Translocation of great crested newt *Triturus cristatus* eggs for conservation purposes in Ilkley, West Yorkshire, UK

Gordon B. Haycock*

Wharfedale Naturalists Society and Yorkshire Amphibian and Reptile Group, 88 Riverside Park, Otley, West Yorkshire, LS21 2RW, UK

SUMMARY

Translocation of great crested newt eggs was undertaken for nature conservation purposes, with the aim of establishing a new population in a currently unoccupied part of their natural range in the UK. Research prior to undertaking the translocation established that suitable habitat existed at the receptor site and no great crested newts were present at the time. Approximately 600 eggs were carefully introduced to the receptor pond from a donor pond each spring for three years. Five years after the initial translocation, a population appeared to be established, with breeding recorded in the receptor pond and two adjacent ponds. The methodology may have implications for population translocations undertaken for mitigation purposes under licence in UK, as currently the focus is on welfare and translocation of terrestrial juveniles and adults rather than eggs and larvae. Results reported here indicate that to increase likelihood of success when attempting to translocate populations of great crested newt, an emphasis on translocation of eggs as well as adults in terrestrial phase would be prudent.

BACKGROUND

England has an internationally important population of great crested newt *Triturus cristatus* which is protected by UK legislation (primarily under the Conservation of Habitats and Species (Amendment) Regulations 2012), and the species is recognised as a species of principal importance for the purpose of conserving biodiversity under the Natural Environment and Rural Communities Act 2006. Conservation plans for this species may include an aspiration to undertake translocation of great crested newts to areas within its natural range where there is no extant population (e.g. Amphibian and Reptile Conservation Trust 2009). Lower Wharfedale has had an active recording community since 1947 when Wharfedale Naturalists Society was formed. However, there are no historical records of great crested newts in Lower Wharfedale despite the presence of seemingly suitable habitat. Records of this species exist to the south and north (Leeds and Harrogate District). Consequently, after some consideration, introduction of great crested newts was attempted at Nell Bank Centre, Ilkley in order to support nature conservation efforts for this species nationally.

Rationale for introduction: In considering the suitability of the proposed translocation of great crested newt to Nell Bank Centre, reference was made to *The Great Crested Newt Conservation Handbook* (Langton *et al*. 2001) and *A policy for conservation translocations of species in Britain – Annex 1* (JNCC 2003). The International Union for Conservation of Nature has recently updated its guidelines for reintroductions and other conservation translocations (IUCN/SSC 2013). These documents give guidelines and criteria which should be met if a proposal for a species introduction is to take place in the UK.

The site chosen as the receptor site was Nell Bank Environment Centre, Ilkley, West Yorkshire (British National Grid reference SE126486). The Centre is owned by Bradford Metropolitan District Council and was established in 1977 in a rural location on the northern edge of Ilkley. It is a private facility with access granted only to environment centre staff, local naturalists by appointment, and people on supervised courses. The site includes 44 ha of ancient, semi-natural broad-leaved woodland, 4 ha of built environment and wildlife gardens and 7 ha of land which was previously permanent pasture. Of this latter, 1.2 ha is recent broad-leaved plantation and hedgerows; log piles, rough grassland and other wildlife features have also been created. Four ponds exist on the site. The following factors were considered prior to the introduction:

1. Great crested newt not present at the site. There are no known historical records of the species from the Ilkley area. Nell Bank Centre is visited by 16,000 school children and adults each year and many of these groups use three of the ponds for pond dipping. Consequently Centre staff are aware of the amphibians present. No great crested newts had ever been caught on this site. However, palmate newt *Lissotriton helveticus*, common frog *Rana temporaria* and common toad *Bufo bufo* were all frequently encountered. The local biological records centre, West Yorkshire Ecology, confirmed in 2008 that there were no records of great crested newt in Bradford District.

2. Great crested newt unlikely to colonise naturally. The local distribution of great crested newt was relatively well known. The closest record for the species was at a distance of 11.6 km from the proposed introduction site. Poor connectivity meant that natural re-colonisation was unlikely.

Whilst it was considered that Lower Wharfedale is within the natural range of great crested newt in England, and apparently suitable terrestrial habitat exists, ponds have not been a historic feature of land use in the valley, and many of the ponds that existed in the locality in the early twentieth century have been lost, in line with trends throughout England.

Prior to the receptor site's development as an environment centre, the site was a large house with grounds adjoining open countryside with no suitable breeding habitat for great crested newt. The site now has suitable habitat, but a lack of connectivity to other populations in the area meant that colonisation had not taken place by 2009. It was considered unlikely that natural colonisation would take place in the near future.

* To whom correspondence should be addressed: gordon.haycock@haycockandjay.co.uk

ISSN 1758-2067

Figure 1. Nell Bank (a) Pond P1, (b) Pond P2, (c) Pond P3, (d) Pond P4.

3. Newt habitat is safe from threat of unfavourable land use change. Nell Bank Centre is a registered charity managed specifically for nature conservation and resourced by Bradford Metropolitan District Council and donations. Bradford Council own the site, and the Centre's future is assured.

4. Receptor site has suitable ponds. The site is an Environment Centre in a rural location. The Centre and its extensive grounds are specifically managed for nature conservation and wildlife. The site has four ponds, three of these are used for pond dipping (P1 – P3) and are located near the Centre buildings (Figure 1). The fourth pond (P4) was created in 2006 in former pasture and has been allowed to vegetate naturally (Figure 1). P4 is the largest pond, and no pond dipping has taken place in this pond. There are no fish in any of the ponds and a policy is in place that fish should not be introduced; however, there is a possibility that fish will arrive by natural means.

Whilst pond dipping takes place in ponds P1 to P3, disturbance due to pond dipping is minimised by the close supervision of children and the equipment used. The majority of the pond is always undisturbed, and all animals caught are treated with respect and returned to the aquatic environment carefully and unharmed. Great crested newt Habitat Suitability Index (Oldham *et al*. 2000) data were recorded for these ponds in March 2009 to assess their suitability for great crested newt (Table 1).

5. Terrestrial habitat. Within a 500 m radius of the receptor pond, there was estimated to be approximately 64 ha of high quality terrestrial habitat for great crested newts with connectivity to the pond, of which 51 ha is within the boundary of Nell Bank Environment Centre. The Centre is surrounded by open countryside with predominantly pastoral usage, hedgerows and broad-leaved woodland. This represents good habitat for great crested newt and capacity for great crested newt to colonise surrounding suitable habitat in due course.

6. Further considerations: The spread of chytridiomycosis (a disease of amphibians caused by the fungus *Batrachochytrium dendrobatidis*) in Britain is a major concern, and precautions were taken in line with standard biosecurity protocol (ARG-UK 2008) to minimise the possibility of transferring this disease between populations of amphibians. In particular, it was important to ensure that the donor population was not infected

Table 1. Habitat suitability data for great crested newt for ponds at receptor site

Pond	Date of creation	Habitat Suitability Index	Comments
P1	< 2006	0.71 (Good)	Pond dipping takes place. Pond area 40.5 m². Permanent. Water quality moderate. No shading, 40% macrophytes.
P2	< 2006	0.76 (Good)	Pond dipping takes place. Pond area 21 m². Permanent. Water quality good. No shading, 80% macrophytes.
P3	2008	0.75 (Good)	Pond dipping takes place. Pond area 36 m². Permanent. Water quality good, 20% shaded perimeter. Macrophytes 60%.
P4	2006	0.81 (Excellent)	No pond dipping takes place. Proposed release site. Pond area 286 m². Permanent. Water quality good. 10% shading, 10% macrophytes.

ISSN 1758-2067

as live material was transferred from the donor site to Nell Bank Centre. The donor site was tested for *B. dendrobatidis* in 2009 prior to egg transfer, with swabs taken from 30 animals and submitted for testing by PCR at the Zoological Society of London.

Policy background: There is currently no official action plan for the conservation of this species. However, ARC-Trust have published a national Species Action Plan (see http://www.arc-trust.org/Resources/Arc%20Trust/Documents/GCN-SAP-Aug09.pdf), which refers to introduction by translocation. There is a perceived population decline in UK and a loss of suitable breeding ponds and loss and fragmentation of terrestrial habitat are considered likely reasons for continuing decline (Jehle *et al*. 2011). Increasing fragmentation and loss of connectivity due to pond and terrestrial habitat loss mean that colonisation of new ponds is becoming less likely.

Donor Site: Donor site selection took place through discussion with local authority staff responsible for nature conservation at Bradford Metropolitan District Council, Leeds City Council and Harrogate District Council. No great crested newt populations were known in Bradford Metropolitan District Council. Populations at all known sites in Leeds were regarded as being too small to sustain any removal of eggs. Harrogate District borders Ilkley, and a number of sites with known large great crested newt populations were considered. The Mar, Arkendale (British National Grid reference SE 384610) was selected as the donor site due to its known robust great crested newt population supported by survey data. The Mar is a village pond managed by Arkendale Parish Council. The site is 24.5 km from the receptor site and was surveyed by the author and other Amphibian and Reptile Group volunteers in 2005 and 2006. A large great crested newt population was recorded at The Mar, with further records from several locations throughout the village indicating a robust metapopulation. Six hundred eggs represents the annual egg laying potential of two or three mature females (Griffiths 1996), and their removal was considered unlikely to impact negatively on the population.

ACTION

Introduction: The author was granted a series of Conservation Licences by Natural England, the government agency with derogation powers under the Conservation of Habitats and Species (Amendment) Regulations 2012. This allowed the transfer of up to 600 great crested newt eggs per year for three years (2009 – 2011 inclusive). The donor population was tested for *B. dendrobatidis* prior to commencement and found to be negative.

Eggs were taken from The Mar, Arkendale by inserting bundles of "egg strips" made from black plastic dustbin liners attached to canes (see Figure 2). Each year fifteen canes were introduced at the start of the mating season (typically mid-April) and checked regularly. Great crested newt readily utilised the egg strips as illustrated on Figure 3. Once sufficient great crested newt eggs were estimated to be present (typically mid-May), the egg strips were removed by hand, put in a container with pond water and taken immediately to the receptor pond. The eggs were introduced to pond P4 (the receptor pond) at Nell Bank by immersing the egg strips in the pond amongst submerged pond weed (mainly Canadian pondweed *Elodea canadensis*).

A feature of great crested newt genetics means that only 50% of eggs laid are viable (Horner & Macgregor 1995); consequently a maximum of 300 eggs could be expected to successfully develop each year. Great crested newts are long-lived (up to approximately 15 years) and are predominantly terrestrial. Once newts completed metamorphosis and emerged from the pond, it was considered likely that it would take two to four years before they were mature and ready to breed.

Figure 2. Egg strips ready for donor pond

Monitoring: Amphibian surveys have been undertaken at Nell Bank Centre regularly since 2007, and these data have been useful for indicating amphibian species presence and population levels prior to the introduction. Three survey methods were generally employed; bottle trapping, visual search using 500,000 candlepower Clu-lite torches (flashlights) and egg search. Surveys took place in the breeding season (April to June inclusive).

In 2014 a population survey meeting Natural England guidelines (English Nature 2001) was undertaken, involving six survey events during the breeding season using the three methods outlined above. A subsequent survey took place in 2015 using the same techniques over three survey events.

Figure 3. Egg strips with great crested newt eggs

ISSN 1758-2067

Table 2. Monitoring results from four ponds after introduction of great crested newt eggs to Pond P4 in 2009 – 2011.

Year	Date	Great crested newt records
2012	26/04/2012	None.
2012	10/05/2012	None.
2013	30/05/2013	Pond P4 - 2 males by torchlight, eggs present.
2013	04/06/2013	Pond P4 - 2 males by torchlight, 1 male in bottle trap, eggs present.
2014	07/04/2014	Pond P4 - 1 male by torchlight, 2 females in bottletraps.
2014	15/04/2014	Pond P4 - 5 males and 2 females by torchlight. Eggs present.
2014	06/05/2014	Pond P1 - 1 female. Pond P4 - 3 male and 5 female by torchlight. Eggs present.
2014	14/05/2014	Pond P1 - 1 female by torchlight, 1 male in bottle trap. Eggs present. Pond P4 - 4 male and 6 female by torchlight.
2014	22/05/2014	Pond P1 - 1 male by torchlight. Pond P4 - 1 female by torchlight.
2014	03/06/2014	Pond P4 - 1 larva recorded.
2015	31/03/2015	No great crested newts recorded.
2015	21/04/2015	Pond P1 – 7 males by torchlight, 3 male and 2 female in bottletraps. Pond P3 – 2 males 1 female by torchlight, 2 male 1 female in bottletraps. Pond P4 – 1 male by torchlight.
2015	19/05/2015	Pond P1 – 3 male by torchlight, 1 male in bottletrap. Pond P3 – 1 male by torchlight.

CONSEQUENCES

The findings from surveys undertaken after the introduction of great crested newt to The Mar for 2012, 2013, 2014 and 2015 are shown in Table 2. In each summer great crested newt larvae were recorded in the pond at Nell Bank indicating that eggs had developed successfully. The results of the 2014 survey indicated a small breeding population of great crested newts in the pond. A subsequent survey in 2015 indicated that a medium sized population was established at the receptor site. Great crested newt breeding was also recorded at two of the pond dipping ponds, indicating colonisation had taken place.

The peak count in the receptor pond in 2014 was 10 individuals (including observation of egg laying females) on 14th May. Peak count in P1 was two individuals and great crested newt eggs were also observed here on 14th May.

Peak count for the site in 2015 was 11 individuals spread throughout ponds P1, P3 and P4 on 21st April.

DISCUSSION

Background: Moving great crested newts to unoccupied habitat (translocation) has been undertaken in an effort to mitigate for habitat loss due to development in UK since the mid-1980s. The number of projects licensed by statutory agencies in UK has increased steadily over this period. For example in England 273 licences were issued in 2000 compared with over 600 in 2009 (Lewis 2012). Notwithstanding a requirement for post-development monitoring and reporting as a condition of licensing, Lewis (2012) reported that only 41% of English licences had provided documentation and, of those that reported, only 9% supplied post-development monitoring data. Further evaluation of licensed mitigation projects found that none had provided conclusive evidence to suggest translocations resulted in self-sustaining populations of great crested newt (Lewis 2012, Lewis *et al*. 2013).

Whilst this analysis appears bleak, there are several further studies which suggest successful translocations of populations have taken place; however, evidence is lacking due to poor licence returns and the short-term nature of post-development monitoring. Oldham and Humphries (2000) reviewed 178 translocation programmes in the period 1985–1994 and found evidence that populations were present in 37% of all cases one year after translocation. However, over half of projects did not provide enough evidence to assess success.

One replicated before-and-after study in 2005 (Lewis *et al*. 2007) provided perhaps the most reliable data regarding the efficacy of translocations intended to mitigate for site loss, with monitoring undertaken after three or more years at nine receptor sites. Their study focused on mitigation actions which included translocation as an element, and concluded that translocation of great crested newts had resulted in maintenance or establishment of populations at all sites. However, numbers captured at five of the nine sites were lower than that recorded prior to translocation or less than the total translocated. Additionally one long term study (Cooke 2001) indicated that a population was established from low numbers of introduced great crested newt (38), but that with such a small population traditional monitoring techniques may fail to detect the presence of the species in the medium term.

In contrast, a recent analysis of licensed mitigation procedures (Lewis *et al*. 2013) indicated that, of the twelve sites examined, populations had declined in seven (in three cases to apparent extinction) and at the remaining five sites populations appeared lower than comparable control sites. Moreover, it was concluded that favourable conservation status had not been maintained at eleven of the twelve sites.

Successful introduction at Nell Bank? Based on the data gathered to date it is considered likely that a population of great crested newt has been successfully established at the receptor site using translocation of eggs only.

Overwhelmingly, translocations for mitigation projects as described above focused on movement of adult individuals

ISSN 1758-2067

captured during the terrestrial phase. Only where pond loss takes place was it usual for licensed translocations to involve larvae and eggs from breeding ponds (Edgar *et al*. 2005, Lewis 2012).

The Nell Bank introduction was undertaken utilising one life stage of great crested newt which contrasts with the majority of attempted population translocations for mitigation purposes in England as described above and in Smith and Sutherland (2014). When undertaking translocation for mitigation purposes there is a legal obligation to avoid harm to individual newts and consequently the focus is often on capture and translocation of adults. In the case of translocations to establish new populations for conservation purposes there is more flexibility. Successful re-introduction of great crested newt and smooth newt *Lissotriton vulgaris* utilising larvae and juveniles has been documented (Kinne 2005), and spawn translocation has been widely used to establish natterjack toad populations (Griffiths *et al*. 2010). Additionally, removal of eggs was also considered in this study to minimise impact on the donor population, where loss of eggs and juveniles was observed to be a regular occurrence due to stochastic events (for example when ephemeral ponds dry out).

Eggs were also chosen as it was believed by the author that using this life stage was most likely to result in successful establishment of a population with emerging larvae experiencing terrestrial habitat for the first time at the receptor site. Introduction of adults was considered less likely to be successful, as adults would find themselves in novel habitat where survivorship was likely to be impaired. Available research data appear inconclusive in this respect (Oldham & Humphries 2000, Lewis 2012); however, it is clear that current mitigation actions including translocation of adults are not maintaining the favourable conservation status of great crested newts (Lewis *et al*. 2013).

Implications for great crested newt mitigation: There may be implications for translocations undertaken under European Protected Species Licences for mitigation currently issued by Natural England to allow development to take place. Due to the nature of UK legislation for this species (Conservation of Habitats and Species (Amendment) Regulations 2012) the focus of licensed mitigation efforts is usually avoiding harm to individual great crested newts, rather than maintaining the conservation status of the species through establishing sustainable populations. Consequently, placement and translocation of egg strips does not currently form part of established great crested newt mitigation practice. The results of the introduction reported here indicate that a more comprehensive approach to translocating populations of great crested newts to facilitate development may be to focus on transferring all life stages including eggs from donor ponds (which will subsequently be lost to development) to newly created receptor ponds.

The current study indicates that to increase likelihood of successful establishment of populations, translocation of eggs may need to take place over a number of years prior to trapping and re-locating adults and juveniles to the receptor habitat in the usual way. It is concluded that great crested newt egg translocation can result in population establishment in a short period of time with minimal cost and risk. It is hoped that this population will enhance the conservation status of the species through helping to address colony loss throughout UK, and increase resilience through establishment of a new metapopulation in Lower Wharfedale.

ACKNOWLEDGEMENTS

The costs for processing swabs to check for *Chytridiomycosis* were covered through generous donation by Wharfedale Naturalists Society, Amphibian and Reptile Group-UK and Amphibian and Reptile Conservation Trust. Survey work was undertaken by volunteers from Yorkshire Amphibian and Reptile Group and Wharfedale Naturalists Society. Advice and support was gratefully received from Jim Foster and David Orchard

REFERENCES

Amphibian and Reptile Conservation Trust (2009) *Great crested newt species action plan*. ARC Trust.

ARG-UK (2008) *Advice Note 4. Amphibian disease precautions: a guide for UK fieldworkers.* Version 1. ARG-UK.

Cooke AS (2001) Translocation of small numbers of crested newts (*Triturus cristatus*) to a relatively large site. *Herpetological Bulletin*, **75**, 25-29.

Edgar P.W., Griffiths R.A. & Foster J.P. (2005) Evaluation of conservation as a tool for mitigating development threats to great crested newts (*Triturus cristatus*) in England, 1990-2001. *Biological Conservation*, **122**, 45-52.

English Nature (2001) *Great Crested Newt Mitigation Guidelines, version August 2001*. English Nature.

Griffiths R.A. (1996) *Newts and salamanders of Europe*. London - Poyser.

Griffiths R.A. McGrath A. & Buckley J. (2010) Reintroduction of the natterjack toad in the UK. Pages 62-65 in: *Global Re-introduction Perspectives: 2010. Additional case studies from around the globe*. IUCN/SSC Re-introduction Specialist Group, Gland, Switzerland.

Horner H.A. & Macgregor H.C. (1985) Normal development in newts (*Triturus*) and its arrest as a consequence of an unusual chromosomal situation. *Journal of Herpetology* **19**, 261-270.

IUCN/SSC (2013). *Guidelines for Reintroductions and Other Conservation Translocations. Version 1.0*. IUCN Species Survival Commission, Gland, Switzerland.

Jehle R., Thiesmeier B. & Foster J. (2011) *The Crested Newt, a dwindling pond dweller*. Laurenti-Verlag, Bielefeld, Germany.

JNCC (2003) *A policy for conservation translocations of species in Britain*. JNCC.

Kinne O. (2005) Successful re-introduction of the newts *Triturus cristatus* and *T. vulgaris*. *Endangered Species Research*, **1**, 25-40.

Langton T., Beckett C. & Foster J. (2001) *Great crested newt conservation handbook*. Froglife, Halesworth.

Lewis B., Griffiths R.A. & Barrios Y. (2007) *Field assessment of great crested newt* Triturus cristatus *mitigation projects in England*. Natural England Research Report NERR001.

Lewis B. (2012) An evaluation of mitigation actions for great crested newts at development sites. PhD thesis. The Durrell Institute of Conservation and Ecology, University of Kent.

Lewis B., Griffiths R.A., Wilkinson J.W. & Arnell A. (2013) *Examining the fate of local great crested newt populations following licensed developments*. DEFRA Report WM0321.

Oldham R.S. & Humphries R.N. (2000) Evaluating the success of great crested newt (*Triturus cristatus*) translocation. *Herpetological Journal*, **10**, 183-190.

ISSN 1758-2067

Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000) Evaluating the suitability of habitat for the great crested newt *(Triturus cristatus). Herpetological Journal*, **10**, 143-155.

Smith R.K. & Sutherland W.J. (2014) *Amphibian conservation: Global evidence for the effects of interventions.* Pelagic Publishing, Exeter.

ISSN 1758-2067