd) at the end of the procedure. Half a millilitre of venous blood was collected from the *Vena metatarsalis medialis* or *Vena ulnaris* within 2 minutes of induction of anaesthesia, transferred into a commercial 1ml heparin tube a processed in the pH Ox plus C Critical care analyzer (Nova Biomedical USA) within one minute of collection. The statistical analysis was performed using the commercial package SPSS 12.0 (SPSS Inc,).

Discussion

Determination of blood-gas disturbances can be very useful to monitoring the health status of the falcons and for choosing the adequate fluid therapy. Even though reference ranges for blood-gas parameters in hunting falcons have been previously reported (McKinney, 2003), differences in the ranges of some parameters highlight the necessity for specific reference ranges for the instruments employed.

Acknowledgements

We thank H.H. Sh. Hamdam bin Rashid al Maktoum and Mr. Humaid Obaid al Muhairi, Dubai Falcon Hospital Director, for supporting the work of the Dubai Falcon Hospital, and all of the falcon hospital team for their assistance with cases. An earlier version of this paper was published in the 2007 Proceedings of the European Association. Avian Veterinarians, Zurich, March 2007. Arca-Ruibal, B., Aguilar-Sanchez, V., Silvanose, C., Bailey, T. & Di Somma, A. (2007) Blood gas values in venous blood of captive hunting falcons in the UAE. Pp 459-461.

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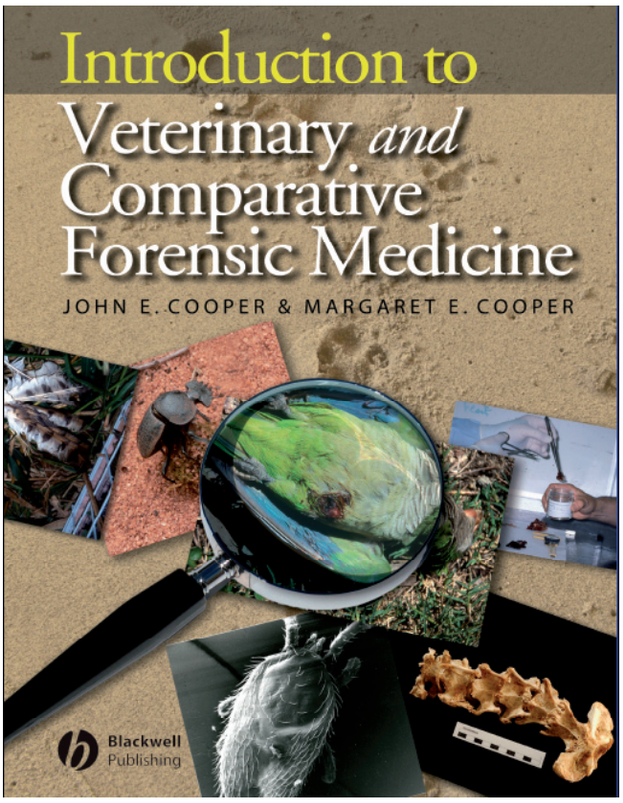
BOOKS

INTRODUCTION TO VETERINARY AND COMPARATIVE FORENSIC MEDICINE

By John E Cooper and Margaret E Cooper



Introduction to Veterinary and Comparative Forensic Medicine (432 pages, 157 illustrations; **ISBN:** 9781405111010, **ISBN10:** 1405111011) is a ground-breaking book in an emerging new speciality. It reflects the increasing demand for expert opinion by veterinarians and others in courts of law and elsewhere on such matters as:

- wildlife conservation
- welfare of, and alleged cruelty to, animals
- insurance, certification and malpractice
- the identification of live and dead species or their derivatives

It also discusses and analyses current concern over possible links between domestic violence and abuse of animals. Throughout the book the emphasis is on the need for a systematic and thorough approach to forensic work. A particular feature is practical advice, with protocols on dealing with common problems, together with case studies, various appendices and an extensive bibliography.

A vital reference for members of the veterinary profession, lawyers, enforcement bodies and welfare and conservation organisations. The comparative

aspects provide an important source of information for those working in human forensic medicine and the biological sciences.

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http://www.blackwellpublishing.com/contents.asp?ref=9781405111010&site=1

John and Margaret Cooper are a husband and wife team, from the United Kingdom. John E Cooper trained as a veterinary surgeon and is now a specialist pathologist with particular interests in wildlife and exotic species, tropical diseases and comparative medicine. Margaret E Cooper is a lawyer who trained originally as a British solicitor and has made the study of animal and conservation law her special interest.

The Coopers have travelled widely and lectured together in many countries. They have spent nearly ten years living in Africa, including a period in Rwanda working with the mountain gorillas. They are currently based at the University of the West Indies in Trinidad and Tobago where they continue to combine their medical and legal backgrounds in the promotion of an interdisciplinary approach to veterinary and biological education, wildlife conservation and forensic science.

BOOKS ON RAPTOR DISEASES AT REDUCED PRICES

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International Zoo Veterinary Group (IZVG)
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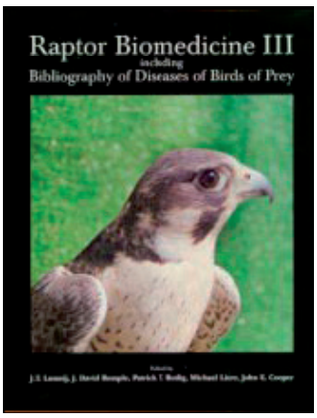
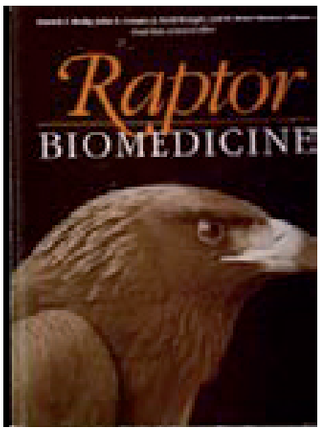
email: admin@izvg.co.uk

We can offer a special pack on the diseases of raptors (birds of prey) for £35:00 (UK postage included). The pack contains the Proceedings of the first three raptor biomedicine conferences and is essential reading for all those concerned with the health or veterinary care of birds of prey.



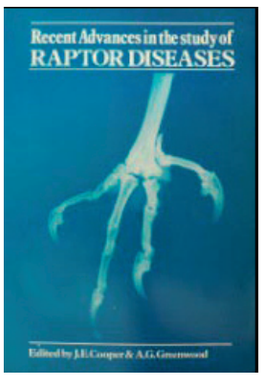
Raptor Biomedicine III (incl. a bibliography on CD-rom)

***eds*. JT Lumeij and others**



Raptor Biomedicine

***eds.* P Redig, JE Cooper and D Remple**



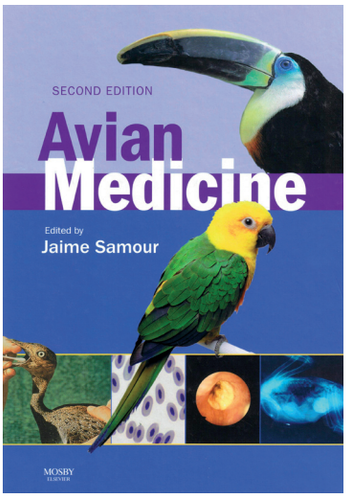
Recent Advances in the Study of Raptor Diseases

eds. JE Cooper and AG Greenwood

Only a limited number of sets of these books are available. Single copies of certain of the books are also available. We also have a few remaining copies of JE Cooper's classic "*Veterinary Aspects of Captive Birds of Prey"* (1985).

AVIAN MEDICINE
Edited By Jaime Samour, MVZ, PhD, Dip ECAMS, Director, Wildlife Division, Wrsan Farm, Abu Dhabi, United Arab Emirates
Hardbound, 470 pages.
ISBN-13: 978-0-7234-3401-6
ISBN-10: 0-7234-3401-8

The second edition of Avian Medicine, continues as a practical, comprehensive full-colour illustrative guide to the diagnosis and management of avian disorders.



With the participation of some of the world's leading authorities in avian medicine, the book addresses issues ranging from the basic aspects of patient management to the most sophisticated diagnostic techniques; aiming to teach the general clinician how to approach all birds. A wide range of avian species are discussed in detail, including psittacines, raptors, bustards and many more. Completely revised, the second edition contains extended and new chapter sections - with a wealth of new illustrations! - including cytology and behavioural osteodystrophy, fluoroscopy and advanced imaging techniques. With numerous practical guidelines on the medical management of the patient or flock and many useful tips on clinical laboratory diagnosis and suggested treatments, Avian Medicine contains valuable practical advice on all aspects of veterinary care of avian species. Avian Medicine combines the practicality of a hands-on manual with the wealth of information of a textbook and the highly illustrated format of an atlas.

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What's New in the Literature?

Abstracts from the First International Wildlife Reintroduction Conference Applying Science to Conservation, April 15-16, 2008, Lincoln Park Zoo, Chicago, IL USA

Worldwide review of reintroduction programs of birds of prey

Roberto Muriel Abad and Miguel Ferrer
Estación Biológica de Doñana (CSIC) Avd. Ma Luisa s/n, 41013 Sevilla, SPAIN

Recently, the number of reintroduction programs has increased in the framework of active recovery of endangered birds of prey. Nevertheless, information still lacks about development and final outcomes from these projects. Thus, we conducted a comprehensive global survey of reintroduction programs of raptors in order to review the methodological and biological traits associated with the reintroduction success. Until 2007, 156 release programs of 34 species of birds of prey in 27 countries have been recorded. 91 percent of the releases were performed in North America and Europe. Although 80 percent of the species reintroduced were diurnal, non-scavenger, territorial and resident species, the proportion of colonial scavengers' reintroductions was higher that expected. Five species monopolized more than 50 percent of releases, specially the American Bald Eagle and the Peregrine Falcon in North America and large vultures in Europe. Program length, habitat quality, number of birds released and demographic traits were related to reintroduction success. Reintroductions have proved to be a successful conservation measure in particular for medium-large size species with lower

recovery capacity. More multi-specific based studies are necessary to improve the overall understanding of the biological processes underlying reintroduction programs and thus improving

Conservation challenges to continue the reintroduction of Houbara Bustard *Chlamydotis macqueenii* in the Kingdom of Saudi Arabia

M. Zafar-ul Islam, Mohammed Basheer P., Moayyad Sher Shah, Hajid al-Subai, Ahmed Boug

National Wildlife Research Centre, P.O. Box 1086, Taif, Kingdom of Saudi Arabia

The reintroduction programme of Houbara Bustard was started in Saudi Arabia in 1986 to undertake the restoration of native species such as Houbara through a programme of re-introduction, involving the release of captive bred birds in the wild. Two sites were selected for Houbara re-introduction i.e., Mahazat as-Sayd and Saja Umm Ar-Rimth protected areas in 1988 and 1998 respectively. Both the areas are fenced fairly level, sandy plain with a few rock outcrops. Captive bred houbara were released in Mahazat since 1991 by NWRC and those birds have been successfully breeding since then. The nesting season of the Houbara at Mahazat recorded from February to May and on an average 20-25 nests are located each year but no nesting recorded in Saja. Houbara are monitored using radio transmitters through aerial tracking technique and also vehicle for terrestrial tracking. Total population of houbara in Mahazat is roughly estimated around ≥500 birds, using the following: N=(n1+n2+n3+n4+n5)-n6 (n1=released or wild born, radio, regularly monitored/ checked; n2=radio tagged missing; n3=wild born chicks not recorded; n4=wild born chicks, recorded but not tagged; n5=immigrants and n6=bird died after release). Since 1991 a total of 781 Houbara are released, of them 374 are the males and 407 are females. Out of 781 Houbara released in Mahazat, 133 died within a span of one month after the release and 648 survived. These mortalities are due to mammal predation and some are because of starvation. Mean annual home range was 467.7±352.6 km2 (n=59) using Kernel and Convex polygons methods. The minimum density of houbara in Mahazat in 2006 was 0.367 individuals per km2. This density is much higher than the natural density. It was recommended that further reintroduction of Houbara in Mahazat should be stopped. In Saja only 25 individuals of houbara have been survived since 2001 because most of the birds are predated immediately after the release. The minimum density of Houbara in Saja was also calculated. In order to know the Houbara movement or their migration to other regions, two captive-reared male Houbara that were released into the wild and one wild born female were fitted with Platform Transmitter Terminals (PTT). The home range shows that wild-born female has larger movement than the two males. More areas need to be selected for reintroduction programme to establish the network of sites to provide easy access to move these birds and mingle with the wild Houbara. Some potential sites have been proposed which require more surveys to check the habitat suitability and conservation issues.

Genetic management of reinforcement programs: the case of Houbara Bustards

Frédéric Lacroix and Michel Saint Jalme

MNHN CNRS Paris VI Managerie du Jardin des Plantes, 57 rue Cuvier 75005 Paris, France. . Emirates Centre for Wildlife Propagation, Po Box 47, Province de Boulemane, 33250 Missour, Royaume du Marocco

The success of reinforcement program is greatly affected by genetic phenomena that act during the captive phase as well as after reinforcement. First, genetic changes in captivity may reduce the overall fitness of reintroduced individuals through loss of genetic diversity, inbreeding depression, accumulation of deleterious mutations and/or adaptation to captivity. Second, reintroduced individuals may cause outbreeding depression when they are genetically distant from wild individuals. We addressed those two concerns in Houbara Bustard, an endangered species undergoing a reinforcement program in Morocco. Using mtDNA and microsatellite markers to delineate potential Conservation Units in North Africa, we found very weak genetic structure with most exchanges between populations being in relation with female dispersion. We then analysed individual variations of some reproductive traits in captivity in relation with genetic parameters computed through a pedigree analysis. We found that most of the initial genetic diversity of the captive flock was preserved. While genetic drift and inbreeding had little impact on overall genetic variability throughout generations, we measured inter annual variations of life-history traits. Those results validated the genetic management of Houbara Bustards project and they highlight the importance of considering epigenetic phenomena which are rarely discussed when considering genetic management of captive breeding.

News and Announcements

5th ARRCN meeting was held in Tam Dao National Park in Vietnam

By Nyambayar Batbayar, Wildlife Science and Conservation Center of Mongolia

The Asian Raptor Research and Conservation Network (ARRCN) hold a symposium once every two years. It brings together a multi-faceted group of raptor experts, including field biologists, environmental educators, captivity specialists, researchers, veterinarians, governmental authorities, politicians, students, bird watchers and other people who are interested in Asian raptors. Therefore, it is an important gathering of people who share common interest in research and conservation of birds of prey in the region.

The symposium provides a unique opportunity for the members of ARRCN to share and exchange information, experiences, and results from their activities. Since the first symposium which took place in 1998 in Shiga, Japan, succeeding symposiums were held in Bandung, Indonesia in 2000, Kenting, Taiwan in 2003, and Taiping, Malaysia in 2005. Vietnam was the host of 5th symposium which has been held from 3-6 April 2008 in Tam Dao National Park, Vietnam. Tam Dao NP is located in a beautiful mountainous area located not far from Hanoi and is one of the most important raptor migration sites in Vietnam. The symposium was organized by ARRCN members in Vietnam and hosted jointly by Tam Dao National Park.

Over 100 people from 18 countries participated in this 5th symposium, and discussed a total of 45 papers. They were divided into 6 sections including 27 oral presentation and 18 posters. The guest speaker of the symposium was Dr.Keith Bildstein of Sarkis Acopian Director of Conservation Science at Hawk Mountain Sanctuary in USA. He masterfully delivered a presentation about geography, ecology, migration paths, and conservation of the migratory raptors in the world. He has studied raptors on a more global scale and authored a worldwide known book on migration of birds prey "Migrating Raptors of the World: Their Ecology and Conservation".

One of the events that painted the symposium was the "international bazaar night". That evening, participants were selling or giving away products or items that were used to raise funds for their activities. The products ranged from delicately wrapped chopsticks to a world class book on raptor identification written by Asian raptor experts. During the symposium Japanese and Taiwanese raptor experts presented second hand digital cameras, binoculars and spotting scopes donated by people of their country to young raptor researchers from Indonesia, Cambodia, and Mongolia. Also, a student from Indonesia was awarded with new Kowa spotting scope for her excellent presentation of her work with raptors.

The last day of the symposium was highlighted by watching migrating raptors and a farewell party that organized in the evening. From 10 am to 14 pm participants of the symposium recorded 16 different raptor species migrating to northern breeding grounds. Weather during the symposium was overwhelmingly dominated by super mist that covered everything from morning till evening with very few hours of clear sky. So it was at the beginning of the last days' raptor watch activity. Fortunately, not sooner participants arrived the sky started clearing and provided five hours of pleasant condition to watch migrating hawks.

During the raptor watching event local school children greeted the international participants. Guests from Japan and Taiwan gave short lectures on raptors, its conservation importance, and demonstrated how to use binoculars and spotting scopes to watch raptors.

Mongolia will host the next symposium in 2010. On the last day of the symposium, it was officially announced that the next symposium will be held in Mongolia in 2010. Mongolia was one of the two countries that wished to host the next symposium. The other country was Thailand. Although the number of members from Mongolia is not high, it is a great opportunity for Mongolia to show its dedication on raptor conservation and research to international raptor community.

Vulture Crisis Deepens

BirdLife News Alert (Apr 30 2008)

www.birdlife.org/news/news/2008/04/vulture_declines.html

Asian vultures will be extinct in the wild within a decade without urgent action to eliminate the livestock drug that has caused their catastrophic decline, a newly published paper warns.

The new study shows that the population of White-rumped Vultures (*Gyps bengalensis)* is dropping by more than 40 per cent each year in India where it has plunged by 99.9 per cent since 1992. Numbers of Indian (*G. indicus)* and Slender-billed Vultures (*G. tenuirostris)* together, have fallen by almost 97 per cent in the same period.

Conservationists say that banning the retail sale of the veterinary drug diclofenac and constructing three more captive breeding centres is the only way to save the birds. Manufacture of the veterinary form of the drug, as an anti-inflammatory treatment for livestock, was outlawed in India in 2006 but it remains widely available. Furthermore, diclofenac formulated for humans is being used to treat livestock.

The study, published in the Journal of the Bombay Natural History Society, states that White-rumped Vulture is now in dire straits with only one thousandth of the 1992 population remaining. Scientists counted vultures in northern and central India between March and June last year. They surveyed the birds from vehicles along 18,900 kilometres of road. Their study followed four previous counts, the last in 2003. The researchers believe that numbers of White-rumped Vultures in India could now be down to 11,000 from tens of millions in the 1980s. Populations of Indian and Slender-billed vultures have dropped to around 45,000 and 1,000 birds respectively.

"Efforts must be redoubled to remove diclofenac from the vultures' food supply and to protect and breed a viable population in captivity", said lead author, Dr Vibhu Prakash, of the Bombay Natural History Society (Birdlife in India). All three species could be down to a few hundred birds or less across the whole country and thus functionally extinct in less than a decade. It is imperative that diclofenac is removed completely from use in livestock without any further delay to avoid the extinction of the three vulture species. Vulture numbers may be even lower than the authors estimate because many of the sites used for their study were in or near protected areas where populations are higher than the average.

"Time has almost run out to prevent the extinction of vultures in the wild in India. The ban on diclofenac manufacture was a good start but a ban on the sale of diclofenac and other drugs known to harm vultures is vital", said co-author, Professor Rhys Green, of the RSPB and the University of Cambridge.

North African Houbara release 'very exciting'

Gulf News (April 02 2008)

www.gulfnews.com/nation/Environment/10202367.html

In line with the UAE's strategic efforts to increase the number of Houbaras in the wild, General Sheikh Mohammad bin Zayed Al Nahyan, Abu Dhabi Crown Prince and Deputy Supreme Commander of the UAE Armed Forces, has participated in the release of more than 5,000 North African Houbaras. General Shaikh Mohammad Bin Zayed participated in the event which happened in an area of about 300km inside the eastern desert of Morocco. General Sheikh Mohammad said: "This release of the Houbaras in North Africa was necessary to meet the continuous decline of Houbara numbers due to the destruction of their wintering and breeding habitat, over-trapping and over-hunting in addition to illegal trade, all of which require insistent steps to restore a healthy Houbara population in the wild." The released Houbaras had been bred in captivity at the Emirates Centre for Wildlife Propagation (ECWP) in Missour, Morocco. This release is considered to be the largest reintroduction of endangered species into the wild so far. The Houbara bustard, the species that has been reintroduced has been seriously threatened by a combination of detrimental factors as well as habitat loss.

The Abu Dhabi Government has put in a great deal of effort to conserve the Houbaras by building a sound scientific knowledge base about the bird and also by initiating sound management and conservation measures. Efforts to conserve the Houbaras started as early as 1977, when the late Sheikh Zayed Bin Sultan Al Nahyan directed that Al Ain Zoo begin a breeding programme for the Asian Houbara bustard, even before the population reached "vulnerable" status on the endangered list. In 1982, the first captive chick saw daylight in the UAE. In 1989, the National Avian Research Centre (NARC) which is currently spearheading maximum conservation efforts was founded and later incorporated under the Environment Agency-Abu Dhabi. "We are very excited to have helped increase the Houbara population in the wild. The UAE is committed to restoring an unlimited houbara population in the wild," said Sheikh Mohammad. He noted that the integrated programme set by the UAE, in which the ECWP is participating has made tremendous progress and has already succeeded in creating a self-sustaining captive Houbara population. Despite the intense challenges of breeding this shy bird in captivity, the UAE is on target to meet its ambitious goal of producing 5,000 birds per year. About 35 per cent of the released Houbaras were fitted by satellite transmitter to track their movement. Birds chosen to be released were selected from a group of chicks produced by the centre based on specific criteria.

The centre's breeding complex is the headquarters of a vast network of specialised stations distributed over 40,000 square km in eastern Morocco. The integrated, state-of-the-art facilities use the latest scientific innovations to breed, acclimatise and reintroduce the Houbaras into the wild. After release, their movements are closely tracked and their behaviour is studied in their natural habitat. One of the project's successes is that it locally grows all the food required by the Houbara population. Since the ECWP's primary objective is to restore a sustainable wild Houbara population, tracking the released birds and monitoring their behaviour in their natural habitat is crucial. In studying the Houbara's efforts to survive, ECWP scientists monitor everything from weather systems to vegetation and wildlife in the release areas.

EAD releases more Houbara in Pakistan

Middle East Online (May 12 2008)

In line with its plans to protect Asiatic Houbara and increase their declining population in their geographic distribution, Environment Agency-Abu Dhabi 'EAD' released the 2nd flock in the Pakistani wild. The flock included 25 Asiatic Houbara which were captive-bred in the National Avian Research Center 'NARC'.

Al Bowardi says second release of UAE Captive-bred houbara indicates program's success.

The release was witnessed by Mohammed Al Bowardi, Secretary General of Abu Dhabi Executive Council and Managing Director of EAD, Brigadier (Retired) Mukhtar Ahmad, General Manager of the Houbara Foundation International Pakistan (HFIP), and VIPs and representatives of local and international organizations in Pakistan.

Six Houbara of the flock were tagged with satellite transmitters to track their movements and migration routes. The remaining Houbara were tagged with ground telemetry systems, which allow to closely observe the Houbara and examine the extent of their adaptation and survival. Delighted with the recurrent release, Al Bowardi stated that the event follows the success of releasing 18 bustard to the Pakistani wild last year. He said 'The two releases are intended to support the wild resident population of Houbara which is being crashing sharply due to over-hunting and smuggling which the two countries are doing their best to put an end to and to address successfully."

Al Bowardi also mentioned that the data which NARC researchers received from the satellite and terrestrial-tracking devices, located one of the female Houbara, released in Pakistan last year, which nested and incubated two eggs. He pointed out that the survival of that female Houbara and its natural breeding represent one of the main objectives of the release program. He added that re-introducing those captive-bred birds to their original land and their adaptation to the environment conditions indicate clearly how successful and advanced is EAD captive-breeding program, and represent the fruit of the efforts exerted by NARC researchers in this regard. It is worth mentioning that the release culminates a long process that was first initiated by selecting one day-old Houbara chicks in NARC where they were rehabilitated to adapt to the natural environment conditions and kept away from the captive-breeding facilities.

Moreover, the Houbara, which were selected to be released, are of Pakistani origin bearing the same genetic make-up of the birds in the release ground. This measure was intended to protect the endangered Asiatic Houbara and to prevent bloodlines mixture in the wild, and consequently to maintain the pure genetic make-up of these rare birds. At the end of six-month rehabilitation period, the bustards are transferred to the same Pakistani ground chosen by the researchers after many field visits to determine the most suitable place for the bustard survival.

It is worth mentioning that all bustards released since 2007 are being satellite-monitored and tracked by other radio-tracking devices which provided the researchers with valuable data about bustards' post-release behavior, movement and most importantly the reasons why some of them die or fail to survive. The analysis of all data transmitted would contribute to upgrade the success of later releases and to bring those birds back safely to their homeland in Central Asia.

The release of captive-bred bustards is considered one of the pioneering programs conducted by NARC inside and outside UAE, and it is intended to increase the number of wild population, to try to re-introduce them to some UAE grounds, and finally to increase falconry contribution to Houbara conservation and to the sustainability of heritage and natural resources.

Sooty Falcon, Red Sea islands, Egypt. (A. Dixon)

صقر الغروب في الإمارات العربية المتحدة

صقر الغروب طير مهاجر يتكاثر في الإمارات العربية المتحدة (ا ع م) ولم يسجل تكاثره إلا في إمارة أبو ظبي. تولت هيئة البيئة في أبو ظبي انجاز مسح شامل في 2007 لتوثيق وضعه الراهن. تم مسح 22 موقعا (19 موقعا في جزر و3 مواقع على الساحل) في إمارة أبو ظبي. أجري المسح 3 مرات خلال موسم التكاثر: في بدايته ومنتصفه وقرب انتهاء موسم التكاثر. عثر على صقور الغروب في7 من المواقع التي مسحت وشوهد التكاثر في 5 منها فقط. تمثل الأزواج الخمسة المتكاثرة التي شوهدت في 2007 انخفاضا بنسبة 64% بالمقارنة مع 14-25 زوجا قدّرت في 1996. ولأن كل الصقور المتكاثرة وجدت في أبو ظبي، فإن الصون على المدى الطويل لصقر الغروب في ا ع م يستند إلى جهود الصون المتخذة في أبو ظبي. إن المراقبة والدراسات البيئية أمران أساسيان لصون صقر الغروب على المدى الطويل في الإمارات العربية المتحدة.

الوضع الراهن لصقر الغزال في بلغاريا

كان صقر الغزال *Falco cherrug* يتواجد بوفرة وعلى نطاق واسع في بلغاريا في الماضي. إلا أن أعداده قد تناقصت بشكل ملحوظ بعد الحرب العالمية الثانية نتيجة للتغيرات في الممارسات الزراعية والتي غيرت صفحة الأراضي بشكل كبير. إضافة إلى ذلك فإن الحملات التي رعتها الحكومة للقضاء على الطيور والقوارض الكاسرة أثرت بشكل مباشر على أعداد صقر الغزال وعلى سنجاب سوسليك وهو النوع الذي يفضل الصقر افتراسه. كانت أعداد صقر الغزال قد تقلصت في نهاية الثمانينيات إلى 30-50 زوجا متكاثرة. وتلا ذلك، مع تغيير الحكومة في 1989، زيادة في سرقة الأعشاش والصيد غير المشروع، ويعتقد الآن أن صقر الغزال قد انقرض كنوع متكاثر في البلاد. بانضمام بلغاريا إلى الإتحاد الأوربي وإنشاء شبكة من مواقع ناتورا 2000 المحمية فإن هناك فرصة لاسترجاع صقر الغزال من خلال برنامج لإعادة التقديم. تصف المقالة دراسة الجدوى الجارية حاليا لبحث فرص نجاح هذا المشروع واحتياجاته.

تطوير نظام للرقابة الصحية للنسر الأسود Coragyps atratus بجمع نماذج بطرق غير جائرة من مجموعة في ووللرفيلد، ترينيداد

ونتيجة للقلق من التناقص العالمي لأعدادها، جرى في السنوات الأخيرة، وفي معظم أنحاء العالم، ، وضع مختلف مجموعات الحياة الفطرية تحت المجهر من قبل المهتمين بالصون وغيرهم. شارك البيطريون في الأمر بسبب القلق حول صحة تلك المجموعات، واحتمال أن تكون أمراض معدية وغير معدية قد لعبت دورا في هذا التناقص. كانت أعداد المجموعات الآسيوية من نسور العالم القديم قد تدهورت خلال العقد الماضي، وهناك قلق من أن تتناقص أعدادها الآن في العالم الجديد. لقد سبق تطوير وتطبيق عدة أنظمة رقابية لمتابعة الوضع الصحي لهذه النسور ولغيرها من الطيور الجارحة، لكن هذا المشروع يهدف لإيجاد نظام رقابة صحية للنسر الأسود *Coragyps atratus* مهيأ لأخذ النماذج بطرق غير جائرة للحصول على صورة لصحتها. تتواجد الأعداد التي يجري مراقبتها في ووللرفيلد، شمال ترينيداد، وتقدر بحوالي 500 طيرا. اشتملت النماذج التي جمعت على ريش تساقط بشكل طبيعي، وإخراجات (براز وبول)، وحبيبات جاءت كلها من المناطق التي ترتادها النسور.

تفشي حاد لمرض السلمونيللا في الصقور الصيادة في الإمارات العربية المتحدة

نفق في خلال 5 أسابيع 18 صقرا صيادا من مجموعة تضم 20 منها. أظهر الفحص العِيانِيّ لثمانية منها الْتِهابُ صِّفاق فِبْرِينِيّ وانتفاخ الكبد والطحال في معظم الحالات. أظهرت الحالات الخمسة الأولى العديد من البقع الدُخْنِيّة الصفراء في الكبد، تماثل التهاب الكبد (أ) بفيروس-هربس. وجد في الحالات الأخيرة القليل من قروح أصغر (أَصْغَرُ مِنَ الدُّخْنِيّ) منتشرة بشكل غير منتظم على الكبد والطحال. أظهر فحص الأنسجة للحالات الأولى وجود كثير من النخر غير المشتمل والتهاب كبد (أ) قيحي خلالي. وجدت في الحالات الأخيرة خُراجات مِكْرَوِيّة ذات خلايا ضخمة في الكبد والطحال. تم عزل السلمونيللا من تحت النوع (أ) من الأعضاء والأمعاء في 6 من 8 صقور شرّحت. عزلت التيفيات *S. typhimurium* وإفانتس *S. infantis* من 2 من 3 حمائم من مخزون التغذية. لم يكتشف مصدر العدوى حتى الآن.

إدارة المجموعات الصغيرة من الصقور في الأسر ونتائج دراسة رائدة لتخزين المني بالتبريد من *Falconidae* باستخدام تقنيات الحقل.

أجريت مراجعة ديموغرافية وجينية لبرنامج التكاثر في الأسر للصقر النيوزيلاندي *Falco novaeseelandiae* باستخدام برنامج كتاب السلالة سباركس SPARKS. إضافة لذلك، تم تقييم طريقة عملية لتخزين المني بالتبريد في نشرة *Falconidae* بغرض تكوين بنك للموارد الجينية لدعم إدارة الطيور الجارحة المهددة، كالصقر النيوزيلاندي، في الأسر.

يقدم لنا كنّه وزملائه وصفا لتفشي مرض السلمونيللا في الصقور الأسيرة. كان يظنّ أن الصقور قد أصيبت بالمرض من أنواع الطعام، ويوصي المؤلفين بالتطعيم الدوري ضد السلمونيللا للحمام والسمان (السلوى) لحماية الصقور الصيادة والمتكاثرة من هذا المرض.

لا يسعنا إلا أن نشكر لوك هالبن على مساعدته في تحرير ومراجعة هذا العدد من **فالكو**.

هجرة وأنماط تحركات النسر الأسود في منغوليا

إن النسر الأسود (الأسمر) *Aegypius monachus* هو أكبر جوارح العالم القديم، وتتفرق أماكن تكاثره عبر مجال يمتد من اسبانيا غربا إلى منغوليا شرقا. تبين هذه المقالة الدراسات الأولية لتحركات وتصرفات الهجرة للصقر الأسود من أماكن تكاثره في منغوليا باستخدام النظام العالمي لتحديد المواقع بالأقمار الصناعية GPS وبطاقات التعريف على الأجنحة. تم تصميم برنامج البحث هذا لفهم العوامل البيئية التي تؤثر في نجاح تكاثر وتوزيع ووفرة وأنماط تحركات النسر الأسود في منغوليا وآسيا. تم وضع بطاقات وحلقات التعريف على أجنحة وأرجل 150 نسرا أسودا في منغوليا. دلت المشاهدات التالية لتلك النسور إلى أن بعضها على الأقل تتشتت في الشتاء في منغوليا وترتحل إلى شبه القارة الهندية والصين والشرق الأقصى لروسيا، ياكوتسك، وجنوب كوريا.

تطورات في مشروع الأعشاش الصناعية في منغوليا

إن تعداد صقور الغزال *Falco cherrug* في أواسط منغوليا محدد بتوفر مواقع مناسبة للتعشيش. وهناك قرائن تدل على وجود فائض من أعداد صقور الغزال غير المتكاثرة في السهوب الوسطى لمنغوليا. يمكن تشجيع جزء الطيور البالغة غير المتكاثرة على التكاثر في هذا الموطن ذي العدد المحدود من مواقع التعشيش بتزويدها بمواقع مناسبة للتعشيش. تمنح حكومة منغوليا حاليا رخصا سنويا لحصد الصقور البرية لتزويدها لأسواق الصقارة العربية. يخضع الاتجار السنوي لأحكام نظم *الاتفاقية الدولية للاتجار بالأحياء البرية المهددة بالانقراض* CITES وبهذا فإن أحد التحديات التي تواجه الحكومة المنغولية هو في ضمان أن تكون تلك التجارة مستدامة ولا تؤثر في بقاء النوع في البرية. هيأت الدراسة الأولية للبحث عن حل يمكن أن يؤدي إلى زيادة جيدة في تعداد صقر الغزال والمساعدة في إبقاء الاتجار مستداما باستخدام مبدأ تجديد حصص الحصد استنادا إلى إنتاجية الصقور التي تتكاثر في مواقع للأعشاش الصناعية.

العقبان النسارية في إمارة أبو ظبي؛ الوضع الراهن للتكاثر ودور المنصات في مساعدة التعشيش

يتمتع العقاب النساري *Pandion haliaetus* بأولوية إقليمية وهو نوع متكاثر مقيم في الإمارات العربية المتحدة.أجريت عمليات مسح شاملة خلال موسم التكاثر في عام 2007 لتقييم الوضع الراهن لتكاثر العقبان النسارية في إمارة أبو ظبي. جرى مسح ما مجموعه 61 موقعا، تضمنت 46 جزيرة و15 موقعا ساحليا. تم على الإجمال تسجيل 117 عشا كان 61 منها في حالة نشطة، 47 غير نشطة وكانت 9 منها مشغولة بطيور غير متكاثرة. بالإضافة إلىأعشاشها الطبيعية، استخدمت العقبان النسارية بنجاح المنصات التي أقيمت لتعينها على إقامة أعشاشها. من قرابة 27 عشا، كان 56% منها نشطا أو مأهولا. ورغم ارتفاع مستويات الإزعاج في بعض مواقع تعشيش العقبان النسارية، إلا أن الأعداد الإجمالية لها قد بقيت مستقرة، بل وقد تكون قد ازدادت، خلال العقد الماضي. ولعل الحماية الأفضل في بعض الجزر التي يملكها أشخاص، وتوفير منصات التعشيش الاصطناعية قد ساهما في تحسين وضع تكاثر العقاب النساري في الإمارة.

Saker Falcon at artificial nest site, Mongolia (T. Kunca)

كلمة العدد

حان فصل الخريف وستبدأ معه كثير من الطيور الجارحة بالهجرة إلى مواطنها الشتوية. تهاجر صقور الشاهين القطبية من سهول التندرا السيبيرية لقضاء الشتاء في مناطق في خطوط عرض أبعد إلى الجنوب، بل إن بعضها سيجازف ببلوغ أماكن أبعد جنوبا في أفريقيا والجزيرة العربية والهند وجنوب شرق آسيا. سيرحل العديد من صقور الغزال من السهوب الوسطى لسيبيريا ومنغوليا إلى الأراضي العشبية المرتفعة لهضبة تشينغهاي -التبت لقضاء فصل الشتاء، بينما سيبقى بعضها في مناطق تكاثرها. تأخذ هذه التنقلات الجوارح لمسافات طويلة عبر حدود دولية وكثير من الموائل المختلفة تتميز كل منها بتحدياتها و/أو منافعها الخاصة. قد تقود طبوغرافية الأراضي، وهي عادة ممر خلال سلسلة جبال أو مضيق ساحلي ضيق، الطيور الجارحة المهاجرة إلى مناطق يجتمع فيها الآلاف لدى مرورها من خلال نقطة "عنق الزجاجة". لكن أنماط هجرة الجوارح تتفاوت، فقد يهاجر بعضها مثلا في أسراب بينما يهاجر البعض الآخر فرادى؛ كما قد تهاجر كل أعداد نوع ما بينما قد لا يهاجر إلا قسم ، معظمه من الصغار، منها ؛ تنطلق بعض الأنواع في هجرتها بتزامن بينما تبدأ أنواع أخرى هجرتها بشكل متعاقب؛ تهاجر بعض الطيور عبر "خطوط طيران" منتظمة وتهاجر أخرى عبر طرق متشتتة؛ إضافة لذلك فإن بعض هذه الاختلافات قد تشاهد في مجموعات مختلفة ضمن نفس النوع. لذا لا ينبغي أن ندهش لأن هناك الكثير مما يجب علينا تعلمه عن بيولوجية وبيئية سلوكيات الهجرة لدى الطيور الجارحة.

إن استخدام التقنيات الجديدة، خاصة القياس البُعادي بالأقمار الصناعية، يثري بشكل متسارع معرفتنا لخطوط وسلوكيات الهجرة، لكن فهمنا للعناصر المباشرة والأساسية الكامنة خلف سلوكيات الهجرة لدى الطيور الجارحة يبقى قاصرا. لماذا يهاجر أعضاء من نفس المجموعة ولا يهاجر البعض الآخر؟ إلى أي حد يعتبر سلوك الهجرة وراثيا؟ ما الذي يطلق رغبة الهجرة لدى الأفراد؟ ما زال هناك الكثير من الأسئلة التي يتوجب على علماء الأحياء المختصين بالجوارح الكشف عن أسرارها. إن القياس البعادي بالأقمار الصناعية يتيح لنا ، من منطلق صوني، الحصول على بيانات البقاء وخطوط دقيقة للهجرة، الأمر الذي سيمكننا من تحديد مواقع التوقف والمواقع ذات الفرص العالية للموات. وإذا كان صون الجوارح المهاجرة يستند إلى الدراسات البيولوجية، فإن تطبيق ذلك يعتمد على التعاون الدولي. سيلتقي في أبو ظبي (20-22 أكتوبر 2008) مندوبون لأكثر من 40 دولة أفريقية وأوراسية للانتهاء من وضع *مذكرة التفاهم بشأن صون الطيور الجارحة المهاجرة في أفريقيا وأوراسيا*. إن لمذكرة التفاهم هذه - والتي طوّرت برعاية "معاهدة المحافظة على الأنواع المهاجرة من الحيوانات الفطرية" CMS في اجتماع ابتدائي عقد في لوخ لوموند باسكتلندا في أكتوبر 2007؛ راجع www.cms.int/raptors - خطة عمل مصاحبة تتضمن نشاطات محددة لإدارة تطبيقها.

نحن في **فالكو** نأمل أن تؤدي اجتماعات أبو ظبي المرتقبة إلى اختتام ناجح وأن يتعزز صون الطيور الجارحة المهاجرة في أفريقيا وأوراسيا. إن تحقيق النجاح سيكون باعتبار مذكرة التفاهم على أنها مجرد خطوة أولى وليست هدفا في حد ذاتها. إن تطبيق الأنشطة التي تحتويها خطة العمل هو أمر جوهري، وذلك يتطلب عملا من الحكومات، ومنظمات الصون غير الحكومية، ومنظمات البحوث. يحتاج تطبيق هذه الجهود ليس مجرد إرادة سياسية فقط بل المال أيضا، إن التمويل هو أمر حاسم لنجاح أو فشل مذكرة التفاهم في إنجاز فوائد صونية حقيقية للطيور الجارحة.

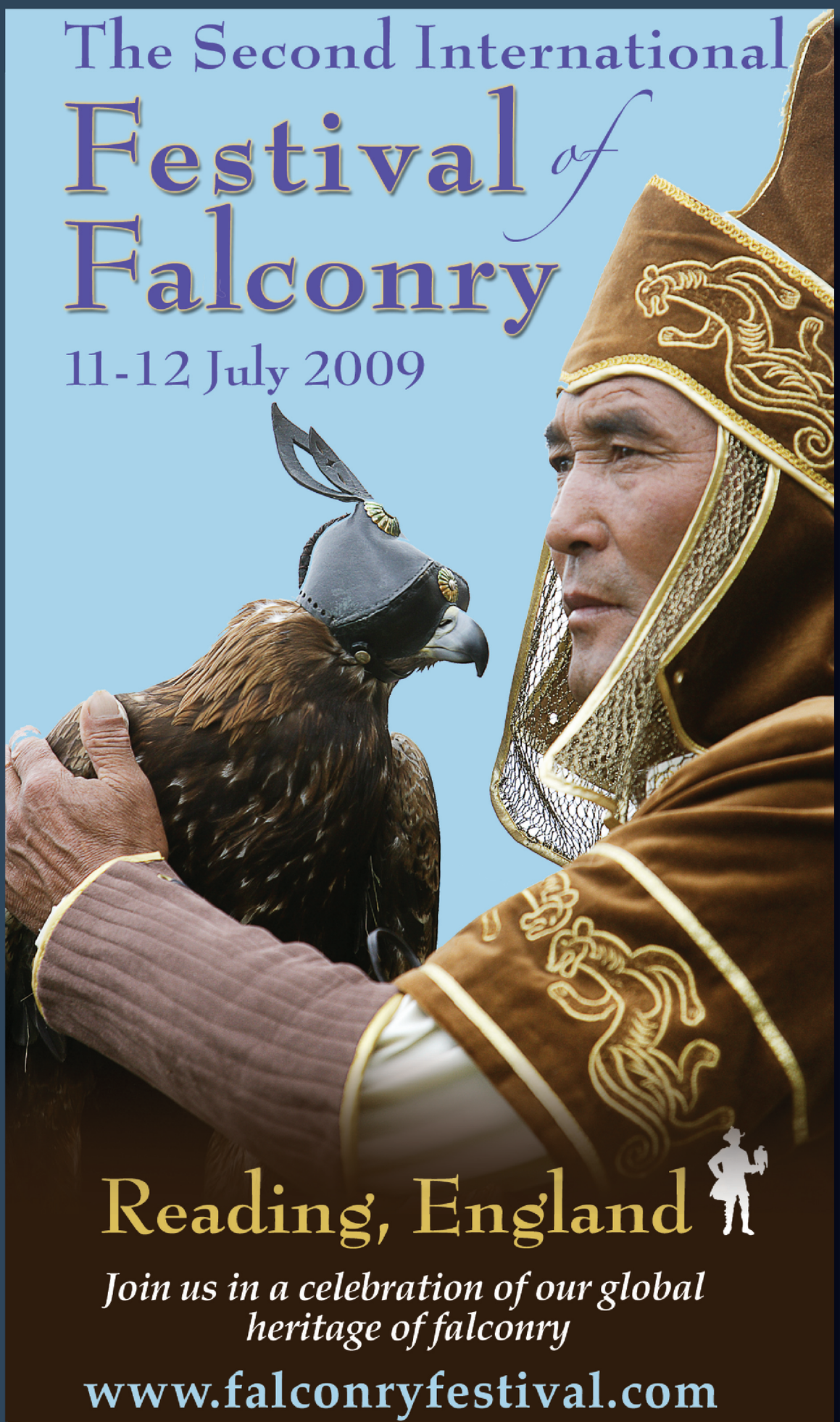
لدينا في هذا العدد من **فالكو** مقالات عن طيرين جارحين مهاجرين أدرجا ضمن الفئة 1 في خطة عمل *مذكرة التفاهم بشأن صون الطيور الجارحة المهاجرة في أفريقيا وأوراسيا*: صقر الغزال والنسر الأسود (الأسمر)، ونقدم معلومات عن محاولات تجريبية لتطوير مواقع تعشيش صناعية لاستخدام صقور الغزال في سهوب منغوليا، والتي قد يكون لها تطبيقات محتملة في تشكيل قاعدة مستدامة بحق للاتجار بالحياة الفطرية وكذلك في التحكم البيولوجي بآفات القوارض. في استمرار لتغطية البحث الذي تموله هيئة البيئة في أبو ظبي عن صقر الغزال فإننا نقدم تقريرا عن أعمال تمهيدية لتقييم جدوى إعادة تقديم صقر الغزال في بلغاريا، بينما يقوم أناتولي ليفين بوصف لمراقبته لصقر الغزال في شرقي كزخستان. يقدم بايانبايار باتبايار وصفا لبعض نتائج دراسات النسر الأسود في منغوليا، مع تشديد على أهمية شبه الجزيرة الكورية كموطن شتوي. إن استثناء شبه الجزيرة الكورية واليابان من *مذكرة التفاهم بشأن صون الطيور الجارحة المهاجرة في أفريقيا وأوراسيا* يبدو أمرا مستغربا لحد ما نظرا لأهميتهما على التعاقب للأنواع من الفئة 1 كالنسر الأسود وعقاب ستيلر البحري.

يقدم شاهد خان وآخرون تقريرا عن مسح للعقاب النساري في أبو ظبي واستخدام هذا النوع لمنصات التعشيش الاصطناعية. صقر الغروب هو طير جارح ساحلي آخر يشاهد تكاثره في الجزر المحيطة بشبه جزيرة العرب، ويقدم لنا جنيد شاه وزملائه تقريرا عن دراسة مسحية للأنواع التي تتكاثر في الجزر الساحلية لأبو ظبي، بينما يعرض مالكولم نكول وآخرون دراستهم لتحديد وضع الأنواع في الجزر الواقعة شمالي عمان.

بالنظر إلى القلق حول أعداد النسر الآسيوي يصف مارك دريسكول وآخرين نظاما للرقابة الصحية طوّر لأجل النسر الأسود في ترينداد.

تركز مقالاتنا البيطرية الأخرى على الصقور الأسيرة. إن الظروف التي تتعرض لها صقور الصيد أثناء الاتجار والتدريب كالتجويع، أو محدودية الماء، أو الأمراض الكلوية، أوالإجهاد، أو التدريب المفرط يمكن أن تؤدي إلى عدم توازن القاعدة الحمضية. يقدم أركا-رويبال وزملائه المجالات المرجعية لعوامل غاز الدم في الصقور. إن معلومات كهذه من الأهمية بمكان للأطباء البيطريين الذين عليهم اختيار المعالجة بالسوائل للطيور المريضة.

يستخدم التلقيح الصناعي للتغلب على بعض صعوبات إدارة مجموعات الطيور في الأسر، ولرفع معدل الإنتاج للأنواع المرغوبة تجاريا كالصقور مثلا. إن الحفاظ على المني بالتعاضد مع التلقيح الصناعي وإنشاء بنوك للموارد الجينية هي أداة هامة في المحافظة على التنوع في المخزون الجيني الثمين. يصف بيلي وزملائه تحليلا ديموغرافيا وجينيا لبرنامج إكثار في الأسر لصقر نيوزيلندي ولتحديد عدم التوازنات الجينية الذي قد يكون مفيدا لإدارة النوع. إضافة لذلك، جرى بحث لجدوى منهجية عملية تخزين المني بالتبريد لتقييم ما إذا كانت هذه التقنية تدعم إدارة أنواع من الطيور الجارحة في الأسر.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