c. the farm was to be no less than 3,000 hectares;
d. there had to be at least 500 head of cattle and/or game for the birds to utilize;
e. there had to be suitable nesting sites for the birds.

So far, a total of 215 red-billed oxpeckers, *Buphagus erythrorhynchus*; and 11 yellow-billed oxpeckers, *B. africanus*, have been caught, in eight separate captures, from three different capture sites, and released onto 11 different properties throughout Zimbabwe.

It is gratifying to note that oxpeckers appear to be spreading naturally as well, into areas in which they used to occur, due mainly to the widespread use of green-label dips.

Follow-up investigation is being done to establish the success or failures of the releases. A re-introduction is considered successful if the birds nest and produce young. Also to be done is a study of the impact of the oxpeckers on the tick burden in their new release areas.

*Contributed by Janine Honywill, Wildlife Unit, Department of Veterinary Services, Harare, Zimbabwe*

**Update on the houbara bustard re-introduction programme in Saudi Arabia**

**Background**

Releases of captive-bred houbara bustards, *Chlamydotis undulata macqueenii*, into the Mahazat as-Sayd reserve were initiated in 1991, with the aim of creating a self-sustaining wild population of houbara in Saudi Arabia. Between 1991 and 1995, 135 houbara, bred at the National Wildlife Research Center, were released into the reserve. By the end of 1995, 33% (41) of these birds could still be located, while 7% (11) were missing.

During the first three years (1991-1993), the focus of the programme was to determine which method of release optimized the survival rate of birds after release. Sub-adults were found to survive best, and since then all releases have been of sub-adult birds aged about two to four months. After transport to the reserve, birds are fitted with radio-transmitters, and kept in soft-netting cages for one to two weeks before being released into a 400 hectare enclosure, which is free of mammals. They are then free to leave this whenever they wish, and are monitored regularly both before and after their departure from the enclosure. Cage trapping of mammalian predators is carried out regularly in a 2 km zone around the release enclosure during the period when houbara are released: captured red foxes, *Vulpes vulpes*, and cats, *Felis sylvestris*, were translocated at varying distances (10-60 km) out of the area, while the smaller Ruppell’s foxes, *V. rupestris*, and sand cats, *F. margarita*, were released on site.

Of the 44 houbara juveniles released in 1995, 55% were confirmed dead by the end of the year, and despite systematic carnivore trapping, 75% (18) of these deaths were attributed to mammalian predators, particularly red fox, and occurred within the area with mammalian traps. Clearly the trapping and translocation programme was ineffective. Efforts in 1996, therefore, were concentrated on reducing mortality of released birds caused by mammalian carnivores through teaching naive birds about predators before their translocation to the reserve, and by improving trapping methods in the reserve.

**Predator-awareness training**

Research on increasing predator-awareness in captive-bred birds was initiated in 1995, when birds destined for release were separated into three groups:

- 1) those hand-raised with minimal human contact (through use of puppets and visual barriers);
- 2) those hand-raised with human contact and ‘trained’ using a mobile fox model; and
- 3) those hand-reared with no training.

While the group reared with minimal human contact showed elevated fear reactions to a static model before their release, ‘training’ hand-reared birds with a mobile fox model only resulted in their rapid habituation and loss of fear of the model. Survival of the three groups after their release was significantly different. A more fearful and realistic training experience appeared to be necessary.

In 1996, rearing with minimal human contact was discontinued in the absence of any supportive evidence for its efficacy from the field, and in view of the labour-intensive nature of this type of management. The predator-training programme was altered to create a situational context that was more realistic and thus more fearful. Half of the released birds were subjected to encounters with a live red fox, muzzled and on a long lead. These encounters were staged at dusk, in a large soft cage, and in the presence of two wild-caught houbara to provide examples of appropriate fear responses. Houbara alarm calls were also played during the training. Training occurred over three consecutive evenings and no habituation to the fox was observed. Final results from the releases are not yet available, as some houbara remain inside the enclosure, but by October 1996 proportionately more predator-trained birds were alive.

**Improved predator trapping regime**

Working on the hypothesis that houbara predation close to the enclosure was occurring because foxes previously trapped and translocated out of the area, had returned and were now trap-shy, the 1996 trapping programme set out to show that predators existed within the trapping area and were avoiding being caught in cage traps. To this end, during the month before the first release of houbara, the cage trap grid was overlaid with a grid of padded leg-hold traps, and both were opened for ten days. Two previously marked red foxes were recaptured as well as four unmarked adult red foxes: whether the latter were recaptures or not was not known, as not all the previously trapped and translocated foxes had been marked. However, trapping results confirmed the presence of trap-shy individuals within the area of the trapping grid.

Between June and September of 1996, 44 sub-adult houbara were released in four groups, each containing both predator-trained and “control” (untrained) houbara. Despite trapping at monthly intervals, high mortality of young houbara in August indicated that not all the foxes had been caught, and trapping effort was increased by doubling the number of traps,
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and leaving them open continuously. Leg-hold traps were closed during the time of the releases because of the risk of catching houbara. Many dispersing juvenile foxes were caught, some adults, and another recapture was made of a previously translocated fox. No deaths of young houbara have occurred since then, and it seems likely that the culprits that were targeting young houbara, possibly only one or two individuals, have been removed from the system. By the end of October, 50% of the houbara released in 1996 were still alive, 7% were missing and 43% were confirmed dead, 39% due to predation.

These results suggest that the use of the same release site from year to year may allow some individual predators to learn to target naïve houbara. To ensure a successful release, young birds must be provided with a window of time in which to establish themselves without having to deal with canny experienced predators. This will require predators to be permanently removed from the area, or releases to be staged at different locations each year.

Contributed by Yolanda van Heezik and Richard Maloney, National Wildlife Research Center, Taif, Saudi Arabia.

Biomedical research programme for the houbara bustard captive breeding and restoration programme, U.A.E.

The National Avian Research Center

The National Avian Research Center (NARC)’s aim is to carry out ecological research to further knowledge, understanding and public interest in the conservation of birds and other wildlife in the United Arab Emirates (U.A.E.). The flagship species for the organisation are the houbara bustard, Chlamydotis undulata macqueenii, and the saker falcon, Falco cherrug. The houbara bustard is the traditional hunting prey for Arab falconry, which is an important part of Arab heritage.

The houbara bustard

The houbara bustard is a shy desert bird which inhabits arid areas from the Canary Islands in the west to China and Mongolia in the east. Houbara bustards migrate through the U.A.E. from October to March. Throughout most of their vast range the houbara’s numbers have been in decline. It is believed that the reasons for the houbara’s decline are overgrazing, intensive farming and the use of pesticides in countries through which they migrate. NARC aims, through scientific understanding, captive breeding, habitat restoration and public education, to increase the numbers of houbara wintering in Abu Dhabi and to help reduce the threat to houbara in the rest of the range.

Other species of bustards and bustard captive breeding programme

The bustard family is made up of 22 species in eight orders. Some such as Heuglin’s bustard, Neotis heuglini, are uncommon while others such as the rufous-crested bustard, Eupodotis ruficerista, are still relatively common. Bustards are medium sized to very large terrestrial birds, chiefly inhabiting open plains and semi-desert regions of the world. Agricultural changes, overgrazing, hunting, trapping, habitat loss, droughts and wars threaten to make more species of bustards scarcer in the future and captive breeding programmes have been established for many bustard species in the Middle East in Saudi Arabia (see van Heezik and Maloney article in this issue), Bahrain, Dubai and Abu Dhabi. NARC has not only established a large captive breeding and restoration programme for the houbara bustard, but it has also established successful breeding programmes for rufous-crested, kori, Ardeotis kori, and the white-bellied bustard, Eupodotis senegalensis.

The Veterinary Science Department of NARC

NARC captive breeding programmes for bustards are carried out in two sites in the U.A.E.: at Sweihan Desert Research Center, and at Al Ain Zoo. The Veterinary Science Department of NARC is fully responsible for the health and medical care of all bustards held at these facilities. The department provides routine and incidental medical treatment to diseased individuals and flocks, as well as conducting veterinary research programmes.

The backbone of the department’s clinical activities is a preventive medicine programme, consisting of vaccinations against Newcastle disease and avian pox (the common viral diseases of the Middle East) and regular anthelmintic and anti-protozoal treatments. A modern quarantine centre has been established to quarantine and health-screen bustards entering and leaving the collection as part of exchanges or, in the future, for restoration projects.

Veterinary and avicultural staff have worked closely to develop a computerised database, called ‘Captive’ which has been customised for the management of NARC’s bustards. In the long term, retrospective analysis of data will be an important element in reviewing the progress of the veterinary services department.

Bustard biomedical research programme

The NARC Veterinary Science Department is collaborating with a number of local and international institutions on a range of biomedical research projects:

1. normal haematology reference values and the haemoresponses of bustards to specific pathological conditions in collaboration with J.S. Pathology, U.K.;
2. normal blood chemistry reference values and the haemoresponses of bustards to specific pathological conditions in collaboration with the Central Veterinary Research Laboratory, Dubai;
3. anatomical studies (gross and ultra-structural) of the alimentary tract of captive and free-ranging bustards in collaboration with the Anatomy Department, Faculty of Medicine, Al Ain University;
4. pharmacological studies of anti-bacterial agents in captive bustards in collaboration with the Pharmacology Department, Faculty of Medicine, Al Ain University;
5. parasitological surveys of the parasites of captive and wild bustards in collaboration with the International Institute of Parasitology, U.K.;
6. bacteriology studies to establish normal microflora of captive and free-ranging bustards and cataloguing the main pathogens of bustards;
7. surveys of the major causes of morbidity and mortality of bustards in the Middle East;