Memoirs of the Museum of Victoria 56(2):587–589 (1997) 28 February 1997
https://doi.org/10.24199/j.mmv.1997.56.54

AN *EX SITU* BREEDING PROGRAMME FOR THE ENDANGERED UK POPULATION OF THE FIELD CRICKET *GRYLLUS CAMPESTRIS*

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Abstract

Pearce-Kelly, P., Croft, P., Atkin, P. and Clarke, D., 1997. An *ex situ* breeding programme for the endangered UK population of the field cricket *Gryllus campestris*. *Memoirs of the Museum of Victoria* 56(2): 587–589.

In 1991 the British population of the field cricket *Gryllus campestris* was close to extinction with fewer than a hundred individuals remaining in the single surviving colony. A key component of English Nature's recovery programme for the species involved the creation of six new colonies in areas of the cricket's former UK range. This objective required the establishment of a captive-breeding programme to provide the large number of animals needed to found the new colonies. Between 1992 and 1995 >4000 captive-bred nymphs were released into five new sites. Monitoring confirmed that the release populations are becoming successfully established.

Introduction

By virtue of their small size, modest accommodation requirements and often substantial reproductive potential, many invertebrate species can be maintained as large captive populations retaining levels of genetic variation necessary to achieve successful field re-introduction and establishment (Morton, 1991; Pearce-Kelly, 1994). Experience has also shown that invertebrate conservation programmes can hold their own when it comes to generating public interest and support. These considerations make many invertebrate species excellent candidates for receiving captive-breeding assistance as part of conservation programme work. An example of the efficacy of providing captive breeding assistance to an endangered invertebrate species is the conservation programme for the UK population of the field cricket, *Gryllus campestris* L.,1758.

Although a relatively common species on the European continent, by 1991 the British population of *G. campestris* had been reduced to a single surviving colony in West Sussex, numbering fewer than 100 individuals and is recorded as Endangered in the British Red Data Book (Shirt, 1987). The reason for the species decline in the UK was essentially loss of its close growing turf sites, which need to be situated on porous sandy soil and to have a sheltered and sunny aspect. A prime cause of this habitat loss has been overgrowth of vegetation, as a result of changes in grazing practices. In an effort to safeguard the surviving UK population and expand the number of colonies, the conservation body English Nature has placed the field cricket onto its Species Recovery Programme. This conservation initiative is directed at recreating the cricket's habitat requirements over areas of its former range and identifying existing alternative sites that already provide suitable habitat.

In autumn 1991 English Nature (EN) and the Zoological Society of London (ZSL) agreed on a protocol to establish a captive-breeding programme, based at the London Zoo's Invertebrate Conservation Centre, to support EN's ongoing Species Recovery Programme for the field-cricket. The protocol involved using wild caught crickets from the sole surviving mainland colony to provide a founder breeding stock to produce the large numbers of captive bred crickets required to populate new colony sites. In the late spring of 1992, six pairs of sub-adult field crickets were collected from the remaining wild colony in West Sussex (Edwards, 1992) and taken to the Zoo's Invertebrate Conservation Centre.

Captive-breeding and rearing conditions

Upon arrival at the Zoo the sub-adult crickets were initially kept separate in plastic tanks 18 x 33 x 18 cm high. The substrate consisted of sterilised Imms No.2 potting soil to a depth of 12cm. Each tank was provided with a sod of turf (collected from the original colony site) to encourage the crickets to excavate a burrow, which they readily did. Drainage holes in the base of the tanks allowed for frequent watering of the substrate. Upon reaching adult the crickets were paired up in the same tanks.

Temperature and humidity levels were aimed at mimicking the recorded field conditions as faithfully as possible. In addition to maintaining a fluctuating day/night background temperature, a 60 watt light bulb was suspended over each of the breeding and rearing tanks to provide radiant basking opportunities. The bulbs were on from 09.00–12.00h and from 13.00–18.00h which elevated maximum temperatures to the low 30s (°C). At night the room temperature dropped to 15°C. Mean humidity levels in the rearing tanks was approximately 50%.

Mated females oviposited directly into the soil substrate of the breeding tanks. Upon hatching, nymphs were left in the breeding tanks until the 2nd or 3rd instar when they were transferred to nymphal rearing tanks 30 × 45 × 30cm high. The rearing tanks were provided with 6 cardboard egg trays stacked at one end of each tank to maximise opportunities for successful moulting, basking and shelter. Care was taken to ensure that offspring of different females were maintained as separate progeny lines.

The overwintering requirements of the crickets were best met by exposing the nymphs to the rigours of a British winter. This was achieved by placing nymphs in unheated external insect rearing units, either in their rearing tanks or into 1.5 m-square external bays with a deep soil and turf substrate to allow more natural overwintering conditions.

The crickets were presented with a variety of vegetables, fruits, leaves and grasses with the most popular food items being fresh lettuce, apple, and carrot. Bran and cuttlebone (a calcium supplement) were also provided. Females were occasionally given the larvae of the wax moth, *Galleria mellonella* which were often accepted. The provision of fish-flakes mid way through the programme was seen as an important protein supplement for nymphs and adults. Free water was provided in the form of damp cotton wool and regular spraying with distilled water.

Results

Crickets were paired up within an week or so of reaching adult in early summer and were observed to mate repeatedly in the breeding tanks. The first hatching were observed in mid June implying a development period of 26 days (Pearce-Kelly and Croft, 1995). The first three years (1992–1995) of the breeding programme produced > 4000 crickets for field release. These animals were used to establish five new colony sites selected by English Nature. Prior to release the different progeny lines were amalgamated so as to ensure maximum genetic mix for colony establishment.

Regular monitoring of the introduction sites has confirmed the successful overwintering of sufficient numbers of the captive-bred crickets to ensure the production of the F1 wild generation. These F1 crickets have in turn gone on to produce the F2 wild generation (Edwards, 1995).

In addition to providing large numbers of animals for colony establishment, the captive-breeding programme is helping to clarify some important biological questions, such as sex ratios and fecundity data, that would otherwise be impossible to ascertain. By summer 1995 the results of the field cricket recovery programme were such that English Nature was able to declare the species secure in the UK.

Conclusion

The captive-breeding programme for *G.campestris* highlights how successful and cost-effective such conservation work for invertebrate species can be. By allocating even modest resources to develop captive-breeding programmes for invertebrates facilities, such as zoos can significantly increase their ability to play a major role in species conservation (Pearce-Kelly, 1994).

Acknowledgements

The authors are indebted to English Nature for generous grant support for equipment and staff. The advice and support of Mr Mike Edwards is also gratefully recorded.

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