AN UPDATE ON THE UK GREAT BUSTARD REINTRODUCTION

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INTRODUCTION

The Great Bustard is a globally threatened species needing conservation action across Europe. They became extinct as a breeding species in the UK in 1832 probably as a result of hunting, agricultural change and inclement weather. The factors that caused the loss are no longer thought to operate. Suitable habitat exists in pockets across England and especially on Salisbury Plain where a large area is protected for military training and conservation purposes. The Plain combines short grass areas for lekking, long grassland for feeding and adjacent arable land for nesting. Pilot studies on arthropods in long grassland suggest that their density is sufficient for chick-rearing but the precautionary creation of additional food-rich areas among arable crops is recommended. Genetic studies indicate that Britain's bustards probably belonged to the central European group and that restocking should not use birds from Iberia. Only Russia has sufficient birds to supply a reintroduction project and losses there through nest devastation are high. By rescuing eggs, artificially incubating them and transporting chicks to Britain, the project should have zero detriment to the donor population.

Disease surveillance is an important aspect of any reintroduction project as it is vital that only healthy birds are released and that they do not carry with them any diseases that may be pathogenic to themselves, other wildlife (or domesticated species) or man.

Some disease screening has been required by UK law - other areas have been carried out as part of a "complete" screening plan and to evaluate the effectiveness of rearing and incubation methods.

Egg Post-Mortems. All eggs that fail to hatch are examined each year. Results are summarised in Table 1.

Table 1. Egg Post-Mortem Results

	Infertile	Early Embryonic Death *	Days 5-11	Day 12 approx	Day 20 approx	Terminal Malposition
2004		Most				2
2005		5				12
2006	5	3				1 (+1 wet chick)
2007	6	15		1	3	
2008	2	2	3		1	2

* = defined as embryo gauged to be less than 5 days' development

Until 2007 most deaths of embryos were either early or due to malposition at hatching. This was felt to be due to problems moving eggs in collection.

In 2007 the situation was markedly different with many more eggs failing to hatch. The major cause of death of early-stage embryos was felt to be the extreme heat during the collection period.

Swabs from four eggs all grew a non-haemolytic *E coli*. This may be significant but, more likely, indicates contamination as examined eggs are frozen and defrosted before necropsy.

2008 showed a more "normal" pattern. There was a greater spread in embryo ages of death – this was felt to be due a much more drawn out laying period compared to previous years. In all cases, embryo death was closely related to the time of collection and transport.

Chick Deaths. All dead chicks are examined each year. Results are summarised in Table 2**.**

Table 2. Chick Post-Mortem Results

2004	Yolk sac retention in all chicks examined
2005	Yolk sac problems much reduced
2006	2 chicks died. Both died on the same night which was very cold. Chicks were 1 day and 14 days old respectively. The latter also had signs of night fright so death was felt to be a combination of trauma and cold
2007	No dead chicks
2008	5 chicks died. Two had been caught in a sudden rain storm – death was felt to be due to chilling One appeared to have suffered physical trauma Two appeared to have died of septicaemia – in one case following chilling after a power failure; the other was a chick that had never thrived

CHICK PROBLEMS.

1. **Angel Wing.** Each year many chicks in their first week start to develop lateral rotation of the carpi. Application of bandages will normally correct this within a few days. In 2005, problems were seen in much older birds. Long-term application of restrictive dressings led to further problems in the development of bone atrophy and pathological fractures. This was associated with a change in diet from "Lundi" Regular Food to Purina "Darling" cat food. This increase in protein was accompanied by reduction in calcium:phosphorus ratio and Vitamin D3.[1] Following problems in food supply, the diet was switched to a commercial crane ration (in Russia) in 2006. Angel wing has not been an issue in older birds since then**.**

2. **Metabolic Bone Disease.** Changes in long bones were observed in older birds in 2008. In this case birds had to be kept in Russia until approximately 2 months of age – much older than normal. Problems in food supply for this prolonged keeping in Russia meant that diet

was switched back to commercial cat food. Fractures of humeri, femurs and tibiotarsi were seen in several birds (predominantly the larger (male) chicks) following trauma or handling. The diet was changed back to Lundi Regular food in the UK and birds were retained in quarantine for a longer period than normal to allow further time for calcium deposition in bone. There have been no apparent cases of pathological fracture in released birds**.**

3. **Septicaemia.** In the first year 4 birds died in quarantine soon after arrival. One was due to a pre-existing gizzard foreign body. The other three had hepatitis linked to septicaemia secondary to yolk sac retention. Yolk sac retention was prevalent in chicks that year. The cause was believed to be premature hatch due to older chicks "calling" younger ones prematurely. Reducing egg numbers in the hatcher effectively reduced this problem. 3 deaths post-arrival in 2005 due to septicaemia were felt to be linked to stress of travelling especially as these birds were found to have signs of osteomalacia – again linked to changes in diet. Transporting older chicks in later years has greatly reduced problems. Chicks in 2008 died of septicaemia following chilling incidents.

4. **Myopathy** was found in one bird that died in quarantine in 2005. Again associated with osteomalacia.

5. **Wing injuries.** In 2004 two birds damaged wings following attempts to fly in the soft release pens. One suffered humeral fracture, the other elbow dislocation. Neither bird could be released. The soft pen stage was subsequently abandoned due to risk of injury. In 2008 wing and leg injuries occurred following nutritional secondary hyperparathyroidism.

6. **Disease Screening**

   a. **Virology.** All tests for Newcastle Disease, Avian Influenza and Avipoxvirus have returned negative results each year.

   b. **Haematology** normals were established for the chicks in 2004. See table 3. These appear similar to values in similar species and subsequent testing in later years has not produced significantly different results.

   c. **Storage of cells and serum** has occurred each year. This will allow for retrospective DNA and serological analyses**.**

   d. ***Chlamydophila psittaci*.** Faecal PCR has been carried out each year in quarantine. In 2004 and 5 there were 4 and 2 positives respectively. None were positive in 2006 or 2007. Positive results were not associated with clinical disease. It is not known whether infection occurred via vertical transmission or breakdown in biosecurity, although the former is felt more likely. Testing for this was abandoned in 2008.

   e. **Faecal parasitology.** In 2004 one chick was found to have flagellates and trematodes at post-mortem examination. In 2005 one bird was found to have intestinal coccidian. No intestinal parasites were found in 2006/7. 2 faecal

samples are taken from each bird post-arrival in the quarantine pens each year. All birds are dewormed with fenbendazole at 100mg/kg po prior to release

Table 3. Haematology Normals for Great Bustard Chicks

	N	Mean	Range
Hb	23	7.07	3-9.5
PCV	23	.32	0.19-0.48
RBC	23	2.31	1.4-3.8
WBC	23	6.16	0.1-30.5
Het	22	4.21	0.51-17.69
Lymph	22	1.14	0.14-4.27
Mono	22	0.69	.06-4.27
Eo	22	0.25	.00-4.27
Baso	22	0.18	.00-1.36

f. **Blood Parasites.** None have been found in any year**.**

g. **Mycobacteria.** Faecal testing has revealed no positives on Ziehl-Nielson staining of faeces**.**

h. **Pathogenic bacteria.** Again two faecal samples from each bird are screened each year in quarantine. *Campylobacter jejuni* was found in four second samples in 2006. The food was felt to be associated with this isolation and no clinical signs were associated with this finding. In 2008 a Group B *Salmonella* was isolated from the small intestine of a bird that had died following signs of enteritis. This was not felt to be a primary pathogen as the bird had suffered physical trauma prior to this and was felt to be stressed. Group b *salmonella* was isolated from the faeces of several healthy birds during routine screening – the source was felt to be the rodents fed in the diet. 2008 was extremely wet – muddy conditions in the quarantine pens would have facilitated spread of this organism**.**

7. Post-release

a. **2004.** The major causes of death were **:**

i. **Predation**

ii. **Collision.** This was felt to be due to the harness-type transmitters. Older dead birds were found to have injuries caused by abrasion by the elastic

of these harnesses. This almost certainly compromised flying ability resulting in a low "skimming" flight making collision more likely. Cessation of use of these harnesses resulted in improved flying ability and improved dispersal of birds post-release**.**

b. **2005.** One predated bird showed signs of previous collision. From one bird *Yersinia pseudotuberculosis* was cultured. This was likely contracted post-release from wild birds**.**

c. **2006.** None recovered for post-mortem**.**

d. **2007.** Two birds showed signs of collision trauma**.**

e. **2008.** As of January 31st 2009, 10 of the 17 released birds survive. Deaths have been due to predation (3 cases), collision (3 cases) and one unknown**.**

Summary: No major infectious disease problems have been identified. However, disease screening continues to ensure this situation continues and to monitor non-infectious disease syndromes.

Project success: In the initial years of release there was a wide dispersal of the released Birds with 3 known to have crossed the channel to France in 2005. More typical winter dispersal distances are around 70km, although a small resident flock has now been established around the release site. Following lekking the birds form small flocks in the local area before dispersing in late autumn. This has enabled newly released young birds to join an existing flock – it is felt that this is the main reason for reduced mortality through predation in the last three years.

In 2007 and 2008 birds started to return to the release site in early spring as would be expected for breeding birds in Russia. Lekking behaviours were observed and in both years a single nest with two eggs was found. In 2008 one pair of birds was observed mating.

In 2009, four females nested and two produced chicks – the first wild Great Bustard hatching in the UK for 177 years!

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