LIFE+ Project “Reintroducing the Great Bustard Otis Tarda to Southern England”
(LIFE09/NAT/UK/020): Year 2 Summary

01/09/2011 – 31/08/2012
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Action A2: Develop release strategy for the project period

A release strategy was prepared and completed in January 2012. This made recommendations to the Project Steering Group to (i) continue releases at Release Site 2 and secure a legal Land Management Agreement (ii) discontinue releasing birds at Release Site 1. These recommendations were agreed by the PSG.

In March 2012, however, the University of Bath monitoring team suggested that habitat modelling work showed the importance of grassland to the great bustards, and that releasing birds at the original release site should be reconsidered. In June 2012, a review of the release strategy (see below) was submitted to the Project Steering Group who agreed to reconsider the area around Release Site 1 for release of a small number of birds if a large enough area could be electrically fenced to provide protection from predators. However, the costs for this action proved prohibitive and this area was not used to release birds in 2012.


This paper to the Project Steering Group recommends that PSG uphold the decision not to release birds near Release Site 1

Project Manager, 21 June 2012

1. Positive results from 2011

During the past five months we have seen the results of the 2012 releases at two sites; Release Site 1 and Release Site 2. [One free-ranging bird from each release site in 2011 has recruited into the main population; this recruitment may have been facilitated by the association with older members of the population (LIFE+ Year 1 Summary).

We are now aware that initial post-release survival was much improved for birds released at Release Site 2 for the first 60 days before the general dispersal in early November that has occurred in every year of releases.

[In 2011, sixteen birds were released at Release Site 1 (12 females, 4 males) and thirteen were released at Release Site 2 (7 females, 6 males). Compared to previous years, birds released in 2011 showed slightly higher survival from release to 60 days post-release than average (Kaplan-Meier survival model - 2011: 57.1% ± 9.3%; 2004-2009: 47.0% ±13.5%). Those released at Release Site 2 had significantly higher survival to 60 days post-release than those released at Release Site 1 (Kaplan-Meier survival model - Release Site 1: 40.0% ±12.6%; Release Site 2: 76.9% ±11.6%; Figure 1). However, these estimates are based on carcass recoveries; over this 60-day period there was a decline at both sites in the number of birds observed on a daily basis,
therefore there is a possibility that birds not observed may have died. (LIFE+ Year 1 Summary).

To date we are aware of four birds from 2011 that have regularly been seen associating with the older birds. This includes Bk20 that was held back (having had its wing feathers trimmed) and overwintered at Release Site 1 with the older birds, over the last month this bird has gained its flight feathers and is now a competent flyer. In addition, T5 returned from France landing within five miles of her release site where she was caught by a member of the public and bird keeper. Within the hour she had been released at Release Site 1 (31/05/12) where there were five male bustards of mixed age. Since then she has not left the older group and has shown impressive flying ability. T5 is the only bird without any identifying tags (she has a microchip). The known population therefore now numbers nine great bustards (1x♀:8yrs, 1x♀:7yrs, 1x♂:5yrs, 2x♂:2yrs, 2x♂:1yr, 2x♀:1yr). To have four surviving birds from last year’s release at this stage should be considered a success, in comparison to other years.

2. Negative results from 2011

Progress of the reintroduction trial has been impeded by a low survival rate, primarily attributed to predation and collisions. In 2011 the LIFE+ Reintroduction Project held a Technical Working Group to discuss factors that might be affecting survival of the birds, which outlined several areas for investigation. Following this, improvements were made to the chick diet in Russia and to the quarantine facility to ensure that leaner, fitter birds with improved feather condition were produced. The TWG also agreed that the project team should investigate the possibility of importing eggs from Russia, as this would enable further improvement of rearing conditions, remove the stress involved with transport of chicks, including damage to feather condition, and allow for earlier release (data has shown that birds released earlier survive longer, J Burnside, Unpublished data).

Even though these improvements were made, released birds still continued to die following release in 2011. [From release (15/09) to 15th December 2011, thirteen birds of twenty-nine released in 2011 were recovered dead. Predation was the main cause of death of birds at Release Site 1 (67% of 9 birds), with collision-related injuries resulting in comparatively fewer deaths (11%); 22% of deaths were difficult to classify and may have been due to either predation, collision or collision followed by predation. At Release Site 2, there were four carcasses recovered: two were collision-related injuries, including at least one with power lines, one was caused by entanglement with the release pen fence, and one may have been due to either predation, collision, or collision followed by predation. (LIFE+ Year 1 Summary)].

Therefore the actual cause of mortality has still not been identified, although issues that are exacerbating the problem have been identified, especially at Release Site 1.
Predation

Preliminary work has been undertaken to determine predator numbers at both release sites, which has identified that bustards are more susceptible to predation at Release Site 1 due to a combination of higher numbers of fox, features of the landscape and behaviour of the birds. [A preliminary assessment of Red fox (Vulpes vulpes) density around Release Site 1 has suggested that the highest density is in the valley where the release pen is situated (A. Weldon, pers. comm.). This may be due to a high density of the main prey species of the Red fox, European wild rabbit (Oryctolagus cuniculus), but it may also be related to the topography of the landscape. The majority of the carcasses recovered from around Release Site 1 since 2004 have been in the valley where the release pen is situated; this valley may act as a corridor facilitating the movement of foxes (A. Weldon, pers. comm.). Initial camera surveys at both release sites recorded proportionally more images of foxes at Release Site 1 than at Release Site 2. (A.Weldon, LIFE+ Year 1 Summary: 10/01/12)]. We do not have agreement to undertake fox control at Release Site 1 and the project site is a funnel out onto Salisbury Plain which is a constant supply of foxes.

Behaviour of newly released birds

Through observations of bird behaviour in the immediate weeks following release, we were able to identify features at Release Site 1 that were not only incompatible with the birds’ behaviour but that actually made predation more likely. The same behaviour was seen at both sites during the first three weeks. The bustards took short preliminary flights, often not far, they would then walk back to rejoin the other birds. At Release Site 2 these flights often stayed within the 20Ha release field, but sometimes the birds would end up outside of the fence. Here it was easy to open up the 1m high electric netting fence to enable the birds to walk back in unharmed. At Release Site 1, the 2m high solid fence surrounding 7Ha either posed a direct threat to the birds on these exploratory flights or created an insurmountable obstacle if they found themselves outside of it. In addition, the adjacent field is bounded on all sides by barbed wire fencing creating several barriers. This would leave the birds pacing along the fences seemingly unable to get back to their group. We observed that birds were taking these early flights often soon after dawn and near dusk, at times when no staff were on site at Release Site 1 to try to get birds back into the safety of the release pen. As time went on and the birds’ flight ability increased the risk lessened, however by that time many birds released at Release Site 1 had already been lost to foxes.

Feather condition

Through assessment of feather condition in 2011 we identified that, although the new design soft release pens were not a problem, some birds are not fully equipped with a perfect set of feathers possibly due to age, travel and the time of year that birds are released and undergo moult. This may be partly or wholly responsible for the number of collisions. [Birds released in 2011 had on average 66% (±3%) fully-developed and
undamaged primaries, 14% (±2%) damaged, 8% (±2%) still developing/in pin and 12% (±2%) missing. Between quarantine and soft release, 32% of birds showed no change in the number of complete and undamaged primary feathers, whereas 32% showed a decline and 36% showed an improvement (due to feathers completing development during this period). Overall, there was no change in feather condition during the soft pen period (Wilcoxon signed rank test (paired): V=120, p=0.6).

3. January 2012 Recommendation to PSG

Due to the results of the 2011 release detailed above, in January 2012 the project team made recommendation to the LIFE+ Project Steering Group that no further releases should take place at Release Site 1, that the release of birds at Release Site 2 should be repeated in 2012, and that a further site should be identified by the end of 2012 for use in 2013. This recommendation was agreed by the steering group.

[We recommend Option 2; to release all birds at Release Site 2 in 2012. However, in the long term we consider that it is better to release birds at more than one site. A management agreement with a new landowner should be in place by autumn 2012, to allow us to create suitable habitat at the site for release in 2013. As the farm is mainly arable, fence removal, if necessary, around the chosen site should be considered as part of the management agreement. Predator control should also be a fundamental part of any agreement. A known risk to released birds, and a cause of mortality to at least one of the birds released in 2011, is the set of power lines within close proximity of the release area. If bustards are to be released here in future years, contact should be made with the power company to seek to mark these lines (LIFE+ project team)].

4. Recommendation from Monitoring team – March 2012

Since the PSG supported the way forward for releases in 2012, a new suggestion and recommendation to the Steering Group came forward from the University of Bath in March 2012. This suggested a benefit to the young released birds from the ability to mix more readily with older birds at Release Site 1, however, as the release pen is unsuitable on many accounts the birds should be released in the field above the pen.

[One free-ranging bird from each release site in 2011 has recruited into the main population; this recruitment may have been facilitated by the association with older members of the population. As all the known older individuals currently reside in the Release Site 1 area, this area should not be abandoned as a release site. However, as much of the early mortality in the Release Site 1 area was related with the release pen enclosure (predation through birds not being able to return to the pen once outside, collisions with the pen fence), birds should not be released into the pen. Using the temporary fencing methods employed at Release Site 2 we could release birds into a more favourable area, possibly the area where the main group of bustards now reside, to reduce post-release mortality. In 2012, we suggest that at least two release sites are used with the temporary fencing methods employed in 2011. Based on these new post-
release monitoring data, we can propose to establish a more favourable permanent release site in 2013. [K.Ashbrook & T.Szekely, 07/03/12].

This has been discussed within the team, permission sought and granted from the tenant farmer and MoD (as it would involve use of stone-curlew plot managed by the military), and costs established for the extra electric fencing that would be required (£1,200).

5. For consideration - Holding birds back

During the spring census in Russia project staff were able to see some birds from last year that had been held back from release for various reasons. They appeared strong, healthy birds with very good condition feathers. Similarly Bk20 was held back at Release Site 1 last year, and has now grown his wing feathers and is able to fly in and out of the pen with the others. It has long been recognised within the team that one thing that cannot be provided for the young birds is the prolonged post-natal care that chicks would have in the wild; staying with mother through autumn and winter and into the next spring until the mother wants to nest again. Perhaps keeping the chicks back in the pen, through clipped primary feathers, would allow them to bond with the older birds, to learn from them and grow stronger giving them a better chance of negotiating foxes once they are strong fliers, better preparing them for life beyond the pen? This of course could only happen at Release Site 1 as the 2m high solid fence would be required for ultimate protection while the birds were flightless. Holding birds back until the following spring would also mean we were ensuring the birds 'homed' to a location that we know has high predation levels, putting any nesting females and their chicks in great danger.

6. Disadvantages and advantages of releasing birds at Release Site 1

Disadvantages of Release Site 1:

1. 2m high solid pen fence has caused collisions from flights inside and outside of pen
2. Barbed wire fences surrounding the hide field prevent birds walking to the release pen or back to the suggested release area on higher ground above
3. Trying to ‘flush’ birds out of hide field is potentially hazardous to birds due to fences
4. Barbed wire fences bounding the track prevent birds walking to the release pen
5. Fox numbers remain high with constant influx from the Plain
6. A large enough area could not be electric fenced to effectively deter foxes
7. We are unable to control foxes at the project site or on Salisbury Plain
8. The electric netting could not be left open during the day as there is no regular human activity to deter foxes from the area during the day
9. Older bustards in the main pen may attract younger birds down into the valley

Advantages of Release Site 1:

1. Flat, open fields with plot on the higher ground regularly used by the older birds
2. The 1m high electric poultry netting could be deployed
3. Older bustards in the main pen for young to mix with, O15 only regular at Release Site 2
4. Maintaining releases will allow visitors to see bustards
5. Few people around due to military area

7. Surviving birds from 2011 release

T5 - released at Release Site 2

Spent winter in France (December 2011-May 2012). In May 2012 returned to within 5 miles of Release Site 2 but taken to Release Site 1 due to lack of birds at Release Site 2 and need to integrate this bird with other bustards.

Bk09 - released at Release Site 2

Accompanied (fostered) by O15 female through autumn and winter. Taken to Release Site 1 by O15 in December 2011. Has remained at Release Site 1 with group of males (O15 returned to Release Site 2 in March).

Bk17 - released at Release Site 1

Accompanied (fostered) by Y22 female through autumn and winter. Has left and returned to Release Site 1 several times.

Bk20 – overwintered at Release Site 1 with wings trimmed (now free-flying)

These birds have doubled the population of great bustards on Salisbury Plain and there is now a mixed sex and age group regularly using the pen and surrounding fields and plots. Although all the survivors from 2011 are at Release Site 1, it could be argued that only Bk17 and T5 have shown any site faithfulness, and although T5 was heading for her release ground she has so far not left the group at Release Site 1. Bk09 has made no attempt to return to Release Site 2 to date.

8. Conclusion & Recommendation

The apparent turn around regarding the decision to release birds at Release Site 1 was raised at the June project staff meeting (13/06/12). The project manager outlined that since the PSG agreed recommendation in January 2012, there had been no changes made at Release Site 1 to suggest it is now fit for purpose. The hazards to the birds have not been removed.
The only reason to reconsider this suggestion is that the established group of birds are at Release Site 1 and that two birds released at Release Site 2 in 2011 are now integrated into the Release Site 1 group. There is only one bird regularly visiting Release Site 2; O15.

The conclusion is that releasing birds at Release Site 1 puts many hazards in their way, greatly increasing the chances of them having a collision or being predated. However, how much the young birds learn from the older birds is unknown and there are presumed benefits.

We will be releasing birds at Release Site 2 again this year, as agreed by PSG in January, as following that decision we have sought a more secure area at Release Site 2. 2011 was a ‘trial’ release with the release field on loan and actively cultivated for crops in the spring/summer, used by the gamekeepers and shoot between October and February and used to grow sheep fodder in the winter. We now have a designated 10ha Land Management Agreement and as sole occupants LIFE+ project staff will undertake management of the land for bustards. No shoot activity is allowed there but we have agreement to control foxes on the LMA. Being at the far west side of a 20ha field, away from general farm activity, it should provide a refuge for the bustards if necessary during the shoot season.

We do have a commitment to the birds at Release Site 1 but with the ability to properly manage land elsewhere, we ought to be able to build-up a second population that would be a draw for any birds at Release Site 1.

The recommendation is that the project steering group uphold the decision made in January 2012; to not release any more birds at Release Site 1 but to release all birds at Release Site 2 in 2012 and continue to seek a second release site for 2013.

The Release Strategy was completed to schedule; however, this document will be updated and refined in 2013 to take into account highly successful modifications to rearing and release methods undertaken in 2012 and any agreements for Management Areas.
Action A3: Develop long term strategy to secure Great Bustard conservation

The project proposal identified several key steps for the development of this strategy:

i) Creation of a landscape-scale land-use plan for Wessex (the region of southern England in which Salisbury Plain lies), highlighting the habitat management that will be needed to support a self-sustaining population of great bustards in the area

An assessment of habitat preference by great bustards was completed in Q3 by the University of Bath which will form the first published paper under action E2. Information for this was used to visit and assess suitability of habitat in a 20 mile radius of the current release site in 2012. Using PTT data from 2004 - 2011, behavioural monitoring data, land use data from farmers and AES information from NE, a document will be completed in early 2014 identifying habitat availability and possibilities for provision of that habitat through AES across the Wessex area of southern England. Data for this will continue to be collected throughout 2013 by monitoring staff. In addition, using locations identified by PTT data the LIFE Project Adviser will visit many of the farms that great bustards have historically visited, investigating historic and current habitat and the possibilities for suitable habitat provision through the implementation of options under agri-environment schemes, under action C6.

ii) A review of opportunities for releases in other parts of the UK – for example in Breckland, a dry, sandy area in East Anglia

To date the project team have concentrated on increasing survival and identifying the causes of high mortality. This lead to closure of the original site as a place to release birds, and much effort has been put into Actions A2 and B2 to determine a set of suitability criteria for new release sites. The second year of release at Release Site 2 has resulted in incomparable success which we intend to build upon in 2013, and we have started the search for a second release site. Against the backdrop of this year's success with local work to build the population of great bustards, we have begun to consider other parts of the country for the future. The LIFE Project Adviser, LIFE Release Site Manager and volunteer Farm Liaison plan to visit Lincolnshire in December 2012.

iii) A review of the potential to obtain birds for reintroduction from source populations other than that being used at present
Work investigating the genetics of great bustards worldwide began in June 2012 by Dr. Paul O’Donohue at Chester University and is scheduled to be complete by the end of the year (see E2). This will update previous work on this subject for the species and greatly help to identify other potential sources of eggs or chicks for the reintroduction project.

**iv) A review of likely climate change impacts and the potential effects of these on great bustards**

The production of this document is planned for 2014.

**v) A review of the potential role of reintroduction in the conservation of great bustards elsewhere in Europe, and of how experience gained in the UK could best be used to inform work in other countries.**

The production of this document is planned for 2014.

**vi) Population viability analysis, based on the most up-to-date information, to inform any future release programme**

The production of this document is planned for the final year of the project, 2015.
**Action B1: Lease land for current release site**

The rent for Release Site 1 is paid monthly for the lease of an approx. 8 hectare field on which the release pen (7ha) and the project office are located. The release pen is managed specifically for great bustards (see project action C3 for information on site management). The facility and some equipment for hatching and rearing great bustard eggs coming from Russia was funded through LIFE+ in February 2012.

As previously mentioned we are no longer releasing birds at Release Site 1 (see A2). However, there are several reasons why we need to continue to rent this site – for the short-term.

Obligation to previously released birds:

- The adult males use this site as a lek
- Two birds released here in 2011, and two released at Release Site 2, two males and two females, use the site daily
- For the above reasons we need to continue monitoring the area and need to maintain the habitats within the pen for the immediate future.

Predator-proof pen for delayed release:

- If birds are deemed not fit for release at the correct time, due to feather condition for example, or a bird receives a non-fatal injury that can be treated but delays its release, we sometimes need a safe facility for birds that cannot fly to overwinter until gaining proper flight the following spring. The permanent fenced pen at Release Site 1 provides this facility.
**Action B2: Lease land for additional release sites and management areas**

This action is linked to action A2 which contains the details of how Release Site 2 was selected (Year 1 summary). The first ‘trial’ release at Release Site 2 had been very successful in comparison to releases in previous years at Release Site 1 (see action E2). Some problems were encountered in dealing with other farm users, however, we felt these could be overcome and a proposal for a Land Management Agreement (LMA) was put to the landowners. The LMA was agreed in principle in March 2012 covering an area of ten hectares in a different field on the same farm, the majority of which was already in spring barley at that time. We did have the opportunity to manage a hectare strip of land for bustards and planted a pollen and nectar mix, however, the majority of our management started at the end of July after the 2012 harvest. Before the 2012 release of great bustards the majority of the release site was barley stubble with volunteer oil seed rape growing (see action C4).

Two potential ‘Management Areas’ have been identified adjacent to Release Site 2, with approaches to the landowners planned for Q1 2013.
**Action C1: Transport young bustards from Russia to the UK**

**First import of Great Bustard eggs**

In July 2011 it was reported to the Technical Working Group that evidence from monitoring data suggested that chicks released earlier had survived longer (Appendix 1). As the UK quarantine restrictions meant that chicks from Russia could not be released any earlier, it was suggested that import of great bustard eggs should be investigated. If eggs could be hatched in the UK then the 30-day quarantine regulations would start with the hatching of the last egg meaning that chicks could be released at least one month earlier.

Incubating and rearing of UK hatched great bustards implied no deviation from the objectives and aims of the LIFE project, however, would incur some costs. Having undertaken a full budget review at the end of Year1, the Project Manager was able to identify savings so that costs for this action could be found within the current budget.

The project manager sought agreement from the External Monitoring Team; who noted that as neither of these budget changes exceed the threshold (Common Provisions Art 15.2) requiring a Modification Request - no formal modification request was required.

Incubation and rearing would replicate what is currently done in Russia, with methods developed by GBG but adopting better UK standards, however a review of rear and release techniques used in other projects was also undertaken by the RSPB. An aviculturist was employed from May 2012 and all equipment was made ready in advance of the import. We planned to import eggs at the start of the season in April.

However, difficulties with airlines delayed import such that many eggs had already hatched in Russia and only six remained for export. Equipment purchased through the LIFE+ project to facilitate this included a portable battery powered incubator and a thermal box for the flight, as the airline would not allow a powered incubator to be used.

In June 2012 the first great bustard eggs arrived in the UK.

All six eggs hatched in the new purpose built incubation and chick rearing building which was also built and equipped through the LIFE+ project. This new building was compliant with the UK quarantine regulations and was licensed as such. Sadly one chick hatched with an exteriorised yolk sack and died when a few days old, not an uncommon occurrence. The remaining five chicks were successfully reared and at the time of writing are all alive. The trial did allow the release phase to be started over a month earlier when compared to the chicks imported from Russia. A further advantage was the ability to control and monitor all aspects of the chicks’ rearing - something which has not been possible in Russia. The trial was judged a success by project staff. The equipment and facilities purchased for this successful trial in 2012 are available for
future use with either more eggs imported from Russia or from any other population and will be used through to the end of the LIFE+ project and beyond.

**Import of Great Bustard chicks**

On the morning of Thursday 26th July, the GBG Project Officer flew from Heathrow to Moscow to collect the 2012 consignment of great bustard chicks. He arrived in the evening and caught the overnight train to Saratov, arriving at 12:00 pm the following day. At Saratov, he was collected by the field station staff and driven to Diakovka village, where the field station is located. The weekend was spent ensuring that everything was ready for departure on the following Monday night (30th July). This included checking health and export paperwork was in order, and that crates for transport had been constructed.

On the Monday morning he went with the field station staff into Krasny Kut, a local town, to get veterinary paperwork stamped and signed before waiting for permission from customs to transport the chicks in the evening. A small lorry and driver had been hired to drive the birds to the airport and he arrived in good time in the afternoon. Customs finally granted permission to transport the birds just before their office closed for the night! Leaving the field station in the early evening meant that the air temperature was cooler for the birds. They stopped off at the Saratov office to collect the last few documents on the way through and arrived the following morning at Domodedovo airport near Moscow and immediately started the process of checking the birds onto their British Airways flight. This involved a great deal of paperwork and many lengthy discussions with various officials and departments.

Although long and arduous, all went well until one of the veterinary officers decided he was not happy with the list of microchip numbers! The document listed all chip numbers for the birds at the field station; the vet wanted a list with only the birds being transported on it. The list showed all birds that had been health tested from the flock.

After a lot of negotiation, he agreed to re-scan the birds in his presence, which had to be done in the back of the lorry at the airport. He finally agreed to let the birds travel, and the birds boarded the plane just in time!
Once back at Heathrow, he was collected and taken to the Animal Reception Centre where other project staff were waiting. The team waited for quite a few hours until the birds’ paperwork had been processed. Once everything had been completed, the birds were transported to the quarantine facility where we finally arrived late in the evening on 31st July. The project vet oversaw the process of checking over and settling the birds in and ensuring veterinary/quarantine requirements were met.

*Great Bustards from Russia awaiting customs clearance at Heathrow Airport*
Action C2: Carry out necessary health checks on young bustards

During the quarantine period of 30 days, it is necessary for four veterinary checks to be carried out on the young Great Bustards (health checks are also carried out in Russia, including swab samples taken and checked for any viruses just before the bustards are transported to the UK). All necessary health checks required by DEFRA in the UK are undertaken by project vets legally registered to the project.

In 2012, nine Great Bustard chicks arrived at Release Site 1 on Tuesday 31st July 2012, all of the birds were examined by the project vet on arrival and unloading. One bird was found to be drooping its wings and on examination was found to have fractures to both humeri. Loxicom was orally administered (this bird was later put down).

(1) faecal samples collected from quarantine units on 05/08. Lungworm was detected through examination of the faecal samples for which Panacur was administered to all birds as treatment.

(2) buccal and cloacal swabs were taken from the birds on 10/08.

(3) blood samples were taken for submission on 23/08, as well as a general health check.

Checks 2-3 involve project staff catching and handling each bird each time.
Report on UK chick rearing and husbandry - 2012

I. SET UP AND PROTOCOLS

1. QUARANTINE BARRIER PROTOCOLS

1.1 General Quarantine Protocols
- Outdoor footwear to be dipped on outside footbath prior to entering the facility, and to be removed and left in entrance hall.
- Indoor footwear to be taken from tray, placed on feet and dipped on footbath in front of the room that we are entering. Indoor footwear not to be in contact with entrance hall floor or outdoor footwear.
- Alternatively, outdoor footwear can be covered with disposable protective plastic sleeves and dipped in footbath when entering either room. The sleeves need to be removed and disposed in the bin as we step out of the room, and not touch the floor of the entrance hall.
- Coats to be worn in the hatchery.
- Dehumanizing suits or coats to be worn in the rearing room.
- Hands to be washed with F10 hand soap outside the facility prior to entering. Hands to be treated with F10 hand gel before manipulating anything and prior to leaving quarantine. Hands to be washed with F10 hand soap outside quarantine after exiting the quarantine facility.
- Rubbish to be bagged in bio-hazardous bag and to be stored in the quarantine residue unit.
- No tools, equipment, clothing, specimens, samples or liquids to leave the facility during the period of quarantine.

1.2 Recommendations
- Independent light switches to all rooms.
- Area for storage of cleaning tools and chemicals, as well as miscellaneous tools and machines that are not used on a regular basis or that are too big to be kept elsewhere.

2. HATCHERY

2.1 INCUBATION ROOM

2.1.1 Equipment and Set Up
a) List of equipment

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<th>Item</th>
<th>Quantity</th>
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<td>Bottle of F10 hand gel</td>
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<td>Thermometer probe</td>
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<td>Bottle of F10 hand wipes</td>
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b) Equipment setup

Both incubators were set at 37.2°C. The display on the incubators read both temperature and humidity. Humidity was kept between 45% and 55%, using distilled water to keep the water level stable or to increase humidity when needed. The incubator’s water pumps were not used. A thermometer probe was placed inside the incubators through the ventilation hole for a reading the air temperature on the surface of the eggs.

Room temperature and humidity were monitored with a wall thermometer and a digital weather station. The averages for room temperature and relative humidity were 22.9°C and 55.1%.

2.1.2 Incubation Routines

- All parameters (temperature and humidity of room and incubators) were checked and recorded every four hours between 06:00 and 22:00 daily.
- Eggs were checked for signs of movement, vocalizations or pipping every four hours between 06:00 and 02:00.
- Eggs were weighed once a day to monitor weight loss.
- Eggs were manually turned 180° three times a day on alternate directions, at 06:00, 14:00 and 22:00.
- The light was kept on during daylight hours.
- The window was kept open during daylight hours and its opening was adjusted depending on the external environmental temperature.
- Hands were disinfected with F10 gel before and after handling the eggs of each incubator.
- Surfaces and floor were cleaned and disinfected once a day.

2.1.3 Procedures on signs prior to hatching

Not all eggs were taken through the same procedures, due to a variety of factors.

The first clutch started hatching almost as soon as the eggs arrived, so there was little opportunity to observe weight loss or egg movement, and therefore to determine time between first signs of movement and external pipping. When the eggs of the second clutch started showing signs of movement, they were transferred onto a hatcher to avoid malpositioning of the chick prior to hatching. However these eggs took 6 days to externally pip, and in that time one of the eggs stopped losing weight for 2 consecutive days. This egg was put back on incubator conditions (low humidity) but without being turned. It pipped on the same day and the chick hatched with a large volume of protruded tissue, likely due to the egg not being able to lose weight in the hatcher’s high humidity conditions.

With the last clutch of eggs I tried the following guidelines and in retrospective I believe it might have been the best course of action for most of the eggs.

<table>
<thead>
<tr>
<th>Sign/Time</th>
<th>Interpretation</th>
<th>Move to</th>
<th>Setup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four days after first signs of movement</td>
<td>Chick might be getting ready to pip internally</td>
<td>Pre-hatching conditions to:</td>
<td>Incubator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Avoid malpositioning</td>
<td>T= 37.2ºC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Allow weight loss</td>
<td>45% &lt; H &lt; 55%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No turning</td>
</tr>
<tr>
<td>Vocalizations</td>
<td>Chick internally pipped</td>
<td>Hatching conditions to:</td>
<td>Hatcher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Avoid drying</td>
<td>T= 36.7ºC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>H &gt; 70%</td>
</tr>
</tbody>
</table>
2.2 HATCHING AND BROODING ROOM

2.2.1 Equipment and Setup

a) List of equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatcher Brinsea</td>
<td>2</td>
<td>Bottle of F10 hand gel</td>
<td>1</td>
</tr>
<tr>
<td>Brooder Brinsea “TLC-3’”</td>
<td>2</td>
<td>Bottle of F10 hand wipes</td>
<td>1</td>
</tr>
<tr>
<td>Whiteboard markers</td>
<td>1</td>
<td>Bottle of distilled water</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hygrometer probe</td>
<td>1</td>
<td>Jug</td>
<td>1</td>
</tr>
<tr>
<td>Thermometer and hygrometer probe</td>
<td>1</td>
<td>Chick weights log</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temp and Hum log</td>
<td>1</td>
</tr>
<tr>
<td>Kitchen roll</td>
<td>1</td>
<td>Water atomizer bottle</td>
<td>1</td>
</tr>
</tbody>
</table>

Spares kept in storage unit: boxes of gloves, F10 wipes, F10 hand gel, kitchen roll, F10 disinfectant spray bottle, sample pots, astroturf for brooder, tweezers, cups, syringes and needles.

b) Setup

The hatcher was set up at a temperature of 36.7°C. Humidity in the hatcher was 75% on average and was kept higher than 70% at any time with distilled water. Thermometer and hygrometer probes were placed inside both machines for more accurate reading at the egg and chick level. The brooder was kept initially at 36.5°C and the water containers were topped up with distilled water. The probe placed on the floor of the brooder recorded an average temperature of 33.6°C and relative humidity of 63%. The temperature was gradually reduced during the stay of the chicks and prior to moving them to the rearing room.

Room temperature and humidity were monitored with a wall thermometer and a digital weather station, which recorded an average temperature and humidity of 22.1°C and 57.6%. 
2.2.2 Hatching Routines

- All parameters (temperature and humidity of room, hatchers and brooders) were checked and recorded every 4 hours between 06:00 and 22:00 daily.
- Hatching eggs were checked for progress every two hours between 06:00 and 02:00 daily.
- Eggs were weighed once a day to check progression of weight loss.
- The light was kept on during daylight hours.
- The window was kept open during daylight hours and its opening was adjusted depending on the external environmental temperature.
- Hands were disinfected with F10 gel before and after handling the eggs or chicks.
- Surfaces and floor were cleaned and disinfected daily.

2.2.3 Brooding routines

- As soon as a chick was out of the egg it was weighed, inspected and moved to the brooder, placed on tissue to dry out.
- Egg sample taken for genetic study, labeled and kept in the fridge.
- Each hatcher was used for only one clutch at a time in rotation. After a clutch had finished hatching, the hatcher was washed and disinfected, ready to use again.
- All chicks were kept a minimum of 24 hours in the brooder unless they had a sibling hatching that would join them, in which case they remained there until the younger sibling had been there for 24 hours itself.
- Chicks were checked every 2 hours.
- Day 0: First fluids were given 4 hours after hatching and every 4 hours for the first 24 hours between 06:00 and 00:00.
- Day 1: First solids were offered 24 hours after hatching and consisted of one soaked lundi pellet with Avipro and one soft invertebrate. After that the chick was offered food every 2 hours (3-5 soaked pellets with Nutrobal) during days 1 and 2 between 06:00 and 22:00.

Rearing note: Solids were offered with the puppet. The chicks were normally keen to take the food offered but their aim was poor for the first few attempts, so patience was needed.

<table>
<thead>
<tr>
<th>SITUATION</th>
<th>ACTION/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatched chick with blood on navel</td>
<td>Wash and iodine area and check periodically</td>
</tr>
<tr>
<td>Hatched chick with placenta hanging from very fine string</td>
<td>Cut string to prevent it from pulling navel contents out when chick moves and iodine area</td>
</tr>
</tbody>
</table>
**2.3 RECOMMENDATIONS FOR THE HATCHERY**

- More work surface to work comfortably with the various machines and bits of equipment, disinfectants, scales, forms, jugs of water, kitchen roll etc. and to be able to do various consecutive tasks without having to shift equipment and tools out of the way to make room for the next task. Ideally there should be as much free surface as the area occupied by the machines.
- An area designated for washing and cleaning the equipment, large enough to wash comfortably large items such as brooders, tables, hatchers, incubators, astroturf and bins.
- More storage space in cupboards under worktops.
- Shelves above worktops to be removed, to avoid objects falling onto equipment, eggs or chicks.
- Incubators: As many incubators as needed (each Octagon 20 can hold up to nine bustard eggs) plus three extra incubators (one to run dry for eggs that fail to lose weight, a second one to isolate eggs with health concerns or cracked shells, and a third one for backup in case of power failure or malfunction of any other one).
- Hatchers: A minimum of three hatchers to be used and cleaned in rotation, plus an extra one for backup in case of malfunction.
- Insect lights above worktops to be removed to avoid insect remains and debris from falling onto equipment, eggs and chicks.
- A freezer to keep samples, carcasses and other material that has to be kept below zero degrees.
- More thermometers, hygrometers and probes, one for each machine.
- A bin in each room, preferably pedal-operated so that no hands are needed to open and close it.
- Running tap water and a grey water containment unit.
3. REARING ROOM AND PENS

3.1 Equipment

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand (substrate main area)</td>
<td>8 bags</td>
<td>Digital baby scales</td>
<td>1</td>
</tr>
<tr>
<td>Astroturf (in rearing box)</td>
<td>1</td>
<td>F10 hand gel bottle</td>
<td>1</td>
</tr>
<tr>
<td>Table</td>
<td>1</td>
<td>Kitchen roll</td>
<td>1</td>
</tr>
<tr>
<td>Food dish</td>
<td>3</td>
<td>Water atomizer</td>
<td>1</td>
</tr>
<tr>
<td>Wall thermometer</td>
<td>1</td>
<td>Weights log</td>
<td>1</td>
</tr>
</tbody>
</table>

3.2 Rearing routines

**Basic routines**

- The lights were kept on during daylight hours.
- The heating lamps were kept on all the time, except on very hot days, in which were switched off between 12:00 and 18:00.
- The window was open all the time, more open during the day and almost closed at night time.
- The food dishes were switched at every meal and the dirty ones were washed and disinfected to be ready for the next meal.
- The sand was sieved every day with the birds shut outside in the covered pen.
- The astroturf in the rearing box was swapped every day for a clean one, and the dirty one was washed and disinfected to be ready for the next day.

**Diet**

The diet consisted of soaked ‘Lundi regular’ pellets (60%), chopped lucerne (40%) and invertebrates (2-3 inverts per bird per meal). Oilseed rape and dandelion were added to the diet at 10 days old. As chicks grew the overall quantities increased whilst the number and frequency of meals decreased.

**Weaning**

The birds were fed with the puppet and encouraged to feed from the dish. If the chicks would start pecking from dish they were left to get on with it until they stopped. As they grew older chicks were pecking from dish more readily at beginning of meal times so dish was offered for them to feed for themselves until they stopped, time for the puppet to take over and encourage them to feed for a bit longer.
Feeding regime progression

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3 days</td>
<td>Every 2 hours</td>
</tr>
<tr>
<td></td>
<td>06:00 till 22:00</td>
</tr>
<tr>
<td>3-20 days</td>
<td>Every 3 hours</td>
</tr>
<tr>
<td></td>
<td>06:00 till 21:00</td>
</tr>
<tr>
<td>20-30 days</td>
<td>Every 4 hours</td>
</tr>
<tr>
<td></td>
<td>07:00 till 19:00</td>
</tr>
<tr>
<td>30-35 days</td>
<td>Every 6 hours</td>
</tr>
<tr>
<td></td>
<td>08:00 till 20:00</td>
</tr>
<tr>
<td>Over 35 days</td>
<td>Twice a day</td>
</tr>
<tr>
<td></td>
<td>08:00 and 18:00</td>
</tr>
</tbody>
</table>

Imprinting on the suit and puppet

The chicks were fed from day 1 with the help of the puppet by a handler wearing the suit and hood. The suit was used to relate to positive experiences such as being fed and walking through the vegetation of the outdoor enclosures.

The chicks were trained to be weighed on top of baby scales covered by astroturf with positive rewards, so the suit was involved in this training. The suit was also useful to move chicks between areas to contain them during work in other facilities such as maintenance, repairs, cleaning or washing of equipment.

The suit was not used to carry out tasks that the chicks would relate to negative experiences, mainly any type of handling for the purpose of examination, treatment or ringing. For these instances a lab coat was worn during quarantine and normal overalls were used after quarantine was lifted.

The suit’s design, shape and color pattern seemed to work well, with only some small issues related to its size and length: the bottom end was too long and drags on the floor, so it was pulled up by inserting a rubber band in the rim. The sleeves also drag on the floor as most of the early work is done crouching next to the chicks, so the sleeves were knotted up to keep from dragging. Also most chicks seemed attracted to white long and narrow objects (resembling worms perhaps) so they would try to reach and peck the white rim at the bottom of the
suit and the sleeves. Attempts were made to disguise the rim it or to keep it out of the way.

The puppet worked well getting chicks to feed from its beak, showing them how to peck at objects on the food dish and pull at vegetation. After each meal the puppet was left on the floor to keep a reassuring presence while chicks were young (up to two weeks old) as sometimes they would snuggle up against the puppet. After two weeks the puppet was shown only during meals to encourage the chicks to feed for themselves, rather than to expect to be fed by the puppet.

**Mixing age groups**
Chicks of different clutches were mixed together when the youngest were at least four days old (after spending two days in the brooder and two days in the rearing pen). The younger chicks could hear the older ones in the rearing room from the rearing box, and on day 5 the partition was removed and they were mixed. No aggression between chicks was observed when the chicks were mixed in this way.

**Enclosure progression, exposure to sunlight and exercise**

<table>
<thead>
<tr>
<th>AGE</th>
<th>QUARANTINE</th>
<th>AGE</th>
<th>MOVED TO BIRD HOUSE IN PEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2 days</td>
<td>Brooder</td>
<td>31-32 days</td>
<td>Shed</td>
</tr>
<tr>
<td>3-4 days</td>
<td>Rearing box</td>
<td>33-37 days</td>
<td>Run</td>
</tr>
<tr>
<td>5-6 days</td>
<td>Rearing room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-7 days</td>
<td>Outdoors – covered</td>
<td>37-71 days</td>
<td>Pen only on supervised walks</td>
</tr>
<tr>
<td>8-30 days</td>
<td>Outdoors – uncovered</td>
<td>Over 71 days</td>
<td>Pen free access plus walks</td>
</tr>
</tbody>
</table>

Once let into the rearing room the chicks had still access to the rearing box which had astroturf, unless it was needed for younger chicks. Any new access to outdoor facilities (either covered or uncovered, the shed run or main pen) was always for short and supervised visits during the first day. After that the chicks had free access to the facility and were only kept indoors during periods of bad weather (mainly rain).

The chicks always chose to sleep under heat lamps, both in rearing facilities and in the Bird House in the pen, so access to indoor heat lamps was never restricted during the night.
3.3 RECOMMENDATIONS FOR THE REARING FACILITIES

- The creation of a washing facility to clean equipment and tools. Could even be the same as the hatchery cleaning area.
- The creation of a separate area with a worktop to hold various pieces of equipment and recording material, such as gloves, hand gels, weight logs, thermometers, etc.
- A stuffed bird was not used but it might be considered a positive substitute used by very young chicks to cuddle up to in the absence of the aviculturalist.
- Decoys were not used on the rearing process, but they might be a useful tool for the chicks to get used to, so consideration might be given to their use in outdoor facilities during the rearing of the chicks, both in the rearing quarantine and in the bird house.

4. ‘BIRD HOUSE’ IN FIELD PEN

The birds were moved to the Bird House in the pen on the 7th August 2012, when the oldest chick was 51 days old and the youngest was 36.

They were transferred by being walked to the new enclosure and were kept inside the shed during the first day. On the second day they were walked in the outdoor run supervised, and on the third day they were allowed free access to the outdoor run during the day. The chicks were kept in the shed during night time for the first week in the bird house, and after that the shed’s door was kept permanently open.

The bird house was fitted with four heatlamps, a dustbathing area with sand in a corner, the weighing scales, a drinker and a food dish. Outside the run was another drinker.

After five days in the bird house the birds were walked by a suited person in the main pen for the first time. The first walk was kept short and to a structure, from that moment the birds were walked outdoors following the same structure between one and three times a day, depending on the bird’s willingness and the weather (unless the weather was very bad throughout the day in which case the birds weren’t walked at all).

The birds were fed soaked ‘Lundi’ pellets on a food dish twice a day, morning and afternoon. If the bad weather didn’t allow for the birds to be walked and fed on the crops, vegetation such as lucerne, dandelion and oilseed rape was added to the food.
The structure of the walks was simple:
- If weather allowed it, birds were walked before their morning and afternoon meal.
- The birds were let out by the door at the far end of the run, following the handler.
- Once outside they were kept in a loose group that followed the handler through different types of crops and wild grasses where they were encouraged to feed on vegetation and small animals such as insects, arachnids and molluscs.
- Stops were made throughout to allow the birds to feed, dust bathe or sunbathe in an area for a while.
- The birds were offered food by the handler throughout the walk to keep the bond with the ‘mother’ figure.
- The birds were never handled, picked up or chased during the walks to avoid negative association.
- The birds were walked back towards the bird house, gathered outside the door of the run and then called from inside the run using the white tub or bucket with the insects, once inside the birds were offered the tub with the insects and allowed to have them all while the handler closed the door behind.
- Once the birds had finished the insects the handler stayed in the run with the birds and offered them the food dish with their morning or afternoon meal of soaked pellets.

5. REARING SUMMARY

5.1 CALENDAR OF EVENTS
Aviculturalist arrived and started working on the 21st, preparing rooms, setting equipment and testing machines and starting recording parameters. Eggs arrived on the 14th June 2012.

First clutch started hatching straight away during the first weekend and the second and third clutch hatched within a week from each other.

<table>
<thead>
<tr>
<th>Clutch 20</th>
<th>Egg 20.1</th>
<th>Chick 1</th>
<th>17-06-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Egg 20.2</td>
<td>Chick 2</td>
<td>18-06-2012</td>
</tr>
<tr>
<td>Clutch 22</td>
<td>Egg 22.2</td>
<td>Chick 3</td>
<td>24-06-2012</td>
</tr>
<tr>
<td></td>
<td>Egg 22.1</td>
<td>Chick 4</td>
<td>24-06-2012</td>
</tr>
</tbody>
</table>
5.2 EGG DEVELOPMENT, WEIGHT LOSS AND HATCHING

The eggs were weighed every day and the weight loss was recorded. The average weight loss seemed constant in time and the daily average loss was of 0.87g per egg.

First signs of movement, when it was observed, was at 6 (two eggs), 7 and 9 days before hatching. Sound was mostly detected after external pipping, and in one egg it was detected one day before external pipping.

Egg 22.1 did not lose weight for the two days prior to hatching and the chick (Chick 4) hatched with a large mass of protruded tissue. These events seem related as it was the only egg that failed to lose weight in such manner.

5.3 Chick growth, weight and health issues

With the exception of Chick 4 who died at 2 days of age, the rest of the chicks were weighed once a day at least. Chicks with health concerns were weighed more often and the daily weight has been averaged. Missing weights correspond to days when the chicks could not be weighed or the scales had no battery. At around 10 days of age the chicks could no longer be weighed with the precision scales and were weighed on human baby scales, which in comparison are much less accurate and have a minimum weight difference of 10g.
Chick 1
- Developed angel wing only once and received short treatment at 16 days of age.
- At 40 days old, problems with the feather condition were detected, pinched feathers were dropping and looking malformed. The second lot of feathers looked much better but also started falling in a similar manner.

Chick 2
- Developed angel wing and was treated for it at 14 days of age and again at 25 days.
- Always having been a quiet bird, it lost interest in food at around 25 days of age, while the weight stopped increasing. It was fed more regularly and on its own, and received a three day-course of antibiotics at the time.
- At 30 days of age a problem with the feathers was detected, with pinched and malformed feathers dropping off the body. The second lot of feathers looks better but is dropping too.

Chick 3
- This chick hatched with a small bit of tissue hanging by a thread from its navel and was put on a 5 day-course of Synulox at 1 day of age.
- Developed angel wing on one wing at 15 days of age and was successfully treated for it.

Chick 4
- Hatched with a large volume of tissue protruding from navel. The tissue was amputated and treated with fluids and antibiotics. Died at 2 days of age.

Chick 5
LIFE+ Project “Reintroducing the Great Bustard Otis Tarda to Southern England”
(LIFE09/NAT/UK/020): Year 2 Summary

- This chick hatched with a small volume of tissue (the size of a marble) sticking out of its navel. The chick was put on a 5 day-course of Synulox and the tissue was regularly washed and disinfected until it shrank and dried off.
- Was treated for angel wing at the age of 17 days which recurred and was treated for again at 46 days old.

Chick 6
- This chick always had good appetite and a slight overnight jump on its weight might be behind a slight torsion of the left leg. On inspection by the vet it was determined that the ligaments at the hip level were a bit looser than they should be and the chick’s food intake was restricted for five days to an amount that would allow it to grow avoiding sudden increases in bodyweight. A month later, having been moved to the bird house in the pen and given regular walks in the fields the torsion seems to have corrected itself to a degree that is hardly noticeable.
- At 21 days of age this chick presented sudden apathy and lack of appetite, very unlike its usual behavior. It was not interested in food and for a while it would spit out any food that it would try to take, even when offered soft invertebrates. It was noticed that the chick had not passed feces for over 6 hours, which is also very unusual. After a few hours under observation the chick was given fluids with Avipro and forty minutes later it passed a large poo. From that moment the chick started taking food at short intervals and resumed passing feces regularly. The following day it was put on a 3 day-course of antibiotics.
- Was treated for angel wing at 18 days old, and shortly after at 21 days. It recurred once more at 44 days, very faintly, and was treated again.

Great Bustard chicks reared in the UK for the first time, 2012.
Quarantine and Release Schedule August – September 2012

Introduction

In Year 2, effort was concentrated on trying to improve the pre-release condition of the birds to help improve their survival. Changes implemented included giving them larger quarantine units with more windows creating a more open space, wearing a dehumanisation suit when providing food, not applying any wing-tags or harnessed transmitters, and therefore less handling. The decision not to apply wing-tags or harnessed transmitters was not unanimous among the LIFE+ project partners.

Although research undertaken by J-C Alonso in Spain reported that there is no negative effect to birds from wearing the same type of harness that has been applied to the UK released bustards in the past, the RSPB and GBG realised that in Spain, the harnesses are being applied to wild-bred young bustards that are still with their mothers and so have a much higher starting point in terms of condition and capability than do the UK released juvenile bustards. These are captive reared in Russia by an aviculturist, never see an adult bustard, potentially damage feathers during each capture for veterinary checks both in Russia and the UK, undergo 24 hours of travelling in crates from Russia to the UK, spend 30 days in quarantine where more damage to feathers is possible and are then released at 2-3 months of age once monitoring devices have been applied. Photographs taken of wing and tail feathers in 2011, showed many birds to have primary and tail feathers either missing or broken. (In that year, more photographs were taken after the birds had been in soft-release pens for seven days; this found no further damage had occurred and so supported the continued use of the new soft-release pens). The RSPB and Great Bustard Group wished to trial a year when birds did not have monitoring devices applied, especially as it appeared that the number of birds available to be imported was going to be low.

The University of Bath and Natural England considered that every bird should carry some kind of monitoring device to allow them to be located should they leave the release site. The University of Bath investigated past survival rates with distance for those birds carrying monitoring devices, however, not enough birds had survived to produce statistical evidence with most birds not having flown far from the release site. Indeed, there was only one bird alive currently carrying a non-functioning PTT. Natural England were concerned that without PTT data it would be difficult to determine the cause of death of birds that did not survive. Applications were submitted to the BTO by the project manager for the purposes of BTO ringing and colour-ringing the birds, and an application to use unconventional methods proposed the application of wing-tags, radio necklaces and PTTs via harness for the UM Technical Panel to decide what was appropriate. The BTO UNTP response suggested there was no evidence for not using wing-tags, no evidence either way for the use of radio tags, and prescribed a cautionary approach to using harnessed transmitters. Three members of the project Steering Group (RSPB, GBG and project manager) decided upon using leg rings only.
Changes were made to the quarantine units to try and lower stress for the birds, and therefore lower the frequency of flapping and jumping from fright and any subsequent damage caused. The main quarantine building for the Russian chicks was opened up to make two pens that were twice the size of the previous year, with five birds in one unit and three larger birds in the other. In addition, these two units had extra windows.

This was the first year that we have used suits to disguise the human shape when feeding the birds. The suits differed in colour from front to back, instead of the normal top/bottom slit of colour seen worn by humans. The colours also had some resemblance to that of the birds. Suits were worn when feeding the birds in quarantine; this year taking the food dish into the pens with the birds instead of pushing it through a pophole. At the release site suits were worn by those undertaking daily morning and afternoon checks. We continued to provide Lundi pellets and mealworms daily. This allowed us to get close views of the birds to assess their condition. Four adult birds learnt quickly that the chicks were finding interesting food following arrival of the ‘suit’, and gradual changes were observed in the behaviour of the adult birds toward suited individuals.

**Release of UK hatched chicks**

On 7th August 2012, the UK hatched chicks were moved from the chick rearing facility to their new, bigger enclosure within the main release pen at Release Site 1, following 30 days of quarantine after the last chick had hatched. The oldest bird was 51 days old and the youngest 36.

Their enclosure within the main release pen comprised a 2m x 5m solid shed with small windows to allow light and air in but high enough that the birds could not see out of them. There was then a door out into a pen made of pheasant rearing panels; five panels long by two panels wide, with soft black mesh stretched over and fastened down the sides with ‘S’ clips to create a soft roof. Each panel was 3m wide by 1.5m high giving the birds an outdoor pen area of 90m sq.

The shed in which the birds would be shut into at night for the first week and could go freely in and out of during the day, was equipped with four heatlamps, a sand dustbathing area, scales for continued daily weighing, a feed dish and a drinker. There was another drinker outside in the run. There were two doors into the pen, one for staff access nearer the night shelter and one on the end with a lower step for walking the birds out into the main pen.

The birds were transferred from the rearing facility to their new enclosure by using the suit and walking them from one to the other. They were kept in the shed on their first day, allowed out supervised on the second and allowed unsupervised to roam their pen from the third day onwards.
The enclosure and night shelter

After five days in their new enclosure they were taken out for walks with a suited person, starting off with short structured walks and progressing to longer more varied walks, showing them different vegetation and allowing them to peck at various foliage that had been planted specifically within the release pen for bustards. During these walks there was some interaction between the chicks and the adults that were in the release pen at Release Site 1 at the time, particularly female T5 who would come closer than the rest. However on Sunday 09th September the five adults left Release Site 1 and were reported at the second release site.

On 11th September the two panels at the end of the outdoor run were removed giving the five chicks free access to the whole of the release pen. For the first few days the chicks stayed fairly close to the pen and only ventured further when taken on walks with a suited person. On 17th September the UK hatched chicks were ringed by two BTO licensed ringers with lime green leg rings on the left leg; L07, L08 and L09 (males) and L25 and L26 females) and the BTO metal ring on the right leg.
Quarantine & husbandry: Russian chicks

On 31st July 2012, nine Russian chicks arrived at Release Site 1 in two crates at 2300 hours. This was a much lower number than expected and due to there being a lower number of eggs received at the field station in Diakovka. In addition, the Russian partners required half of those birds available to release in Russia; as we had already had six eggs (see above report), these also counted towards our quota. Of the nine birds, only six were subsequently released.

Quarantine had been made ready following the guidelines issued for ‘Approved quarantine facility’ Commission Regulation (EC) 318/2007, and approved by Animal Health, Veterinary Laboratories Agency (AHVLA) Gloucester.

Two large units were created by removing a separating panel and more windows were created allowing a wider external view. This was implemented to lessen any stress that may be caused by the enclosed space, and in an attempt to stop the birds from ‘jumping’ up to the roof netting as they have done in previous years. The walls of quarantine units were lined with thick plastic again this year, to avoid feather abrasion. Just inside the entrance of each unit, a small roofed area provided dry ground for dust-bathing, shelter and to keep food from spoiling in wet conditions. Thick carpet was used to cover the wooden beams of the roofed area to protect the birds should they jump up.

All quarantine regulations were followed. Rearing suits were put on and footwear was changed in the entrance porch and boots dipped in F10 disinfectant solution before
entering the main building. This dip was replenished regularly. Disinfected mats were placed at the entrance to each unit; these were regularly soaked with new F10 solution.

A water supply had been installed for cleaning food dishes, changing drinking water and cleaning hands. All refuse was secured in black bags and stored in a cupboard for the duration of quarantine. Waste water was also stored in a large sealed container for the duration of quarantine. Hand-wash, F10 solution and nailbrushes were used to clean hands before leaving quarantine and again after leaving the unit.

The birds were fed twice per day, c.0700 and c.1600. Food was prepared in a small unit at the end of the main building, placed on large dishes and taken into the units by staff wearing a dehumanisation suit. Collection of food dishes and drinking water containers for filling or cleaning was all undertaken wearing the suit. This year both oil seed rape and lucerne were grown in the plots outside of quarantine, and so both were provided at each feed time. No iceberg lettuce was given in 2012. The aim this year was to reduce protein levels in the diet and although cheddar cheese was provided, the amount was very much reduced and no cottage cheese was given. White mice were generally only provided occasionally and were used to administer medication to the birds, if necessary. Mealworms were provided again this year. Quarantine ended on 30 August. Official permission to release the birds was received on 2 September.

**Ringing of chicks**

Altogether 12 birds were ringed with both a BTO metal ring, on the right leg, and a plastic coloured ring on the left leg (see Table 1). Rings were applied to the birds by licensed ringers. In 2012 the colour rings were lime green with black numbers. Birds were ringed from two months of age when there was no risk of the ring slipping down over the toes.

On the same day the seven Russian birds were transported from quarantine to the release pens at Release Site 2. This involved one trip to the site with the seven birds contained in two large animal carriage boxes. During this day photographs were taken of wings and tails of each bird for reference to feather condition. On the day before the birds were due to be released one bird was found to have broken its leg in the soft release pen and unfortunately was euthanized on 8th September. The following table shows the ring combination and sex of the six birds released at Release Site 2 in 2012.
**Table 1: Great bustards ringed by the UK project in 2012**

<table>
<thead>
<tr>
<th>Sex</th>
<th>BTO ring no.</th>
<th>Right leg</th>
<th>Colour ring ID</th>
<th>Left leg</th>
<th>Ringing date</th>
<th>Release site</th>
</tr>
</thead>
<tbody>
<tr>
<td>*M</td>
<td>4010002</td>
<td>L02</td>
<td>02/09/2012</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4010003</td>
<td>L03</td>
<td>02/09/2012</td>
<td>Release Site 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4010004</td>
<td>L04</td>
<td>02/09/2012</td>
<td>Release Site 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4010001</td>
<td>L06</td>
<td>02/09/2012</td>
<td>Release Site 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5268951</td>
<td>L21</td>
<td>02/09/2012</td>
<td>Release Site 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5268953</td>
<td>L23</td>
<td>02/09/2012</td>
<td>Release Site 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5268952</td>
<td>L24</td>
<td>02/09/2012</td>
<td>Release Site 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4010005</td>
<td>L07</td>
<td>19/09/2012</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4010006</td>
<td>L08</td>
<td>19/09/2012</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>4010007</td>
<td>L09</td>
<td>19/09/2012</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5268954</td>
<td>L25</td>
<td>19/09/2012</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>5268955</td>
<td>L26</td>
<td>19/09/2012</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*L02 broke a leg in the soft release pen and could not be released.

**Soft-release pens**

Following 30 days in quarantine, the birds require a period of adjustment to the surroundings, to adapt visually to the immediate landscape, to see older bustards in the vicinity and to ‘home’ to the site. Using the same design of soft-release pen adopted in
2011, two adjoining units were built. One contained the seven birds, the other remained empty so that if any birds needed to be separated they could be moved or if the first unit became too soiled the birds could be moved next door.

Each pen unit was constructed using three panels by two panels (6m x 9m) providing an area of 54m²

54m² /6 birds = 9m² per bird (great bustard wingspan ~ 1.8m).

[In 2011 the area provided was 7.2 m²/bird]

In late August the release pens were constructed on top of oil seed rape that had been planted in a strip at the release site. Inside each pen was placed a food dish and water container. As extra protection and to stop predators from trying to dig underneath the pens, two 50m lengths of poultry netting were joined together and erected around the outside of the pens at a 2m distance. Four wooden corner posts were erected to help tighten the netting. A single steel wire was then located, at 10cm above ground and fixed with metal corner stakes and plastic fencing posts. A single 3-Joule energiser and 12v battery provided the electric.

An automatic feeder was placed a few meters from the pens; this was not switched on initially but provided the focus of where feed trays were placed. A water container was also nearby. In addition, several plastic bustard decoys were situated in the pen. The auto-feeder was switched on December 10th to distribute Lundi pellets twice per day. This was left on over the winter.

During their time in the soft-pens the birds were provided with the same food and water that they had received in quarantine, by one person wearing the suit.
2012 Release

Two days before release started, four adult bustards that had spent the whole winter at Release Site 1 arrived at Release Site 2. P5 (2007), Pk2 (2010), Bk9 (2011) and T5 (2011), the 2011 birds had both been released at Release Site 2 the previous year but neither had been there since. These adult birds spent a lot of time around the soft release pens while the chicks were inside. They moved away when the suit arrived and Pk2 flew further up the field.

The chicks were released between the 10th and 13th of September, the doors of the soft release pen being closed nightly until the 13th. Then on the 14th the end panels were permanently removed. Some of the chicks came back into the open pen for some time after release, but this slowly wore off. Three of the birds came out of the pen on Day 1 of release and one took off and did not return. This bird however returned to the release field on Day 3 after spending two nights out alone. The electric netting plus the use of the suit proved very useful as two of the males found themselves out of the pen in the adjacent field on separate occasions; we were able to simply approach them and lower or open the netting to allow the bird to walk in and return to the group. It was apparent that the suit worked best from inside of the release field, not outside.

Over time the group of four adults got used to the suit going to the centre of the field where the food dishes were placed. The chicks would see the suit and come running or flying across the field. The adults even started to come and join the chicks at feed time. We decided to continue providing mealworms and Lundi pellets daily as even though the chicks did not need this, and were most often feeding elsewhere with the adults...
when we arrived, we hoped that it would help to retain them at the site and stop them from dispersing.

In 2012 the suited staff saw that the birds all flew very well; they took off immediately upwards, showed good control in flight and direction, and all landed well. This was in complete contrast to 2011 when some birds did not fly too high or far, and sometimes did not want to take off again after an exhausting flight. In 2012, we also received many comments and reports from the farmer and other farm users that they were seeing the birds fly much more this year.

One interesting and often daily observation occurred when red kites flew over the release field. The kites spooked the bustards such that they all took off, usually circling over the site several times before landing back inside the release field again. At other times they flew much further away, returning some time later.

By Day 14 of release, four of the chicks had roosted outside of the release field with the adults, and all six chicks were roosting outside by Day 51. However, all birds roosted inside the release field most of the time. On Day 57 (November 5th) a female chick (L21) disappeared. On Tuesday 6th November she was found in Les Sables d’Olonne, Vendee, France, and taken to the Veterinary Centre of Wildlife and Ecosystem in Nantes on Saturday 10th November. The LPO had found her exhausted but not injured and taken her to a veterinary clinic in Nantes. Due to the time she spent in captivity, the fact that they tame very easily and that she could not be released into the countryside in France as there are no bustards there, the project team decided that the best chance of survival for this bird was to collect her and return her to the group at Release Site 2. On 17th November L21 was returned to her group at Release Site 2 and settled quickly.

P5 (a five-year old male) has visited Release Site 2 in previous years but having not left Release Site 1 for some time, it was interesting to see him arrive at Release Site 2 with the other three adults back in early September, just days before we were to release the chicks from the soft release pens. Over the weeks, as the adults became increasingly trusting of the suit arriving twice a day with pellets and mealworms for the chicks, they started to come closer and staff soon started to wonder if it would be possible to remove the now non-functional PTT from P5 that had stopped transmitting in April of this year. P5 became very territorial over the feeding area and started to ‘escort’ the suit in and out of the area on a twice daily basis, often ‘barking’ continually. The task to remove the PTT fell to the GBG director and on one morning when the chicks were all happily far away at the food dishes, with P5 at his heels he managed to tackle the bird and swiftly cut the elastic. P5 simply turned and walked back to his group seemingly unaware of what had just occurred, leaving the GBG director with PTT in hand and a large scar to his face!

In previous years released birds have usually dispersed from the release site during the first week of November. In 2012, apart from L21 making the trip to France, following her return all the released chicks stayed at the release field for over 90 days – this is a
record number of days for the reintroduction project. In December, the adult group of four birds decided to return to Release Site 1 (probably led by P5 who was released there and has set up the lek there). The chicks remained at Release Site 2 for a further week but then all left the site, we think as a group.

**Results of changes made for Release No 2. 2012**

- Improved feather condition as a result of larger quarantine, less handling, no wing-tags or harnessed transmitters
- Improved flight as a result of the above and therefore overall better condition of the birds
- Less ‘jumping’ into the roof netting as a result of windows in quarantine
- A record retention of birds at the site: 90 days post-release
- Improved survival of released birds: 100% to 90 days post-release
**Action C3: Optimise condition of current release area**

**Year 2 report**

*01/09/2011 – 31/08/2012*

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**Introduction**

The original release area for the great bustard reintroduction project covers seven hectares. This area is enclosed by a 2m high predator-proof fence, with two electrified wires around the base, set at approximately 8cm and 20cm from the ground, and one approximately 25cm from the top.

Land has been managed at this site for great bustards since the first release in 2004. In 2007 the original four hectare fenced area was extended to its current size. Habitat management within the enclosure is designed to provide the best possible conditions for feeding, resting and breeding bustards, with the primary focus being on the period immediately after the release of new birds. The habitat within the release area is a mosaic of grassland, lucerne, arable crops and periodically cultivated land. In order to keep this habitat in the best possible condition, a range of management activities are necessary. These are detailed below. In addition, it is important to maintain the fence around the enclosure, to ensure mammalian predators are excluded from the site. This
allows released birds to adapt to their new environment without immediately facing the threat of predation.

The release site should not be understood simply as the seven hectare fenced enclosure. In fact, the surrounding area and its suitability for bustards is equally important, and our input into the management of this area will also be considered.

**Release area habitat management**

Figure 2 shows the approximate layout of the release area. The numbers allow us to refer easily to individual parcels. These numbers will be used in the account of the management of the release area that follows.

![Figure 2: Layout of Release Site 1](image)

Table 1 shows the habitat available to bustards in each area, and how it changed during the year. Table 2 details all habitat management activities carried out at the release site.

**Table 1: Release site habitat through the year**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Grass</td>
<td>Grass</td>
<td>Grass</td>
<td>Grass</td>
</tr>
<tr>
<td>2</td>
<td>Grass/lucerne</td>
<td>Grass/bare earth</td>
<td>Grass/bare earth → lucerne</td>
<td>Grass/bare earth/lucerne/mustard</td>
</tr>
<tr>
<td>3</td>
<td>Oil seed rape</td>
<td>Oil seed rape</td>
<td>Oil seed rape</td>
<td>Bare earth → oil seed rape</td>
</tr>
<tr>
<td>4</td>
<td>Grass</td>
<td>Grass</td>
<td>Grass</td>
<td>Grass</td>
</tr>
<tr>
<td>5</td>
<td>Fallow</td>
<td>Fallow</td>
<td>Fallow</td>
<td>Fallow</td>
</tr>
<tr>
<td>6</td>
<td>Lucerne</td>
<td>Lucerne</td>
<td>Lucerne</td>
<td>Lucerne</td>
</tr>
<tr>
<td>7</td>
<td>Grass/lucerne</td>
<td>Grass/lucerne</td>
<td>Grass/lucerne</td>
<td>Grass/lucerne</td>
</tr>
<tr>
<td>8</td>
<td>Fallow</td>
<td>Fallow</td>
<td>Fallow</td>
<td>Fallow</td>
</tr>
<tr>
<td>9</td>
<td>Grass</td>
<td>Grass</td>
<td>Grass</td>
<td>Grass</td>
</tr>
</tbody>
</table>
Table 2: Habitat management at the release site

<table>
<thead>
<tr>
<th>Date</th>
<th>Area(s)</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/09/2011</td>
<td>5, 7, 8</td>
<td>Topping.</td>
</tr>
<tr>
<td>21/10/2011</td>
<td>7, 8, 9</td>
<td>Topping.</td>
</tr>
<tr>
<td>02/11/2011</td>
<td>2</td>
<td>Topping.</td>
</tr>
<tr>
<td>08/11/2011</td>
<td>2, 5, 8</td>
<td>Topping.</td>
</tr>
<tr>
<td>30/11/2011</td>
<td>10</td>
<td>Ploughed.</td>
</tr>
<tr>
<td>09/12/2011</td>
<td>4, 7, 15</td>
<td>Ploughed narrow strip along fence.</td>
</tr>
<tr>
<td>04/01/2012</td>
<td>8</td>
<td>Ploughed.</td>
</tr>
<tr>
<td>11/01/2012</td>
<td>5</td>
<td>Ploughed.</td>
</tr>
<tr>
<td>01/02/2012</td>
<td>1, 2, 12</td>
<td>Topping.</td>
</tr>
<tr>
<td>24/02/2012</td>
<td>2, 4, 7, 15</td>
<td>Rotavated (narrow strip along fence in areas 4, 7 and 15).</td>
</tr>
<tr>
<td>24/02/2012</td>
<td>16</td>
<td>Ploughed, rotavated, spring barley and lucerne broadcast, rotavated.</td>
</tr>
<tr>
<td>29/02/2012</td>
<td>6</td>
<td>Topping.</td>
</tr>
<tr>
<td>10/04/2012</td>
<td>4, 7, 15</td>
<td>Rotavated, rolled, sunflower seeds and fertiliser broadcast, rotavated, rolled (narrow strip along fence).</td>
</tr>
<tr>
<td>12/04/2012</td>
<td>Around quarantine</td>
<td>Split into three blocks. Block 1 ploughed, rotavated, winter oil seed rape broadcast, rolled, fertiliser broadcast. Block 2 ploughed, rotavated, lucerne broadcast, rolled, fertiliser broadcast. Block 3 rotavated.</td>
</tr>
<tr>
<td>01/05/2012</td>
<td>7</td>
<td>Pumpkins (at two leaf stage) planted in FYM.</td>
</tr>
<tr>
<td>11/05/2012</td>
<td>4, 7, 15</td>
<td>Ploughed narrow strip along fence. In areas 7 and 15,</td>
</tr>
</tbody>
</table>
In September 2011, the release area had been prepared for the release of 16 juvenile great bustards. Oil seed rape had been sown in mid-July in areas 3 and 13 and had grown very well, providing a substantial amount of food for released bustards. It had also been sown in August in area 14, where it established much more slowly, probably due to the combination of a later planting date and competition from volunteer spring barley. The quantity of oil seed rape available meant that it remained available for bustards at the site throughout the winter and spring. We only decided to top and plough areas 3 and 13 in early June, when they had no further value for bustards. Area 14 was left unmanaged as it developed into a weedy fallow which appeared fairly attractive to bustards.

Suitability of the grass and lucerne areas for bustards was maintained through the summer by regular partial topping, creating areas of variable sward height. This allowed bustards to move around easily in shorter areas, foraging there and on the edges of the longer areas. The longer areas also provided cover in which birds could rest or shelter.

A similar practice was established in the fallow of area 8. This was managed in halves, allowing longer vegetation to grow on one half while the other was topped or rotavated, then reversing the management. A variety of different fallow habitats was therefore available throughout the summer.
To avoid a build up of disease we need, as far as possible, to rotate the areas in which oil seed rape is sown. We also require a considerable area of oil seed rape each winter to ensure it is always available for bustards. As a result, we decided to slightly increase the proportion of the release area which is arable, by ploughing area 10 in late November. This was kept weed-free throughout the following spring, then rape was sown on 20th July, exactly the same date as in 2011. It grew equally as well as in the previous summer and within a month was suitable for bustards to feed on. Area 3 was also used for oil seed rape, for the second consecutive year. This was sown in early August and was establishing well by the end of the month.

We also sowed a narrow strip of beans in area 10, as we had in 2010. These grew much more vigorously than the previous year’s crop, and although they did not seem to be used by bustards as food, they certainly provided a strip of cover which birds would often shelter behind.

Area 2 was ploughed in mid-November. Our original intention was to remove the lucerne which had been there since the release area was first established in 2003, and grow a fresh block of lucerne elsewhere in the pen. However, the regrowth of lucerne was vigorous, and ploughing actually increased the proportion of lucerne relative to grass in the area, while also making it more open and therefore easier to use. Regrowth was controlled by rotavating in May and then in June, when mustard was sown in half the area. This grew slowly, probably due to competition with the lucerne, but the combination of the two plants proved extremely attractive to bustards, who favoured this part of the pen throughout July.

Mustard was also sown in area 13, and here it grew much more quickly. Although in its early stages it was clearly a suitable food plant for bustards, it quickly became too tall, and although the topper was used to create strips running through it, adult bustards were not seen using it again.

We attempted to grow a narrow strip of sunflowers along the southern fence line, as a visual screen both for bustards inside the release area and people along the track. These were not successful – the first attempt failed due to wireworms and the second due to slugs. In the second attempt buckwheat was planted instead in area 4. This grew much better than the sunflowers, and although bustards were not recorded using it, this may only be due to the location in the pen.

Our most experimental crop of the year was a small area of pumpkins in area 7, grown in farmyard manure. On our networking visit to Austria in April 2011 we had learnt that bustards sometimes used pumpkin fields, so decided to try this out for ourselves. Bustards in the release area showed no interest in the growing or flowering stage of the plant, and the pumpkins themselves were just starting to develop by the end of August.
Fence maintenance

No substantial maintenance to the fence around the enclosure took place, and it remained predator proof throughout the period. The fence line was sprayed regularly during the spring and summer to prevent any growth of vegetation along the electrified wire. A large population of rabbits was resident within the enclosure. These tended to dig under the fence. A regular duty carried out during the year was to fill or block these small holes. Rabbit control was carried out during the spring to minimise this problem. The rabbit population has been reduced to very low levels, and this has resulted in a corresponding reduction in the damage caused to the base of the fence.

The surroundings of the release area

The new Entry Level Stewardship (ELS) and Higher Level Stewardship (HLS) agreements on the farm around the release area started on 1st April 2011, and were increasingly reflected in real habitat for bustards as the year went on. There are three stone-curlew plots (HF13), all of which are located in areas which could be used by bustards. An additional three stone-curlew plots are located in land managed by the MoD. These are left as long as possible during the winter without management, to provide weedy fallow ground for bustards. Adjacent to one of the MoD stone-curlew plots is a new two hectare block of wild bird seed mixture (HF12). This was sown with a mixture of kale, sunflowers and cereal, with great bustards as the target species.

Constraints

The location of the release site is not ideal for great bustards. It is located towards the bottom of a valley, when bustards prefer an open landscape with good visibility. Outside the release site, they will rarely be seen in valleys. It is nevertheless well used, but this due to ‘homing’ to a site where birds have been released. Areas close to its southern boundary at the very bottom of the valley are rarely used by adult bustards. The number of fences around the release site, including the fence enclosing the site itself, makes the area hazardous for released birds; collisions with fences have been a major cause of mortality. Young birds also tend to fly out then try to walk back. Released bustards have been observed pacing fence lines which they are unable to walk through. This greatly exposes them to fox predation. Fences cannot be removed as they are required for the cattle on the farm.

The report on action C5 details the current situation with fox control at this site. We now consider that the fox population here is too high for the safe release of juvenile great bustards. Due to this combined with the landscape issues detailed above, no further releases will occur at this site (PSG agreement January 2012).
However, Release Site 1 still has two major uses. It is currently our only large area with predator-proof fencing. As it provides a secure, bustard-friendly environment, it is ideal for pre-release management of birds which cannot fly. It can be used for this purpose throughout the winter, for birds which cannot be released in the autumn. We also have a responsibility to the birds which have been released here in previous years. We will continue to seek to provide these birds with attractive habitat throughout the year.

An interesting feature within the release enclosure is a breeding pair of stone-curlew. The same pair had returned each year between 2006 and 2011, making nine individual nesting attempts in the six year period and fledging six chicks. In 2012 at least one of the adult stone-curlews breeding in the release enclosure was different, as confirmed by its colour rings. The pair made two nesting attempts, fledging one chick from the first attempt. Management of the fallow areas within the pen for bustards is suitable for stone-curlews, but it is important that the location of stone-curlew eggs or chicks is known before any management is carried out within the enclosure. The presence of breeding stone-curlew, a Schedule 1 species, also places limits on the acceptable level of disturbance caused by habitat management, even when bustards are not present.

Great bustard use of habitat provided

Oil seed rape was sown earlier in 2011 and established better than in 2010. As the rape became less suitable in the spring, other food sources within the lucerne, grass and fallow became available. This means that food was available for great bustards in the release enclosure throughout the year, a significant improvement on the previous year. Improved food availability had a clear positive influence on great bustard usage of the enclosure. The release enclosure was used almost daily by great bustards through the year. Their pattern of usage did vary – in some periods they spent almost all their time in the pen, and in other periods they would leave the pen during the day and return in the evening to roost. The choice of the pen as a roost site indicates that the birds are aware that it is a safe location. See Table 1 on pen usage for more information.

Actions for year 3

- If snow covers all oil seed rape, clear an area, either at the release site or in a nearby field, to make it accessible to bustards, and provide supplementary food at the release site.
- Ensure oil seed rape leaves are available within the pen throughout each winter.
- Increase the area of arable crops and fallow in the pen, with a corresponding reduction in the area of grass and lucerne, as these are used less intensively by bustards.
- Maintain a mosaic of short and long patches of grass and lucerne.
Continue to record the use of different areas of the enclosure by great bustards, in order to analyse their use of the site and inform further improvements to it.

Figure 2. Percentage of observations recorded for each pen area by season; colours corresponding to percentages shown in key in top panel.
### Table 1. Percentage of observations of birds at Release Site 1 by habitat type and season.

<table>
<thead>
<tr>
<th>Habitat type</th>
<th>Autumn (Sep 11 – Nov 11)</th>
<th>Winter (Dec 11 – Feb 12)</th>
<th>Spring (Mar 12 – May 12)</th>
<th>Summer (Jun 12 – Aug 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallow</td>
<td>9.7</td>
<td>25.4</td>
<td>13.3</td>
<td>19.4</td>
</tr>
<tr>
<td>Grass</td>
<td>14.3</td>
<td>13.2</td>
<td>48.6</td>
<td>26.8</td>
</tr>
<tr>
<td>Grass/Lucerne</td>
<td>4.1</td>
<td>15.5</td>
<td>6.2</td>
<td>10.0</td>
</tr>
<tr>
<td>Lucerne</td>
<td>16.8</td>
<td>0.8</td>
<td>0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>OSR</td>
<td>26.7</td>
<td>32.6</td>
<td>22.2</td>
<td>-</td>
</tr>
<tr>
<td>OSR/volunteer barley</td>
<td>16.8</td>
<td>3.9</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Spring barley stubble</td>
<td>2.5</td>
<td>0.0</td>
<td>0.0</td>
<td>-</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>9.1</td>
<td>0.8</td>
<td>2.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Ploughed</td>
<td>-</td>
<td>7.8</td>
<td>6.2</td>
<td>27.9</td>
</tr>
<tr>
<td>Ploughed/winter beans</td>
<td>-</td>
<td>0.0</td>
<td>0.8</td>
<td>11.9</td>
</tr>
</tbody>
</table>

| Number of observations     | 363                      | 129                      | 257                      | 201                      |

Figure 1. Percentage number of observations by habitat type with season.
**Action C4: Optimise condition of additional release sites/management areas**

*Year 2 report*

*01/09/2011 – 31/08/2012*

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**Introduction**

A trial release of great bustards took place at Release Site 2 for the first time in September 2011. A 21 hectare field of stubble turnips and fodder rape was chosen, with no contractual agreement between the project and the landowner, and no special land management for bustards. Following the relative success of the release here compared to historical releases at the original release site, a legal Land Management Agreement was put in place for the remainder of the LIFE+ project. The agreement consisted of ten hectares, the majority of which was already in winter barley and so most of our management started after the 2012 harvest but before the 2012 release of great bustards. Our management plan was in the early stages of its implementation at the end of the period covered by this report.

In contrast to Release Site 1, no permanent fencing was used at this site. At considerable investment, released birds were protected from predators by electrified poultry netting.
112cm high, with an electrified stand-off wire 20cm off the ground and 30cm from the netting. Each netting section had a length of 50m, and we used three joule energisers to power units of 12 sections. This fencing allows a large area to be fenced quickly and effectively, but also temporarily and unobtrusively. Its use made it much easier to trial a release area in 2011, and it also has significant benefits in bird management. Small areas can be lowered during the day to allow bustards to walk into and out of the fenced area, avoiding the problems of bustards pacing fence lines, which has been experienced at Release Site 1.

The release site should not be understood simply as the fenced area. In fact, the surrounding area and its suitability for bustards is equally important, and our input into the management of this area will also be considered.

**2011 Release area habitat management**

The project had little influence on the management of the release area prior to the 2011 release of great bustards. The field used contained a crop of stubble turnips and forage rape, both suitable food plants for great bustards, and there was wheat stubble in the fields to the south and the north. The electrified netting and stand-off wire described above were installed around the field (which had a boundary of 2450m) in late August. Soft release pens, with additional protection from further electrified netting, were erected within the field at the same time. The netting and the pens remained in place until the bustards were no longer using the field, being removed on 26th October 2011.

After initial successes from the 2011 release, at the beginning of 2012 we started the process of securing a legal Land Management Agreement with the landowner. During this time we agreed in principle to manage ten hectares of an adjacent field for great bustards. As the field in question was already in a crop of winter barley, initially we were only able to manage a one hectare block along one side of it, which was formerly a maize strip. Our habitat management work here started in March 2012, and we took control of the remaining nine hectares at the end of July 2012. Table 1 shows the habitat management work which we carried out at this site during year 2.

Table 1: Habitat management at Release Site 2 (area numbers are those shown in Figure 4).

<table>
<thead>
<tr>
<th>Date</th>
<th>Area(s)</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>14/03/2012</td>
<td>6</td>
<td>Ploughed and rotavated.</td>
</tr>
<tr>
<td>11/04/2012</td>
<td>6</td>
<td>Block at western end (20% of area) rotavated, winter oil seed rape broadcast and rotavated in narrow strip. Nectar flower mixture broadcast and rotavated in eastern block (65% of area).</td>
</tr>
<tr>
<td>27/04/2012</td>
<td>6</td>
<td>Dressing of fertiliser where winter oil seed rape sown</td>
</tr>
</tbody>
</table>
Previously unsown remainder of western block rotavated, winter oil seed rape broadcast, and rotavated again. Sluggo pellets applied to half this. Half of central area (remaining 15%) rotavated.

<table>
<thead>
<tr>
<th>Date</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/06/2012</td>
<td>6</td>
</tr>
<tr>
<td>08/2012</td>
<td>6</td>
</tr>
<tr>
<td>08/2012</td>
<td>5</td>
</tr>
<tr>
<td>08/2012</td>
<td>4</td>
</tr>
</tbody>
</table>

The ten hectare release area is scheduled to become part of a new Higher Level Stewardship (HLS) agreement on the farm, which was due to start on 1st October 2012. The whole area will be managed to fit HLS options, which should provide a useful model for future great bustard release sites and management areas (see Action C6).

**Fence maintenance**

The electrified netting described in the introduction was installed around the 2011 release field on 30th August 2011, and kept in place until 26th October 2011. Regular inspections were required to replace the batteries powering the fence, but also to check for any points where the fence might have fallen or be earthed for any reason. We used three different types of battery. Four 70-75AH batteries, bought new, lasted around ten days between replacements. Two second hand 220AH batteries also lasted well. Attached to a solar panel, one of these did not require replacement during the two months of operation. Four second hand 110AH batteries were less useful, lasting for an average of five days.

On average, batteries were checked every four days. Following this routine, the number of batteries which were fully drained when replaced was too high and possibly would have resulted in periods when parts of the fence were not electrified. Unfortunately this type of fencing can cause animal casualties. In the first week of release one great bustard was found entangled and dead having got caught trying to get back into the field. Two hares, one partridge and several toads were also found dead in the fence. From the day of release we observed bustards walking along the outside of the fence, trying to get back into the release field. We did not expect the netting to pose a danger to the released birds, but when we discovered the dead bustard entangled in the fence, we made an immediate change to our strategy. We decided to open short lengths of fencing during each day, when the chance of a fox entering the field was very low, and close them again at night. This allowed the birds to walk into and out of the field at key points, and we had no further problems.
The surroundings of the release area

The farm around the release area was coming towards the end of a ten year Countryside Stewardship (CSS) agreement in this period. The main features of the CSS agreement which were advantageous for great bustards were four stone-curlew plots and around 40ha of chalk grassland, reverted from arable in a previous agreement.

Neighbouring farms have committed to farmland wildlife conservation on different levels. The farm to the north east of the release area has an HLS agreement which includes two stone-curlew plots and a block of chalk grassland reverted from arable. The farm to the west also has an HLS agreement, with two stone-curlew plots. This estate has been approached with a view to modifying their HLS agreement to enhance the benefits it provides to great bustards, but is not currently interested in any such changes. The farm to the south considered an HLS application and invited input from the project, but ultimately decided HLS would not be profitable enough.

Constraints

The report on action C5 details the current situation with fox presence and fox control on this site. We do consider that the fox population around Release Site 2 is lower than that around Release Site 1, but the restrictions imposed on our ability to carry out fox control on the site mean we cannot do everything we would like to help released and breeding bustards.

The presence of breeding stone-curlew, a Schedule 1 species, within the new great bustard management area places limits on the acceptable level of disturbance caused by habitat management. In summer 2012, two pairs bred – one on the stone-curlew plot and one on the strip managed by the project from the spring – and up to six adult birds were recorded in the field. Management of the fallow areas within the area for bustards will provide suitable nesting habitat for stone-curlews, but it is important that the location of stone-curlew eggs or chicks is known before any management is carried out.

Great bustard use of release site habitat

Using a field of stubble turnips and fodder rape for release in 2011 had advantages and disadvantages. It provided effectively limitless food for the released birds, but within a few weeks of release was too high for bustards to walk through it. They were soon keener on using the surrounding stubble fields, and feeding along the edges of the turnips. Although we encouraged them to roost within the electric fenced area, they had largely stopped using this safe area by the second week of October. Taking the changing habits of the bustards as our cue, we removed the soft release pens and the electric
fence in late October. This appeared to coincide with the main dispersal of the released birds but may have been coincidence.

In 2012, we did not take charge of the majority of the management area until after harvest at the end of July. At the end of August 2012, the majority of the release area was winter barley stubble, although this contained a substantial amount of volunteer oil seed rape. There was also a small block of oil seed rape sown near the soft release pens, an area of fallow, an area of nectar flower mixture and a stone-curlew plot which had been sprayed with Roundup herbicide. Outside of our management area the remainder of the field was a crop of stubble turnips and fodder rape.

**Actions for year 3**

- Open short lengths of fencing in areas used frequently by released bustards to avoid any danger of entanglement in the netting. Ensure these lengths are closed, and the fence is fully electrified, at night.
- Check the fence line and batteries at least once every two days, or invest in solar systems to save damaging fields/tracks.
- If snow covers all oil seed rape, clear an area, either at the release site or in a nearby field, to make it accessible to bustards, and provide supplementary food at the release site.
- Ensure oil seed rape leaves are available within the pen throughout each winter.
- Record the use of different areas of the enclosure by great bustards, in order to analyse their use of the site and inform further improvements to it.
Action C5: Protect bustards and their nests from direct threats

Year 2 report
01/09/2011 – 31/08/2012

Predator Control

Background information

A Project Officer was employed in October 2011 to implement predator control around areas managed by the Great Bustard LIFE Project. It was intended that the role would monitor predator presence using cameras and bait sites, and control fox numbers around breeding and release areas.

Monitoring of fox presence was carried out using remote surveillance cameras (see Figure 3). The ones used by the project are made by Bushnell. They run on eight AA batteries and can record both photos and videos onto an SD card. This design means the camera can be left in remote places and the SD cards swapped when required. Images can be processed on any computer.
At the start of the Project Officer’s employment the Great Bustard Project was releasing birds at two release sites.

Site Information & Action Undertaken

Release Site 1

Predator control at Release Site 1 has historically been carried out by the farmer’s son. This is done all year round on a recreational basis largely via shooting, both at night and during the day.

Release Site 1 appears to have a large reservoir of foxes available to replace those which have been removed, making it highly unsuitable for bustard releasing. This may be partly due to the expanse of Salisbury Plain, most of which has very little predator control carried out upon it. The open grassland provides excellent habitat for a variety of small rodent species – an excellent food source for foxes. The bustard release site is located in a valley system which has large numbers of rabbits present, making it an attractive area for foxes to hunt and visit on a regular basis. The farm also calves 500 cows per year providing a great deal of food in the form of afterbirth. This combination of factors has created an area well suited to high densities of foxes. Indeed, the farmer’s son claims that he consistently shoots the greatest percentage of foxes from the entire farm in close proximity to the bustard release area. The farmers at Release Site 1 have retained the right to carry out all fox control around the site.

Between October and December 2011, remote cameras with scent attractants were used to investigate fox presence on the property (see Table 2). It is difficult to draw conclusions on predator numbers using these techniques due to the similarities between different individuals, but compared to a similar investigation around Release Site 2 (see Table 3), it seemed to indicate a higher fox presence on this site.
Table 2: Fox monitoring using camera traps at Release Site 1

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of fox recordings</th>
<th>Number of camera nights</th>
<th>Date monitoring started/finished</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>11</td>
<td>66</td>
<td>10/10/2011</td>
</tr>
<tr>
<td>November</td>
<td>25</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>17</td>
<td>56</td>
<td>10/12/2011</td>
</tr>
<tr>
<td>TOTAL</td>
<td>53</td>
<td>251</td>
<td></td>
</tr>
<tr>
<td>Foxes recorded per camera night</td>
<td>0.21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Release Site 2

The Great Bustard Project's second release site has proven to be a far safer prospect for releasing bustards. One of the reasons for selecting this site for releases was the assumed low number of foxes based on over ten years of stone-curlew nest monitoring by the RSPB. Stone-curlews on this farm have shown a high fledging rate despite being a ground nesting bird and at risk from ground predators. The farm is also surrounded by well-keepered shooting estates with predator control efforts undertaken upon them. This combination of factors indicated that predation should be less of an issue for released and breeding bustards on this property, but does not mean that predator control is not needed.

Historically, very little predator control has been carried out around Release Site 2 by the gamekeepers, who rent the sporting rights from the landowners. In the summer of 2011, the keepers did shoot foxes during the harvest operation. This level of activity has little impact on fox numbers. The gamekeepers at Release Site 2 have retained the right to carry out all fox control around the site.

Remote cameras with scent attractants were used to investigate fox presence on the property. It is difficult to draw conclusions on predator numbers using these techniques but it seemed to indicate that fewer foxes used this area (see Table 3). The project would like to implement a fox census on the farm in the spring, but this will largely depend on permission being granted by the gamekeepers.
Table 3: Fox monitoring using camera traps around Release Site 2

<table>
<thead>
<tr>
<th>Month</th>
<th>Number of fox recordings</th>
<th>Number of camera nights</th>
<th>Date monitoring started/finished</th>
</tr>
</thead>
<tbody>
<tr>
<td>October</td>
<td>3</td>
<td>66</td>
<td>10/10/2011</td>
</tr>
<tr>
<td>November</td>
<td>9</td>
<td>119</td>
<td>22/11/2011</td>
</tr>
<tr>
<td>December</td>
<td>0</td>
<td>10</td>
<td>05/12/2013</td>
</tr>
<tr>
<td>TOTAL</td>
<td>12</td>
<td>179</td>
<td></td>
</tr>
</tbody>
</table>

Foxes recorded per camera night 0.07

Non-lethal strategies to reduce predation of breeding and released bustards

To date the project has suffered low recruitment (see Action E2) and even with thorough predator control there is a high degree of risk to breeding bustards from predators. Temporary fencing may be the only option whilst the population is in its infancy to ensure sufficient nesting success. This could be in the form of poultry netting, or multiple single strand wires, which although less effective would be of some benefit in reducing fox movement. The ideal scenario for protecting nesting females would combine both fencing and predator control. This would bring down fox numbers in the vicinity of the female, with the fence acting as the last form of defence. Both these factors rely on bustards nesting on land the project has permission to work upon. Bustards released in the autumn are at risk from high fox densities, as the fox population will have been swelled by the year’s recruitment of young animals. At this time of year constant immigration takes place when resident individuals are removed. Therefore, the most effective time for fox control is the spring and early summer when foxes are less transient and in breeding mode.

Future release site plans

The high impact foxes have on released great bustards means that it is vital to choose release sites where fox numbers are not unmanageably high and where predator control can be carried out by the project if necessary. Consequently, new sites should only be chosen for release and population establishment if an initial assessment of the local fox population gives satisfactory results, and if a formal contract to control predators can be established.

The project intends to continue releasing bustards at Release Site 2 having just established a three year management agreement. Due to the high number of predators at Release Site 1 and limited ability of the project to control them, the decision was made in January 2012 not to release any more birds at Release Site 1. Project staff have been investigating the possibilities for a second release site close enough to Release Site 2 to allow birds from both sites to meet and mix. Two potential sites have been found.
and further discussions with the landowners are scheduled for January 2013. Both of the interested landowners have agreed to allow predator control on their properties.

**Nest Protection**

Only one great bustard nest was confirmed in England in 2012, although a further female was strongly suspected to be nesting. There were no other females of breeding age in the population. The project carried out nest protection activities at all likely nest sites.

**Actions for year 3**

- Before the 2013 breeding season we will consider the following interventions to deploy in order to protect nesting female bustards:
  - Increased predator control around the nest site.
  - Fencing around the nest site (close to or far from the nest; electrified netting or electrified wire(s)).
  - Motion sensitive nest cameras to record causes of nest failure, and motion sensitive cameras to record activity close to the nest site.
  - Increased number and duration of observations each day or constant watch in daylight hours.

- Increased monitoring effort directed particularly at potential nesting females will be undertaken in 2013 to identify potential nests for protection.
LIFE+ Project “Reintroducing the Great Bustard Otis Tarda to Southern England” (LIFE09/NAT/UK/020): Year 2 Summary

Action C6: Promote existing and develop new agri-environment options

Year 2 report
01/09/2011 – 31/08/2012
Context

Between the LIFE+ application and its subsequent approval, there were significant changes within Natural England (NE), the Non-Departmental Public Body that administers the Environmental Stewardship scheme, and to the scheme itself. In June 2010, the newly elected UK government announced wide ranging cuts throughout the public sector. By October 2010 it had become clear that the Department for Environment, Food and Rural Affairs (Defra) would face budget cuts of 30% over four years. One of the consequences of this was a restructuring of NE, resulting in 800 staff losses, around one third of the total workforce.

At the same time, there was an immediate freeze in new Higher Level Stewardship (HLS) agreements. By April 2011, agreements were being processed once again, but at a lower rate and in a more tightly targeted manner. A backlog of applications had built up over the preceding months, making it impossible for all interested farmers to access the scheme. The amount of money available to individual agreements also fell sharply, reducing the area of options funded per agreement.

As a result of these changes, when the project adviser took up his post in March 2011, there was far less opportunity within Environmental Stewardship to provide habitat for great bustards than could have been envisaged when the LIFE+ application was submitted.

Development and dissemination of habitat advice for great bustards

During year 1, we carried out a detailed assessment of the habitat requirements of great bustards. Through this work, we established that a number of existing Environmental Stewardship options are suitable for great bustards, either as currently prescribed or with slight modifications. Although it is important to note that at this time all options remain untested for bustards, it is quite possible that no new options will be required for great bustards.

Although great bustards have no specific requirements which differ from other commoner farmland birds, there are details of scale, location and combination of options which are great-bustard specific. For the reintroduction project to have a good chance of success, a substantial area of land around project release sites will need to be managed with great bustards in mind, particularly during the breeding season. This is not possible in present circumstances.

The habitat advice developed was incorporated into a leaflet for farmers and landowners, produced under Action D4. This was completed at the end of year 1, and distributed as widely as possible in year 2. Five hundred were distributed by contacts of
the project working for the NFU, to farmers across Wiltshire. A further 200 were sent out with a communication from the RSPB Wessex Stone-curlew Project, whose target area coincides closely with that of this project. By using these two routes, the vast majority of landowners within the project target area will have been reached.

Local farmland bird advisers, projects such as the RSPB Wessex Stone-curlew Project and Natural England staff (see further information below) have been briefed on the habitat requirements of great bustards through a demonstration day and regular one-to-one meetings. They have also been supplied with the leaflet, and are able to distribute the leaflet and offer basic habitat advice for great bustards to farmers and landowners they come into contact with. Great bustard LIFE project staff also carry leaflets, so that for example during monitoring work, any farmers they meet can be given a leaflet.

**Working with Natural England**

During year 1, initial meetings were held with regional and national Natural England staff to establish an approach to providing habitat for great bustards within Environmental Stewardship. It was made clear that it would not be possible to target HLS resources directly at great bustards. The project was encouraged to use Entry Level Stewardship (ELS), and HLS options targeted at more widespread farmland birds.

At a demonstration event held with the Natural England Wiltshire team and a number of local farmland bird advisers, the Project Adviser proposed a slight modification to this approach which would allow the project to work much more effectively for the benefit of reintroduced great bustards. This was agreed at the meeting, and is detailed in the following paragraph.

Although prone to large, unpredictable movements, which because of their randomness are impossible to cater for through Environmental Stewardship, the great bustards released by the project are generally very sedentary birds. It is therefore possible to define one or more very small areas, within a few kilometres of individual release sites, where it would be appropriate to make sizeable adjustments to HLS agreements for the species. This can be achieved at minimal cost to Natural England or to other farmland birds, which will in any case benefit from options targeted at great bustards. It also meets the needs of the project, as there is no justification for creating great bustard habitat across Wiltshire when there are only a few sites where they could be expected to use it. Priority areas for great bustard habitat creation were established around each release site, each a circle with a radius of 3km, comprising around 2800ha in each case. Note that more priority areas will be required when additional release sites are established.
The best approach to wider bustard habitat provision is to maintain and enhance the existing network of stone-curlew fallow plots around the county, which are known to be well-used by bustards. Appendix 1 shows the wide spread of suitable habitat provided for great bustards through Environmental Stewardship and Countryside Stewardship. Twenty-four farms within the project target area shown in Figure 1 have Countryside Stewardship agreements with options beneficial to great bustards, and a further 51 have Environmental Stewardship agreements with options beneficial to great bustards. This means a total of 75 farms, covering the majority of the non-MoD land within the target area, are creating potential great bustard habitat. Fallow plots for ground nesting birds are the most favourable option for great bustards in the wider landscape, and these are provided on 42 of these 75 farms.

**Habitat advice provided**

The most important habitat advice provided by the project in year 2 was in relation to the new project release site. A Countryside Stewardship agreement on the farm was due to come to an end in September 2012, and the landowner was enthusiastic about replacing this with an HLS agreement. The project adviser was involved from an early stage, dealing with both the landowner and the consultant drawing up the agreement. It was important to ensure the requirements of bustards were well-represented in the agreement, as the farm also has highly significant archaeological features and a large area of chalk grassland, reverted from arable land in a previous agreement.

Although not in place by the end of year 2, the new scheme had been agreed in principle, and the following details should be reflected in the final agreement. The bulk of habitat management targeted directly at great bustards will take place at the site where birds are scheduled to be released, providing habitat throughout the year. Other options across the farm as a whole will also benefit bustards. Figure 2 below shows great bustard habitat management funded by HLS at the release site itself. Areas 1-4 are each 1ha plots, managed rotationally with three years of wild bird seed mixture (HF12) and one year of fallow for ground nesting birds (HF13). The wild bird seed mixture will be winter wheat for two years, and oil seed rape for one year. Area 5 is a 2ha stone-curlew plot (HF13), which will be managed for breeding stone-curlews but in a way that is also sensitive to the requirements of great bustards. Area 6 is a 1ha block of nectar flower mixture (EF4). Area 7 is around 0.75ha of field corner management (EF1), and area 8 is grass which will be created and then managed for great bustards (HK17).
The project also made suggestions for potential modifications to the HLS agreement at a site which neighbours Release Site 2 to the west. These were considered by the landowner, but the low value of the options available compared to cropping meant they were only able to offer a small piece of land with low viability for arable cropping, but also low suitability for great bustards.

A demonstration day held in February 2012 allowed members of the project team to meet the majority of the farmers and landowners from around Release Site 2. The project adviser was introduced and had the opportunity to discuss habitat management for great bustards with those attending. By the end of year 2, the project adviser had been in contact with and provided advice to eighteen priority landowners. This number will rise considerably in year three, through contacts with significant but lower priority landowners from around Wiltshire, and through the search for and establishment of any additional release sites, which will expand our priority area.

**Actions for year 3**

- Ongoing negotiations over the next budget of the European Union, and of the Common Agricultural Policy (CAP) within that, will have a huge effect on the nature and the availability of agri-environment schemes in the UK. The latest available start date for Environmental Stewardship will be December 2013, with applications due to be submitted by June 2013. There will then be a gap with no agri-environment schemes available. The earliest possible start date for agreements in any new scheme is currently January 2015. It is therefore a top priority for the project adviser to ensure any HLS schemes or modifications required by the project are submitted by June 2013.
• Contact the farms south and west of Release Site 2 again, to find out if either would be interested in creating a great bustard management area adjacent to or close to Release Site 2, supported through HLS and the LIFE project budget in combination.

• Contact all farms in areas defined as potentially suitable for a great bustard release site, discussing with them great bustard habitat requirements and the possibility of releasing birds on their land. If a new release site is agreed in early 2013, as is the current intention, immediately look to meet all neighbouring farmers to discuss great bustards and the possibility of establishing new or modifying existing HLS agreements.

• Run a demonstration day for farmers and landowners around any new release site.

• Attend events held by local farmland bird advisers, to meet farmers and promote great bustard habitat management.
Appendices

Appendix 1
LIFE+ Project “Reintroducing the Great Bustard Otis Tarda to Southern England” (LIFE09/NAT/UK/020): Year 2 Summary

Appendix 2
Action C7: Work to secure improved management of MoD land

Year 2 report
01/09/2011 – 31/08/2012

Introduction

The successful implementation of Action C7 should result in full recognition of great bustard conservation issues by the Ministry of Defence (MoD) and Defence Estates; in the management plans used on Salisbury Plain incorporating prescriptions for great bustards; and in key sites within the 19,700ha of Salisbury Plain being managed for this species.

It is important to note that great bustards on Salisbury Plain use the farmed land on the edge of the training estate much more than the core training area. This land is owned by the MoD, but managed by tenant farmers. These farmers should be engaged through Action C6 and a range of D actions.
The project team has an excellent working relationship with the MoD, which is maintained by regular contact with the Defence Estates Natural Environment Team. That team has faced significant government budget cuts since the LIFE action was written, and therefore has much more limited capacity than was anticipated to take on new work concerning great bustards.

As the great bustard LIFE project has progressed, its commitment to working on and around MoD land has gradually fallen. There is much more information on this in the reports on other actions, but a brief summary is appropriate here. Great bustards were released on private farmland for the first time in 2011, and this release was significantly more successful than that at the original project release site on tenanted MoD land. The success of the trial led us to establish a new release site for at least the duration of the LIFE project, and in January 2012 we decided that the original release site would not be used again. Salisbury Plain was considered a low priority area when we conducted a further investigation of potential release sites.

There are two main reasons for this move away from Salisbury Plain as the focus of our releases. The most important factor when considering where to release juvenile great bustards is the fox population, and therefore the likelihood of predation. We have both direct and circumstantial evidence that the area around the original project release site has a particularly high fox population. There is no reason to think that this would be different at any other site around the Plain, where no concerted fox control takes place. Private farmland, with a background level of fox control which we can supplement where necessary, is much more attractive and much more sustainable in the long term.

The other main attraction of private farmland is centred on habitat. Bustards have been shown to spend much more of their time on arable land than on grassland. Although they do use grassland, especially during the summer, releasing them into an area which is primarily grass is not ideal – it is in fact a primarily arable landscape which would be most appropriate.

**Project activities under this action**

In both year 1 and year 2, we have held regular meetings with a representative of Defence Estates whose responsibilities include ensuring that the conservation requirements of stone-curlews on Salisbury Plain are met. The Plain is a Special Protection Area (SPA) under the Birds Directive, designated for its breeding population of stone-curlews and its wintering population of hen harriers. The maintenance of this contact ensures that there is a good understanding of the habitat requirements of great bustards within the most important part of Defence Estates, and a willingness to
support the project where possible. Defence Estates were also represented at the two Technical Working Group meetings held in year 1 of the project.

Several actions beneficial to bustards have been agreed. Stone-curlew fallow plots managed by the MoD around the great bustard release site are left with weedy growth for as long as possible through the winter to provide food and cover for bustards, before being prepared for stone-curlews in the breeding season. In spring 2012 we obtained provisional approval for one of these plots (and an adjacent block of HLS wild bird seed mixture targeted at bustards) to be used for releasing bustards. We were considering the possibility of continuing to release birds in the Release Site 1 area, but away from the valley in which most of the fox predation occurs. We ultimately decided that the risk of suffering similar levels of predation was too high, and therefore did not pursue this option.

We have been given permission in principle to fence around any nests found on the training area in 2013. Should a great bustard nest be found in the grasslands of the training area, we would also expect support in modifying the management of that area to suit the nesting female.

As mentioned in the first paragraph, the highest conservation priority for Defence Estates is breeding stone-curlew. Thirty-seven tilled plots and seven chalk scrapes are managed directly by the MoD for stone-curlews, and great bustards show a strong preference for this habitat, especially during the summer. Management of fallow for stone-curlews is beneficial for feeding bustards, and can also potentially support breeding bustards. Although limited by resources and suitable locations – ploughing in the SSSI chalk grassland is neither possible nor appropriate – further plots are likely to be created in the future, especially towards the western end of the Plain where significant range expansion is occurring. The great bustard LIFE project will work closely with the Wessex Stone-curlew Project where opportunities for new plots arise, to ensure suitability for bustards as well as stone-curlews.
**Action D1: Create and maintain project website**

The LIFE+ Project website is accessed via the main Great Bustard Group website http://greatbustard.org/life_project/ and first went live on April 4th 2011. The LIFE+ Project website contains pages containing information about the project, the project partners, the project team members and their roles, and news stories. The ‘news’ page is regularly updated with any new and interesting stories, along with any relevant pictures and web links. All previous news articles have been archived, so anyone visiting the page can look through and read news articles from as far back as January 2011.
Action D6: Update film on Great Bustard reintroduction

A large part of the work updating the great bustard reintroduction film was done during 2012. Manuel Hinge spent time filming interviews with staff at the project release site, covering the different aspects of the LIFE+ Project among many other things. The new film incorporates footage of the birds that has been captured since the last film, such as lekking, releases and footage of the first wild hatched chicks in 2009. It also contains footage of the 2012 UK hatched and reared chicks being walked.
**Action D7: Carry out programme of media work**

Sept 2011 – Aug 2012

The obligation within LIFE is to produce one press release per year. Two successful press releases were issued in early 2011 regarding the launch of the project. Following the poor survival rate of birds released in autumn 2010 and autumn 2011 the Project Steering Group agreed that it would be prudent to keep the profile of the project low at this stage. The PSG agreed that any press releases might draw negative publicity which would be very damaging to the project. However, it was also agreed that the Great Bustard Group could continue with its regular updates to local Wiltshire radio as this small organisation relies upon continued support of its members. GBG provide monthly updates to BBC Wiltshire Radio. The study undertaken by University of Bath looking at the diet from faecal analysis began in 2012 and we plan a press release surrounding this in early 2013.
**Action D8: Run project demonstration days**

**Year 2 report**

01/09/2011 – 31/08/2012

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**Introduction**

This action requires project staff to organise and run four demonstration days in each year of the project. These days should be aimed at key stakeholder groups such as farmers, landowners, government officials and conservation practitioners from the UK and elsewhere. They allow first-hand sharing of information and experience with selected key stakeholders, allowing staff to interact with groups who have the potential to influence great bustard conservation beyond the scope of the project.

**Demonstration days held during year 2**

The table below gives a summary of the demonstration days which were held. More information on the content and value of each day follows. Three demonstration days were held in year 1, and therefore the five held in year 2 bring the total to eight.
The Delivery Section of the RSPB conservation science department leads within the organisation on research into farmland birds, trialling potential conservation solutions for priority birds and habitats. In recent years, this team has also focused on assessing the effectiveness of agri-environment schemes across the UK. Although not directly involved in the great bustard project, as the University of Bath leads on project monitoring, this was a group of people with lots of experience of working on very similar subjects and hence a lot to offer to the project.

The group were shown around the area of Release Site 1, with lots of time to watch bustards and discuss the project with the Project Adviser and the Monitoring Officer. The Project Adviser then took them to a nearby site, which is another area of key bustard habitat and also offered the opportunity to show them a large flock of stone-curlews.

Ministry of Defence staff, general invitation

As noted in Action C7 above, the relationship between the project and the MoD is very important.

Two dates were advertised to MoD staff, in an attempt to increase knowledge of and support for the project within the organisation. Unfortunately only three people booked to attend, perhaps because the advertising was not wide enough, or perhaps because the dates should have been set at the weekend. One of the two days did go ahead. The attendees were given a talk about the project and a tour of Release Site 1. This should be attempted again before the end of the LIFE project, with a greater effort made to secure good attendance.

Natural England, Wiltshire team (and local farmland bird advisers)

This group of people was always a high priority for a demonstration day. They are the individuals responsible for securing Higher Level Stewardship (HLS) agreements on
farms around the county, and ensuring their content meets all the requirements of the scheme, including farmland bird conservation. It was important to make sure they gained an understanding of the requirements of great bustards, and of the specific target areas of the project, around the two release sites. Natural England is a project partner, although it has no staff working directly on the project. A local Natural England adviser working mainly on Salisbury Plain had recently been designated the local lead on great bustards, and attended this meeting.

The Project Adviser gave a talk about the habitat requirements of great bustards, and there was a discussion among the group of how those requirements could be met through HLS. Broad agreement was reached about areas where HLS could be used to support bustards, given that the great bustard is not an HLS target species. Then the group were given a tour of Release Site 1, to see bustard habitat management in action.

**Farmers and landowners around Release Site 2**

Having trialled the use of Release Site 2 in September 2011, we decided in January 2012 that we would want to establish an agreement to use the site for the remainder of the LIFE project. At that point we wanted the opportunity to speak to as many of the local landowners, farmers and gamekeepers as possible, to tell them about the project and seek their support. We decided that an evening event would be most effective. This was held on Druid’s Lodge, one of the neighbouring estates.

A majority of local landowners were represented. They were shown a short film about the project as an introduction, followed by a brief talk from the Director of the Great Bustard Group, who introduced members of the project team and their work areas. Food was served, and there was plenty of opportunity to discuss the project in a casual setting with those in attendance. This is certainly a model we intend to repeat when further release sites are established, but before any releases, rather than after the first year of releases.

**RSPB major donors**

A large group of major donors to the RSPB visited Wiltshire on a two day visit, and the great bustard project was a key part of their itinerary. The Project Adviser joined them for lunch in Salisbury and introduced the project. They were then taken on a tour of Release Site 1 which involved four 4x4 vehicles – stretching our facilities to their capacity.

This group of people were extremely knowledgeable about and committed to nature conservation in the UK. Bringing the great bustard project to their attention, and giving them an idea of how the project works and how it is funded, can only be beneficial in the long term.
Demonstration days planned for year 3

No dates are currently in place for demonstration days during year 3, but we intend to offer events to the following groups. This list is provisional and may change depending on our priorities.

<table>
<thead>
<tr>
<th>Visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game and Wildlife Conservation Trust</td>
</tr>
<tr>
<td>Farmers and landowners around new release site agreed for 2013 release</td>
</tr>
<tr>
<td>RSPB group</td>
</tr>
<tr>
<td>Great Crane Project</td>
</tr>
</tbody>
</table>
Action D9: Implement a programme of public engagement work

The Great Bustard Project site saw, in total, 1786 visitors between 1st September 2011 and 31st August 2012. Now with the use of another Land Rover through the LIFE+ Project, the project was able to accommodate larger groups, also making use of the larger hide. Previously, groups of a maximum of 10-12 people had been taken out at any one time; this year often saw groups of 15-30 people.

The first big group and the largest group of the project’s second year was a visit from the Essex Birdwatching Group on 9th October 2011. As this was a group of 48, and proved to be successful, it was decided to accommodate as many large groups as possible in future.

Some of the largest groups were from RSPB groups including 30 from the South Somerset RSPB group, 28 from Poole RSPB, and 27 from Medway RSPB. Other large groups were: 15th July - 27 from East Mendip Somerset Wildlife Group, 15th April – 25 from South Wilts Trefoil Guide, and on 15th October – 16 from Keynsham Wildlife Group.

There were also visiting colleges including a group from Wiltshire College of 25 visitors on 17th April and a group from Writtle College on 3rd May of 20 visitors.
Action E2: Carry out essential conservation monitoring

Year 2 Monitoring Report September 2011 – August 2012

Monitoring of released birds in Year 2 was carried out by the Monitoring Officer, RSPB and GBG project staff and eleven monitoring volunteers. Around the release sites, monitoring is carried out approximately five days a week, with volunteers and staff available to follow up re-sighting reports on approximately 4 days a week. Satellite data are dealt with by the Monitoring Officer. In addition, a study of the great bustard diet has been undertaken by an enthusiastic and highly qualified volunteer, Scott Gooch. We would like to thank all volunteers contributing to the monitoring in Year 2.
1. Post-release monitoring of 2011-released birds

1.1 Post-release survival

In 2011, sixteen birds were released at the long-term release site at Release Site 1 (12 females, 4 males) and thirteen were released at Release Site 2 (7 females, 6 males). Compared to previous years, birds released in 2011 showed slightly higher survival from release to 60 days post-release than average (Kaplan-Meier survival model – 2011: 57.1% ± 9.3% (±1SE); 2004 – 2009: 47.0% ± 12.6%). Those released at Release Site 2 had significantly higher survival to 60 days post-release than those released at the long-term release site (Kaplan-Meier survival model – long-term site: 40.0% ± 12.6%; Release Site 2: 76.5% ± 11.6%). However, these estimates are based on carcass recoveries; over the 60-day period there was a decline at both sites in the number of birds observed on a daily basis, therefore birds not observed may have died and have not been recovered.

Burnside et al. (2011) estimated that first-year survival in Great bustards released from 2004 – 2008 was approximately 18.2% (±4.6%). In spring 2012, 4 of bustards released in September 2011 were re-sighted (13.8%); two had been released at the long-term release site (1 male, 1 female) and two had been released at Release Site 2 (1 male, 1 female). This suggested that the new release area and management may have improved survival of released birds, but once birds had dispersed from their release site their survival probability did not improve.

Of those released in 2011 that were not re-sighted in the following year (n = 25 bustards), in 51% of cases carcasses, feathers or transmitters were recovered. Of these, 60% were considered to have been predated, 20% to be deaths related to collision injuries and 20% were from unknown causes, where there was not sufficient information to identify the cause of death.

In 2011, birds were fitted with radio-tags, satellite transmitter or wing-tags before release; those re-sighted in the following spring, recovered dead or neither re-sighted nor recovered are shown in Table 1. The average number of days from release to death for those recovered was 25.9 days for wing-tagged birds (±7.4 days; range = 5 – 84 days) and 75 days for satellite-tagged birds (±27.8 days; range = 20 – 110 days). The only bird recovered with a necklace radio-tag was recovered 43 days from release. As only 3 released birds were fitted satellite transmitters versus 21 birds with other devices, it would not be wise to make any conclusion from such small samples.

Table 1. Individuals released in 2011 re-sighted the following spring, recovered dead or neither by monitoring device fitted on release. The two individuals fitted with radio-tags on release and re-sighted the following spring lost their tags between 1 – 7 months post-release; one was re-captured and fitted with wing-tags.
1.2 Post-release dispersal away from release sites
At both release sites, a large proportion of individuals did not survive to disperse away from their release area (Release Site 1 = 9 of 16; Release Site 2 = 3 of 13). However, those that were recorded to have dispersed, travelled from 3.8 to 239.0 kilometres from their release sites; one female travelled to Normandy, France, before returning to near her release site in the following spring.
2. Breeding productivity in 2012

In 2012, two females were observed showing nesting behaviour: Orange 15, an 8-year old female, and Yellow 22, a 7-year old female. Neither nesting attempt was successful.

From 2007 – 2012, only 25% of breeding attempts have been successful in rearing a chick to fledging. None of these chicks have recruited to the population, as they have not been re-sighted in the following year. As recruitment of wild-hatched chicks is an essential component of a self-sustaining population, part of the monitoring programme will be dedicated to investigating how we can better protect breeding females.

3. Post-release monitoring of 2012-released birds

3.1 Monitoring devices

Over the eight releases prior to 2012, birds have been fitted with a range of monitoring devices, including individually-numbered wing-tags, radio tags and satellite transmitters. The LIFE+ project provisioned for all released bustards to be fitted with wing-tags or metal rings, in addition to 20 radio tags and 5 satellite transmitters each year; a combination of devices considered to provide high-quality data and allowing birds to be tracked in the field and remotely.

In September 2011, a provisional analysis of re-sighting data from 2004 – 2010 suggested that there was a small cost to birds fitted with backpack-mounted satellite transmitters, with birds carrying backpacks having a 3% lower survival probability between 15-day periods over the first 165 days post-release. Given the information at the time, the project team decided to reduce the number of backpack-mounted devices on released birds in 2011. However, further analyses have suggested that there is no significant difference in survival between birds carrying backpack-mounted transmitters and birds not carrying backpack-mounted transmitters and that the initial findings were related to birds with satellite transmitters having a higher recovery rate than any other transmitter, as location data can be remotely accessed (Burnside et al., in preparation).

In June 2012, the project team submitted an application to the British Trust for Ornithology Unconventional Methods Technical Panel of the Ringing Committee, proposing wing-tags, leg-rings, and radio and satellite transmitters for attachment to released birds for independent review. The panel assessed the application against (a) risk of harm to birds; (b) whether the proposed technique would deliver the expected data; and (c) whether the data are of sufficient value to justify the risk. In summary, their evaluation was as follows:

1. “There seems to be no clear evidence either way as regards the safety of patagial wing tags on great bustards because there has been no evaluation of survival or
breeding success comparing wing tagged birds with unmarked or ringed birds. However, wing tags, when correctly fitted, seem to pose only small risks to most species. The Panel noted that you use strimmer line. This has largely been superseded when wing-tagging raptors by dental wire. We suggest that you make this change and can put you in touch with people who use this material. The use of brown tags, rather than more brightly-coloured tags, seems prudent, especially for females, and we recommend that you proceed with it.

2. There seems to be no clear evidence either way as regards the safety of leg rings on great bustards, but ringing is safe on most species and especially so on most large birds. We note that it is more difficult to obtain sightings of rings than wing tags, but recommend that you consider the use of engraved Darvic rings as long-term individual marks. Telescope-readable metal rings could also be considered if you have access to a suitable design.

3. The Panel accepts that large numbers of wild great bustards have been marked with elastic harness mounted radio tags and necklace mounted tags and that field biologists find their use satisfactory. We noted however that there has not been any formal comparison of survival rates of full-grown wild great bustards tagged with harnesses and necklaces with comparable marked birds not fitted with these devices. We also note the evidence of lower survival of harness tagged captive reared juvenile great bustards in Germany after release compared with marked birds without harnesses. The analysis by Burnside of the survival and movements of UK great bustards with and without harness mounted tags was not released to the Panel and we therefore could not evaluate it. We conclude that there is a possibility of harmful effects of radio/satellite tags on bustards and that this might be especially so for captive-reared birds even if the procedures cause little harm to wild birds (though the latter is not fully established). We suggest that it would be prudent to refrain from fitting harness and necklace mounted tags at all unless the data they provide is essential. The application does not provide evidence that it is. A formal trial in which matched pairs of birds marked with rings or wing tags are randomly assigned harness mounted radio tags (males) or no radio tag and necklace mounted tags (females) or no radio tag could be considered, but the study would require careful design to avoid bias due to differential re-sighting probability of birds with and without radio tags. The Panel concluded that it would be difficult to conduct such a trial and that it would require a new application.”

Given the BTO’s evaluation and the relatively small number of birds to be released in 2012, the Steering Committee decided that we would fit only coloured and individually-numbered leg-rings with metal BTO rings in 2012. This decision was not unanimous among project partners, since there are various ways of evaluating the costs and benefits of using different marking schemes. Following the Steering Committee’s decision, all released birds were fitted with lime-green coloured rings on the tarsus.
3.2 Birds released in 2012

Fourteen chicks were imported from Russia or hatched in the UK for the release in 2012. However, as the development of the UK-hatched chicks was poorer than expected, only the Russian-hatched chicks (7 chicks) were considered to be fit for release in the autumn. These chicks were transported to Release Site 2 on the 2nd September and kept in soft release pens for one week, before being allowed to explore the release area under the supervision of a project team member wearing a bustard rearing suit. Four older birds were also present at this release site, allowing the gradual integration of the newly-released birds into a larger multi-age group.

The UK-hatched chicks unable to fly at the release time and those that were injured, were released into the predator-proof Release Site 1 enclosure, to allow them to develop in a more natural environment and interact with older individuals. As of December 2012, the UK-hatched chicks may be considered for release at Release Site 2 shortly.

<table>
<thead>
<tr>
<th>Bird ID</th>
<th>Sex</th>
<th>BTO ring number</th>
<th>Hatch location</th>
<th>Release site</th>
<th>Release date</th>
<th>Current Status</th>
<th>Last re-sighted</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>L02</td>
<td>M</td>
<td>4010002</td>
<td>Russia</td>
<td>Release Site 2</td>
<td>NA</td>
<td>Dead</td>
<td>NA</td>
<td>Leg broken during soft release (08/09/2012)</td>
</tr>
<tr>
<td>L03</td>
<td>M</td>
<td>4010003</td>
<td>Russia</td>
<td>Release Site 2</td>
<td>10/09/2012</td>
<td>Alive</td>
<td>08/12/2012</td>
<td></td>
</tr>
<tr>
<td>L04</td>
<td>M</td>
<td>4010004</td>
<td>Russia</td>
<td>Release Site 2</td>
<td>10/09/2012</td>
<td>Dead</td>
<td>NA</td>
<td>Collision with power lines, Gourleo, France (01/01/2013)</td>
</tr>
<tr>
<td>L05</td>
<td>M</td>
<td>NA</td>
<td>Russia</td>
<td>Not released</td>
<td>NA</td>
<td>Captive</td>
<td>NA</td>
<td>Wing broken in quarantine; permanent captivity at Release Site 1</td>
</tr>
<tr>
<td>L06</td>
<td>M</td>
<td>4010001</td>
<td>Russia</td>
<td>Release Site 2</td>
<td>10/09/2012</td>
<td>Alive</td>
<td>08/12/2012</td>
<td></td>
</tr>
<tr>
<td>L07</td>
<td>M</td>
<td>4010005</td>
<td>UK</td>
<td>Temporarily flightless</td>
<td>Released into enclosure</td>
<td>Alive</td>
<td>21/01/2013</td>
<td></td>
</tr>
<tr>
<td>L08</td>
<td>M</td>
<td>4010006</td>
<td>UK</td>
<td>Temporarily flightless</td>
<td>Released into enclosure</td>
<td>Alive</td>
<td>21/01/2013</td>
<td></td>
</tr>
<tr>
<td>L09</td>
<td>M</td>
<td>4010007</td>
<td>UK</td>
<td>Temporarily flightless</td>
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<td>Alive</td>
<td>21/01/2013</td>
<td></td>
</tr>
<tr>
<td>L21</td>
<td>F</td>
<td>5268951</td>
<td>Russia</td>
<td>Release Site 2</td>
<td>10/09/2012</td>
<td>Alive</td>
<td>08/12/2012</td>
<td></td>
</tr>
</tbody>
</table>
3.3 Post-release survival and dispersal of 2012-released birds

In 2012, 100% of birds released survived to 60 days post-release; this is the first year in the project where this has been achieved. In a Kaplan-Meier survival model of survival over the first 115 post-release, where individuals released between from 2004 – 2011 and not recovered or re-sighted after 115 days were classed as dead on the date of last re-sighting (birds released in 2012 only classed as dead if recovered), survival of birds in 2012 was 83% compared to an average of 24% (range = 10 – 39% survival; Figure 3).

Of six birds released at Release Site 2, five remained around the release area until the beginning of December 2012. One female, L21, travelled to Les Sables d’Olonne, Vendee, France in early November, where she was taken into captivity due to health concerns and transported to the UK and re-released with her release-mates by late November. A few days after the older birds had left Release Site 2 in early December, all newly-released birds dispersed from the site. One of these six birds (L04) was recovered in Gourleo, France, after a collision with power lines. There have been no confirmed sightings of the other five birds (L03, L06, L21, L23, and L24) since the beginning of December. As none of the birds released in 2012 were fitted with tracking devices and the leg-rings were found to be difficult to read in the field, it is challenging to locate them once they left the vicinity of the release site; we aim to address this issue for the 2013 release by considering leg-mounted tracking devices.
4. Habitat usage outside the release pens in 2011 - 2012

From September to November 2011, relatively few habitat types were used with the main ones being wheat stubble, grass and fallow ground managed for stone-curlew. In winter and spring, a greater range of habitat types were used, with the main winter habitats being oil seed rape, wheat stubble, and grass, and in the summer, grass, fallow ground managed for stone-curlew, spring barley and natural grassland. From June to August, the main habitat types used were fallow ground managed for stone-curlew, grass and improved grassland. All the habitat types utilised by season are shown in Table 3.

Table 4. Percentage of observations of Great bustards outside the release pen areas from September 2011 – August 2012 by habitat type.
<table>
<thead>
<tr>
<th>Habitat type</th>
<th>Autumn (Sep 11 – Nov 11)</th>
<th>Winter (Dec 11 – Feb 12)</th>
<th>Spring (Mar 12 – May 12)</th>
<th>Summer (Jun 12 – Aug 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallow</td>
<td>1.2</td>
<td>-</td>
<td>6.0</td>
<td>5.4</td>
</tr>
<tr>
<td>Grass</td>
<td>33.7</td>
<td>15.4</td>
<td>26.8</td>
<td>21.5</td>
</tr>
<tr>
<td>Grass (long)</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>-</td>
</tr>
<tr>
<td>Grass (short)</td>
<td>-</td>
<td>-</td>
<td>5.3</td>
<td>7.5</td>
</tr>
<tr>
<td>Grass with Lucerne</td>
<td>-</td>
<td>4.8</td>
<td>2.3</td>
<td>-</td>
</tr>
<tr>
<td>HF12 plot</td>
<td>-</td>
<td>-</td>
<td>2.3</td>
<td>-</td>
</tr>
<tr>
<td>Improved grassland</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>18.3</td>
</tr>
<tr>
<td>Maize stubble</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Natural grassland</td>
<td>1.2</td>
<td>1.9</td>
<td>10.1</td>
<td>8.6</td>
</tr>
<tr>
<td>OSR</td>
<td>-</td>
<td>39.4</td>
<td>6.6</td>
<td>-</td>
</tr>
<tr>
<td>OSR and stubble</td>
<td>-</td>
<td>1.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ploughed</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>Road</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
</tr>
<tr>
<td>Stone-curlew plot</td>
<td>25.3</td>
<td>3.6</td>
<td>20.2</td>
<td>31.2</td>
</tr>
<tr>
<td>Spring barley</td>
<td>-</td>
<td>-</td>
<td>10.7</td>
<td>-</td>
</tr>
<tr>
<td>Stubble</td>
<td>-</td>
<td>4.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stubble turnips</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stubble turnips/fodder rape</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wheat</td>
<td>-</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wheat stubble</td>
<td>38.55</td>
<td>22.1</td>
<td>3.0</td>
<td>6.5</td>
</tr>
<tr>
<td>Winter barley</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
</tr>
<tr>
<td>Winter barley stubble</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>1.1</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>-</td>
<td>1.0</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>-</td>
</tr>
<tr>
<td>Total number of observations</td>
<td>83</td>
<td>104</td>
<td>168</td>
<td>93</td>
</tr>
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</table>
5. Habitat preferences of Great bustards in South-West England

Under action E2, we proposed to investigate the habitat preferences of Great bustards in the UK, informing release site selection, site management and the development of agri-environment schemes for this species. The aim of this project was to investigate the main environmental variables affecting habitat preferences in Great bustards in South-West England, test for sex-specific habitat preferences and predict preferred habitat for Great bustards in South-West England.

Data from re-sightings and satellite telemetry from 23 males and 27 females released between 2004 – 2010 were used in Maximum Entropy species distribution models to determine the importance of topography (elevation and slope), environment (land-use type and distance from woodland) and infrastructure (distance from roads, settlements and power lines) on the distribution of males and females.

This work showed that the largest piece of land predicted to be suitable for great bustards is the Salisbury Plain largely overlapping with the EU-designated Special Protection Area. In addition, we found that habitat preferences were sex-specific: for males, the most important environmental variables predicting their distribution were distance from roads and distance from settlements. In contrast, for females, the most important environmental variable was land-use type. As land-use type differed in importance between sexes, we further investigated which type of land-use may be responsible for the difference. Females showed a strong preference for calcareous grassland over other land-use categories, whereas males were predicted to show a similar preference for calcareous grassland and arable and horticulture. Both males and females showed a negative preference for improved grassland; however, the sexes differed in their preference for rough low-productivity grassland, with males showing a positive preference and females a strong negative preference.

Males and females in many cases showed a similar predicted response curves to the tested variables:

- Both sexes were predicted to have the highest probability of presence at altitudes lower than 50m above sea-level, after which probability of presence decreased; females, however, showed a much larger negative preference with increasing altitude than males.
- For slope, both males and females were predicted highest presence at slopes less than 10 degrees, after which probability of presence decreased gradually for females, and rapidly for males.
- Males and females showed a similar relationship to distance from power lines, with increasing predicted probability of occurrence from 0m, peaking around 500m, and then declining around 2000m away from power lines.
- Both sexes showed a positive relationship between predicted probability of presence and distance from roads; this relationship was predicted to be stronger for males than females.
- Also, a positive relationship was also found with distance from settlements; however, here females showed a stronger relationship than males, but this variable was not found to contribute as significantly to models for females as for males, as discussed previously.
- Both sexes were also predicted to avoid wooded areas, with low probability of occurrence predicted below 500m from woodland.
Sex differences in habitat preferences were found to have a large impact on the proportion of area within the study region predicted to be suitable in South-West England, with 57.6% of the study area predicted to be preferred for females, whereas only 37.9% was predicted to be preferred for males. Common preferred areas for males and females within this region constituted 17.7%.

6. Dietary selection, foraging behaviour and nutritional intake of Great bustards in South-West England

A key part of the monitoring component of the LIFE+ project is to assess food abundance for this species to determine whether there is sufficient suitable habitat for bustards in the south west of England. Therefore, in 2012 we began a project to assess bustard diet in the UK from behavioural observations in conjunction with faecal sampling.

The aim of the project is to:

1. Determine the diet of reintroduced Great bustards in the UK and investigate changes in diet between seasons to inform habitat management decisions
2. Compare actual diet to available food resources at release areas in order to inform habitat management decisions.
3. If possible, assess whether a change in food resources plays a role in triggering post-release dispersal movements away from release sites in autumn.
4. Investigate the proportion of time that Great bustards spend foraging, determine the nutritional value of the identified diet and compare to published studies of bustard time budgets and diets in Europe. This will allow us to more directly assess the suitability of South-West England for supporting a Great bustard population.

As of December 2012, we have completed two of five data collection periods, with further sampling to take place in January, May, and June of 2013. The anticipated completion date for this project is August 2013.

7. References


Great Bustard (Otis tarda) donor populations – investigations into the genetics of great bustards worldwide

The concept of the Great Bustard trial reintroduction was created in 1998 with the knowledge that a significant number of Great Bustard nests were destroyed by agricultural operations in southern Russia. It was observed that these destroyed nests could provide eggs, which could in turn provide stock for a reintroduction. Providing stock for a reintroduction had previously been attempted in the UK through a captive breeding project (The Great Bustard Trust). This project had used Iberian and Hungarian birds and had not been successful in generating stock. One of several reasons published was that the Iberian birds may not be suited to the UK climate or the daylight patterns arising from changed latitude. A practical study of Great Bustards in captivity, undertaken by GBG shows that with one exception, all captive breeding programmes have been unsuccessful, and that the lack of breeding success of the previous UK project was far more likely to be due to husbandry issues. Time shift due to latitude is not recognised amongst aviculturalists as a likely problem for inhibiting reproductive behaviour in other species.

Great Bustard populations outside of Russia and Spain are small and subject to national conservation measures (Germany, Austria, Hungary, Portugal etc). At the time of making the initial reintroduction project proposals there was no likelihood of obtaining any donor stock from any of these smaller populations.

Another argument against attempting to use a Spanish donor population was the belief that Great Bustards cannot cross the Pyrenees and have evolved to be significantly different from other Great Bustard populations (Pitra et al, 2000, Berlin - copy attached). This paper, although limited in the range of populations studied, suggests that Spanish Great Bustards are genetically distinct from other populations. Again a practical study of the Great Bustard populations in southern Europe reveals Great Bustards do apparently cross the Pyrenees, as do many other species including Little Bustards (Tetrax tetrax).

Given the fact that only Russia suffered large scale nest destruction, and the background of academic opinion being that Spanish birds were different, sourcing Great Bustards from Russia seemed to be the natural choice in 2004. Once the task of obtaining the various licences and permissions to conduct a reintroduction was undertaken concerns were expressed by the UK licensing authorities about any negative impact on the donor populations. These concerns led to conditions being imposed on the import and release of any Great Bustards that ensured only eggs from abandoned or destroyed nests could be used.
Only the Russian population was subject to the widespread mechanical weeding which caused the destruction of nests. At the time of seeking formal permission for the project to go ahead, the Russian population was the only choice.

Other reintroductions or translocations undertaken within the UK have not been subject to these conditions, and it is widely recognised that removing a controlled number of viable eggs from nests does not necessarily lead to a negative impact on the donor population (Red Kite, Osprey, White Tailed Eagle, Common Crane).

One known concern about the Great Bustard population in Saratov Oblast in southern Russia was its propensity to undertake winter movements to the southwest that would take them to Ukraine. The Great Bustard population in Russia is poorly studied and poorly understood. However, that female Great Bustards do move from Saratov to Ukraine has been confirmed by German researchers. The Great Bustard Group has been able to confirm the fact that in some winters at least, Great Bustards are present in Saratov Oblast during the winter. From the experience of the Great Bustard Group and staff of the A.N. Sevetsov Institute of Evolution and Ecology (Russian Academy of Science) some Great Bustards do remain in Saratov Oblast, and the numbers apparently depend of the degree of snow cover; if there is little snow more birds are found. What has not been established is whether or not the birds present in Saratov Oblast in the winter are birds that breed in Saratov, or if they are from another population that has undertaken a partial winter movement.

The experience of the Russian Great Bustards released in the UK has been that they do undertake a south-westerly dispersal. During the first few years of release these movements coincided with cold weather and it was thought the temperature change was the cue for the dispersal. However, in recent years there are stronger suggestions that the south-westerly movement is not determined by weather or temperature and is an instinctive migratory behaviour affected by day length.

The winter movement away from the release sites is believed to be detrimental to the survival rates of newly released young birds. They split up, face greater numbers of dangers in the form of power lines and other unaccounted for birds may even be lost at sea, as five birds have been known to reach France from the UK during the past 10 years. Great Bustards from Spain are largely sedentary and would be most unlikely to undertake any form of seasonal movement if released in the UK.

In 2012, Dr Paul O'Donoghue of the University of Chester has sought to review the genetic variation of Great Bustards across its global range. Working with international colleagues he has been able to obtain genetic samples from historical specimens and from extant specimens. The geographical range of these specimens is from the far east of China through to Iberia, and from the north of England to Korea. The study also includes genetic samples from known UK killed specimens from the original UK population where the specimens have a known provenance. The results from the study
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will be of much interest to many involved in the different aspects of Great Bustard study.

The cost of the study was largely met by the University of Chester, but there was a shortfall of some £6000 for the laboratory costs. The LIFE+ Project Steering Group agreed to seek approval from the EU External Monitoring Team with a view to supporting the proposal by using £6000 of LIFE+ budget to contribute to the genetic study on the understanding that the results would be of great assistance in identifying other possible sources of Great Bustards for the UK reintroduction trial. Specifically, the suitability of birds from Spain will be scrutinised.

In March 2012, approval was granted from the External Monitoring Team to transfer £6,000 from the University of Bath budget where savings had been made on other actions, for a one-off payment to complete the genetics work.

Objections of a political or conservation nature have already been addressed, and the remaining hurdle to be cleared before attempting to undertake the use of Spanish Great Bustards is the scientific one addressed by this study. It was agreed by the LIFE+ PSG that the contribution to the genetic study was to be used for the laboratory processing of the samples and that the LIFE+ Project and staff would confine itself to using the information gained to implement the stated objectives of the LIFE+ project and not become involved in a wider genetic research study which may take place outside the provisions of the LIFE+ Project.
Action E3: Network with other projects

During year 2, project staff visited a great bustard captive breeding project in Spain, and great bustard conservation projects in Germany and Hungary.