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MANAGEMENT OF BUSTARDS IN CAPTIVITY

by Tom Bailey and Sara Hallager

Introduction

This article presents key facts for aviculturists who are working with bustards maintained in breeding projects or zoological collections. Further information on how to manage bustards in captivity may be found in the publications listed in the references at the end of this article.

Bustards

The bustard family is made up of 25 species in 11 genera. Four species, including the Great Indian Bustard *Ardeotis nigriceps*, are listed by the IUCN (International Union for Conservation of Nature and Natural Resources) *Red List of Threatened Animals* as Endangered. One species is listed as vulnerable and an additional six are listed as near-threatened (del Hoyo et al. 1996). Bustards are medium-sized to large terrestrial birds, inhabiting chiefly open plains in arid or seasonally dry regions of the Old World. Agricultural changes, overgrazing, hunting, trapping, habitat loss, droughts and wars are the main threats to bustards (del Hoyo et al. 1996). In recent years, there has been a surge of interest in the propagation of bustards in captivity, in particular, the Houbara Bustard *Chlamydotis undulata* in the Middle East and North Africa (Saint Jalme and Van Heezik, 1996). Similar programmes for vulnerable and threatened species of bustards such as the Great Bustard *Otis tarda* have been established in Europe and the former Soviet Union as well as for the Kori Bustard *A. kori* in the USA. Programmes with threatened bustard species aim to produce surplus birds for release into protected areas, thereby supplementing declining wild populations, while Houbara Bustard projects in the Middle East and North Africa aim to provide surplus birds for sustainable hunting using falcons (Bailey et al. 1996). Captive breeding programmes in the USA for Kori Bustards and the Buff-crested Bustard *Lophotis gindiana* aim to maintain populations that are genetically and demographically self-sustaining and do not rely on continued imports from the wild (Hallager and Ballou, 2001).

Husbandry Housing

Differences exist in the housing of bustards both between and within species and according to the region in which the birds are maintained in captivity. In the Middle East, captive Houbara Bustards are managed in an extreme climate outside of their natural breeding range, and they are maintained in environmentally controlled buildings. In North Africa, where captive Houbara are bred within their natural breeding range, birds are maintained in outdoor aviaries. In the USA, Kori Bustards are maintained in outdoor pens, which are equipped with heated sheds in which the birds are housed in during periods of inclement winter weather. Smaller species



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Large natural-like aviary for Houbara Bustard.

such as the Buff-crested Bustard and White-bellied Bustard *E. senegalensis* are kept in both indoor and outdoor aviaries and provided with supplemental heat during the winter months if housed outdoors and/or moved into winter holding facilities. The provision of shade and shelter are important for birds managed outdoors in tropical and temperate climates respectively, as is the use of predator-proof fencing. All species of bustard are susceptible to frostbite and supplemental heat must be supplied when temperatures drop below 4°C (39.2°F). Outdoor aviaries may have alfalfa beds in addition to natural vegetation. This provides birds with cover in which to hide and also encourages foraging for invertebrates attracted to the vegetation. Trauma is an important cause of morbidity and mortality of all captive bustards, so great attention is paid to using soft materials when pens are constructed. In

addition, pinioning of chicks or feather cutting (of the primaries) of adults are important management tools to reduce the potential for self-inflicted injuries. Pinioning of chicks is preferred as this eliminates the need to routinely catch adults for feather-clipping. Strict biosecurity of large captive breeding projects is an important issue. Smaller bustard species can be exhibited in mixed aviaries. Kori Bustards should preferably be housed by themselves to facilitate breeding, but if necessary, can be maintained in mixed species exhibits with non-aggressive hoofstock (e.g. Gerenuk *Litocranius walleri* or dik dik *Madoqua* spp.).

Diet and feeding

Bustards are opportunistic omnivores and in the wild the diet reflects the local and seasonal abundance of plants and small animals, including invertebrates and small vertebrates. Studies of gut contents have shown that vegetation constitutes a significant proportion of the diet of some free-living bustards (del Hoyo et al. 1996). However, studies of the gut contents of Kori Bustards in Namibia have revealed mostly insects and very little plant material (T. Osborne pers. comm.). In captivity, bustards are fed mice, mealworms, crickets, apple, cabbage, chopped greens and either bustard pellets, game bird pellets or a mixture of crane and ratite pellets (Sleigh and Samour, 1996). Minced or ground beef can be used to replace mice or mealworms if either component is unavailable. Kori Bustards in US zoos are fed horsemeat in addition to mice and the meat is supplemented with either crane and ratite pellets or game bird pellets. The mixture is made into small meatballs and hand-tossed to each bird. This method of feeding facilitates close inspection of each bird as well as helping form a trust bond between the keeper and each bird. Pinkie mice are fed to smaller species of bustards, while fuzzie or adult mice are fed to the larger species such as Kori Bustards.

Calcium carbonate may be added to the fresh food mixture to compensate for the calcium imbalance that is caused by the addition of livefood/mince. Multivitamin supplements (e.g. SA37 at 1g per 10kg bodyweight) are provided to birds maintained in the Middle East (Sleigh and Samour, 1996). Maintenance pellets (15% protein) are fed to birds outside the breeding season and productioner pellets (20.5% protein) are fed during the breeding season (Anderson, 1998; Sleigh and Samour, 1996).

Food is presented in plastic or aluminium food dishes either once or twice a day. Water is provided ad lib. Additional livefood such as mealworms or crickets may be supplemented as part of taming protocols to reduce keeper-induced stress. To encourage natural foraging behaviour, supplement the daily diet and provide a form of enrichment, chopped green beans, cherry tomatoes, hard-boiled egg and blueberries are given twice a week to Kori

Bustards.

Medication may be given to specific birds within favoured items such as mice. Bustard chicks, like those of other long-legged species, are susceptible to long-bone disorders and chick-rearing diets must be supplemented with Vitamin D₃ (e.g. Neutrobal, Vetark). Angel wing is a common occurrence with hand-reared Kori Bustard chicks, typically occurring at day 11-14. Taping the affected primaries in a natural position at the first sign of the outward turning will permanently correct the deformity. A definitive cause of the problem has not been determined (Boylan et al. 2001).



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A suitable way of holding smaller species such as the Buff-crested Bustard.

Capture

To avoid injuries correct methods must be used to catch and handle bustards. For birds maintained in outside aviaries in the Middle East, as well as North American zoos in the south-west, catching is carried out early in the morning to reduce the risk of heat stress. In the Middle East multivitamin solutions are given in the water before large catches to reduce the potential for capture-related myopathies. The specific methods for catching birds depend on the species, aviary size and the reason for catching them (translocation, medication, artificial insemination). Single small to medium-sized birds in small outside aviaries are caught with catching nets. Single tame bustards in small indoor aviaries are caught by hand, after herding the bird into a corner. Flocks of birds in large aviaries can be captured using

a catching corral. This is a blind-ended funnel with a wide mouth and a circular catching area at the blind end. Small and medium-sized bustards can be caught using nets in the blind end, while larger species like Kori Bustards are caught by guiding them slowly into a darkened small shed, cornering them and grabbing them by hand. Nets should not be used for Kori Bustards.

Handling

Bustards should be held firmly against the handler's body, the wings should be fully closed and the legs held together and prevented from rubbing against each other by positioning one of the handler's fingers between the legs. They can be held so that the legs are bent at the tibiotarsal joint. Some movement of the leg is allowed without letting the bird kick uncontrollably. Falcon hoods or cloth bags with holes for the nares can be used to calm birds down although hand-reared birds may be more comfortable without hoods. Birds should be kept as sternal as possible while being held as this reduces stress levels.



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Falcon hoods can be used to calm birds down. Positioning a finger between the legs prevents the legs rubbing against each other.

Transportation

Small bustards (up to 2 kg) can be transported in commercial pet carriers or cardboard boxes. Larger bustards, such as Kori Bustards can be transported individually in transport crates. Crate requirements for all bustard species can be found in the International Air Transport Association manual (IATA, 1998).

Individual identification

Bustards in captivity can be individually identified by using coloured plastic rings with engraved coding attached above the tibiotarsal joint for visual identification of individuals in pens. Birds are also identifiable by means of a subcutaneous passive induced transponder (PIT), which is placed in the inner crural region of the leg.

Routine health care

Bustards in the Middle East have succumbed to a variety of diseases, notably trichomoniasis, Newcastle disease and avian pox. Preventive medicine programmes include annual vaccination with inactivated Newcastle disease vaccine, live canary pox vaccine and regular (two to three times a year dependant on risk) anthelmintic and antiprotozoal medication given in the water or food. Vaccines are given during health assessment catches held one to two months before the breeding season and during the cool season in the Middle East. In the USA, internal parasites are seen occasionally and avian pox has been reported in two chicks. Vaccines are not routinely administered in the USA. Kori Bustards in zoo settings need to be monitored carefully for signs of impaction and zinc toxicity as they have a particular tendency to consume items thrown into their enclosures by visitors (e.g. coins, camera batteries, nails, etc). Daily inspection of pens and the removal of foreign material are very important.

Breeding Management

Sexing

Bustards show sexual dimorphism (see Table 1). Some smaller species such as the White-bellied Bustard can be sexed by differences in head and throat plumage. Larger species, such as the Kori Bustard, are easily sexed at one year of age, for although the plumage of both sexes is similar, males are considerably larger. Juvenile bustards can also be sexed using endoscopy after about six months of age. Genetic sexing offers many advantages, being non-invasive and if done from feathers or blood collected from freshly hatched chicks, it can allow different sexes to be reared under different protocols.

Table 1. Adult bodyweight of bustards.

Species	♂ (kg)	♀ (kg)
Great Bustard <i>Otis tarda</i>	6-8.5	3.8-4.5
Kori Bustard <i>Ardeotis kori struthinuculus</i> ¹	10-18	6-7
Kori Bustard <i>Ardeotis kori kori</i> ²	7-14	3-6
Houbara Bustard <i>Chlamydotis undulata</i>	1.5-2.5	0.8-1.4
White-bellied Bustard <i>Eupodotis senegalensis</i>	1.0-1.3	0.9-1.1
Buff-crested Bustard <i>Lophotis gindiana</i>	0.4-0.8	0.4-0.6

¹ subspecies maintained in US zoos

² subspecies maintained in the Middle East

Breeding strategies

Bustards are K-selected species - long-lived and with a low reproductive output (del Hoyo et al. 1996). Management strategies for breeding vary according to the species but there are basically three regimes (see Table 2).

Table 2. Examples of breeding strategies.

Strategy	Species	Age	Social Grouping
Isolated for artificial insemination	Houbara	Adult Juvenile	Singles Small groups (≤ 5)
Pairs	White-bellied	Adult Juvenile	Pairs Small groups (≤ 5)
Heterosexual groups	Kori	Adult Adult Juvenile	Large group (~ 25) Trio or 2.3 Large group (~ 15)

In most species, males and females do not establish a true pair-bond, and depend instead on a dispersed lek breeding system in which the males advertise themselves in traditional areas. Male bustards perform elaborate displays to attract females and maintain a dominance hierarchy. The females are left alone to undertake the nesting, incubation and rearing of the young. In captivity, Houbara Bustards managed as pairs or as mixed sex groups rarely, if ever, breed. Similarly, Houbara Bustards caught as adults remain sensitive to stress and in most cases fail to breed. Successful Houbara Bustard breeding projects use hand-reared birds, which are more suitable for intensive production efforts utilizing artificial insemination. White-bellied Bustards

are monogamous and adults are maintained in pairs. Kori Bustards are managed in mixed-sex flocks, but can be managed as trios. Intraspecific aggression can occur between pairs of Buff-crested Bustards (σ^7 - ♀) and male Kori Bustards (σ^7 - σ^7) in the breeding season so care needs to be taken when there are changes to group structure. Adult male Kori Bustards may require physical and visual separation during the breeding season to prevent aggression and physical injuries (Boylan et al. 2001).

End-piece

Species such as the Houbara are in the early stages of domestication, with the objective to produce large numbers for managed hunting. Other species, e.g. Great Bustard and Kori Bustard, are maintained in captivity for conservation objectives. The successful breeding of all species is being held back because of the poor understanding of nutritional requirements and high levels of infertility and chick mortality. An expansion of the knowledge base is needed if advances in the husbandry and medical management of these birds are to be made.

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WONGA SUCCESS

by Louise Peat

The Wonga Pigeon *Leucosarcia melanoleuca* is endemic to Australia, where it is found mainly on the east coast. A plump bird that spends a lot of time on the ground where it forages for fruits, seeds and insects, it is renowned for its far-carrying and monotonous call.

At the Cotswold Wildlife Park, Oxon., UK, we have kept Wonga or Wonga Wonga Pigeons (as they are also known) since 1998. A pair was kept initially in our walk-through aviary, in which the pair made a wonderful display, but failed to breed. Several months later we lost the female to a Stoat *Mustela erminea*, after which the male was moved to a more secure aviary while the Stoat problem was resolved.

We decided that more birds and a change of aviary could prove fruitful, so in October 2000 five more Wonga Pigeons arrived. The old male and the five new birds were placed together in an aviary on the Pheasant Section. They mixed together well without any aggression being shown by any of the six birds. A choice of nesting places was offered including baskets, roofed boxes and open-roofed boxes. The open-roofed boxes were favoured, as the birds seemed more secure in these. Nest material in the form of long slender twigs were eagerly snatched up as soon as they were placed on the aviary floor.

Our first egg was laid in June 2001 but it was clear, as were those of the first three clutches; then in August, after sitting for the full incubation period, both adults were seen away from the nest and made no attempt to return. The nest was checked and two eggs were found, one was clear, the other had a chick half way out of the shell. The chick was warmed up and helped out of the shell. Hand-rearing was attempted but the chick survived for only three days. Eggs continued to come, but were abandoned and with bad weather on the way, it was decided to try foster-rearing using Barbary Doves *Streptopelia roseogrisea* (dom.). These had been set up for our pair of Pink Pigeons *Nesoenas mayeri* and, at that time, had successfully reared both Pink Pigeons and Crested Pigeons *Ocyphaps lophotes*. Wonga Pigeon eggs are slightly larger than Pink Pigeon eggs, so initially there was concern that they might be unable to turn the Wonga Pigeon eggs, however, this concern proved unjustified. The Barbary Doves did a wonderful job, but most of the eggs proved to be clear, until in October when the first chick hatched. Unfortunately, I had set up the Barbary Doves to synchronise with the 16-18 day incubation period given by Gibbs et al. (2001). The chick hatched on the 19th day and therefore missed the crucial first three days of crop milk. As a result the chick was very small and died 10 days later. The



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