Institution: University of Kent

Unit of Assessment: Anthropology and Development Studies UoA 24

Title of case study: Amphibian and Reptile Protocols

1. Summary of the impact

This case study describes how innovative new survey protocols for amphibians and reptiles in the UK are already changing conservation and planning practice in the UK. The new protocols, developed by a team led by Professor Richard Griffiths at the University of Kent, make surveys more effective and provide guidance for obtaining better data on trends for these species. Thanks to a series of engagement workshops held in 2011-12, the team's research has already informed best practice amongst ecologists, consultants and fieldworkers involved in professional practice and national recording schemes. Moreover, the revised and science-based survey protocols, published in March 2013, are in the process of being adopted within policy, best practice and statutory guidance in England, Wales and Scotland.

Prior to this research, survey protocols for amphibians and reptiles had changed little for some 20 years, and were not science-based. Consequently, the amount of survey effort required to reliably determine population status was controversial. With developers forced to spend up to £125 million per year to mitigate impacts on some species, this issue was particularly pressing within the commercial sector. Using statistical models, Griffiths' team derived recommendations that resolved how much effort was required to reliably detect whether a species was present or absent from a site. If it were not for this research, these important protocols would not have changed, and surveys would not have been as cost-effective or as reliable. Indeed, despite several decades of intensive recording activity, there were insufficient data to provide a meaningful statement on long-term trends of UK species for the recent National Ecosystem Assessment.

2. Underpinning research

The aim of the underpinning research was to use recent developments in statistical modelling to improve the design and analysis of surveys carried out within both professional practice and voluntary sectors, including the National Amphibian and Reptile Recording Scheme (NARRS). The results of this research are now being adopted within guidance provided by the government conservation agencies, and subsequently by professional consultants and NGOs involved with survey and monitoring.

All species of amphibian and reptile in Britain have some degree of legal protection. Work by Griffiths' team showed that up to £125 million is being spent annually on efforts to mitigate the impacts of development on just one of these, the great crested newt. However, previous survey protocols have been largely unable to provide the evidence needed to show that such expensive efforts are effective in conserving populations. The underpinning research focused on two fundamental issues. Firstly, conservation assessments usually use simple counts of animals. These do not take into account variation in detectability, and can lead to 'false absences'. This means that the counts may actually be a better reflection of factors influencing detection (e.g weather conditions, vegetation, surveyor expertise) than they are of the number of animals present. The research used capture-mark-recapture and occupancy models to estimate levels of detectability using different survey methods. Secondly, the amount of survey effort required to reliably detect animals or populations has been largely based on anecdotal evidence. The research used statistical models to determine the optimal combination of survey visits and survey methods for a given survey goal. The project has therefore resolved long-running debates about how much survey effort was needed to obtain data on population status that was statistically defensible.

The research was funded by the Esmee Fairbairn Foundation via two 2-year grants (2007-8: amphibians; 2009-10: reptiles; details in section 3, points a, b). These were channelled through the University of Sussex with Co-PIs at Sussex (Beebee) and Kent (Griffiths, employed at Kent 1995 to

present), and with the project officer (Dr David Sewell) based at Kent (2007-2011 employed by Sussex but based at Kent; 2011-present employed by and based at Kent). A NERC Knowledge Exchange grant (2010-12) followed these grants and provided the vehicle for discussion and dissemination of the findings; it involved the same partnership with colleagues at the University of Sussex but was administered through Kent. All stages of the research have involved close collaboration with the School of Mathematics, Statistics and Actuarial Science at Kent. Therefore, the contribution of leading researchers at Kent (notably Griffiths) was substantial. Professor Griffiths is a leading authority on amphibian and reptile conservation, as evidenced by his election as President of the British Herpetological Society and his membership of several influential trusts and committees within the field.

Since 2008 this research has resulted in two papers (one published in *Biological Conservation*, the other in *PLoS ONE*) which built on Griffiths' earlier research in the same area. The first paper evaluated amphibian survey protocols for the National Amphibian and Reptile Recording Scheme (NARRS) in Britain, which aims to assess the status of five widespread amphibian species. Surveys were undertaken by trained volunteers and researchers in contrasting landscapes over two years, and occupancy modelling was used to determine covariates of detection, and to optimise the number of surveys and number of methods required. In the second study the team used the same occupancy modelling approach on all six native reptile species in the UK to determine: (i) occupancy and detectability of all the species across a range of sites; (ii) the optimal number of survey visits to carry out per site; and (iii) the required sampling effort to detect population declines at different power levels. The approach described in the studies has been instrumental in finding the best compromises between rigor and simplicity when volunteers are used in large-scale surveys.

It became clear that the results of this research were of considerable interest to statutory conservation agencies, professional ecologists, planners, policy makers and reserve managers, all of whom carry out amphibian and reptile surveys as part of their work.

3. References to the research

i. Sewell, D., G. Guilleria-Arroita, **R.A. Griffiths** and T.J.C. Beebee (2012). When is a species declining? Optimising survey effort to detect population changes in reptiles. PLoS ONE 7: e43387. doi:10.1371/journal.pone.0043387.

ii. Sewell, D., T.J.C. Beebee and **R.A. Griffiths** (2010). Optimising the efficiency of biodiversity assessments by volunteers: the application of occupancy modelling to large-scale amphibian surveys. *Biological Conservation* 143: 2102-2110. doi: 10.1016/j.biocon.2010.05.019.

iii. **Griffiths, R.A.**, D. Sewell and R. McRea (2010). Dynamics of a declining amphibian metapopulation: survival, dispersal and the impact of climate. *Biological Conservation* 143: 485-491. doi: 10.1016/j.biocon.2009.11.017.

iv. Platenberg, R.J. and **R.A. Griffiths** (1999). Translocation of slow-worms as a mitigation strategy: a case study from SE England. *Biological Conservation* 90: 125-132. doi: 10.1016/S0006-3207(99)00023-3.

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a. £75,532 from Esmée Fairbairn Foundation: National Amphibian and Reptile Recording Scheme – Research Support 1 2007-2008 (*co-PI with Prof. T. Beebee – grant administered through University of Sussex*).

b. £102,942 from Esmée Fairbairn Foundation: National Amphibian and Reptile Recording Scheme – Research Support 2 2008-2009 (*co-PI with Prof. T. Beebee – grant administered through University of Sussex*).

c. £82,409 from NERC: Development of standardized protocols for assessing reptile and amphibian populations. 2011-2012 (*PI, grant administered through University of Kent*)

4. Details of the impact

The work undertaken by Griffiths et al. has already had significant impact in informing debate amongst practitioners and volunteers and in redefining best practice in the field.

In addition to the new research (see section 3, publications i, ii, iii, iv), a key element of this project has been consultation and engagement between the academic team and professionals and volunteers on the ground. The NERC Knowledge Exchange project had the support of all three statutory agencies (Natural England, Countryside Council for Wales and Scottish Natural Heritage) and the main NGO working in this area, Amphibian and Reptile Conservation Trust (ARC Trust), as well as major environmental consultancies that carry out surveys on behalf of developer clients. As part of the NERC project, four workshops were conducted (one each in Scotland and Wales and two in England) to disseminate the results of the research and obtain input from the professional and voluntary sector (section 5, points A, C, D, E). Griffiths was subsequently asked to organise a further workshop (in South West England) that was funded externally. Ninety-one personnel attended these workshops, with stakeholders from all sectors represented (i.e. government and non-government organisations, consultants, scientists, planners and volunteers). Feedback questionnaires from the workshops were overwhelmingly positive (e.g. 'Very grateful to the DICE team for sharing emerging best practice') and were used to identify future training needs at a final workshop on 19 December 2012. This was aimed at professionals engaged with the design and delivery of survey training courses and was attended by a further 16 personnel. In addition to these stakeholder workshops, the project outputs and updates were presented annually at the Herpetofauna Workers' Meetings from 2010-2013 (c.150-200 delegates per year, drawn from professional, government and voluntary sectors). Through discussion and dissemination at these events the new protocols have already informed practitioner debate and had a significant impact on survey practice in Britain (see section 5, points A, D, E).

A project report summarising the research and workshop outputs was published in March 2013 (*'Survey protocols for the British herpetofauna. Version 1.0'*). It has been widely disseminated to project partners and placed on the ARC Trust website. This document will be used by the ARC Trust as the key reference document for guidance and consultation (see section 5, points B, C). The results of the research are also now being adopted as policy guidance provided by the government conservation agencies in Britain (Natural England, Countryside Council for Wales and Scottish Natural Heritage), and subsequently by professional consultants and NGOs involved with survey and monitoring (see section 5, points A, C, D, E for details, relevant quotes from those statements are below).

For example the Countryside Council for Wales (CCW) states: *'The results from this project will be used to inform standardised methods which can be applied at a range of scales to inform us better of local site importance and statutory site management as well as providing a better basis for licence application assessments. The development of further standardised guidance for both CCW staff and other regulatory bodies in Wales (Environment Agency and Forestry Commission) will be of great benefit to our current process of bringing other WAG agencies into line with protected species licensing requirements.'*

Jim Foster, Amphibian and Reptile Conservation: '*The NERC KE project has also been helpful in developing ARC's research and monitoring agenda. We work with a range of researchers and students, and the work done under the NERC KE project has prompted us to re-assess which areas are of key interest.'*

John McKinnell of Scottish Natural Heritage (SNH) states: '*The development of better protocols which better assess population size and sustainability is very important to our role.'*

Paul Edgar of Natural England states: '*The Amphibian and Reptile Survey Protocols produced by*

DICE have made an immediate, vital and outstanding impact to our work and will greatly improve our monitoring and surveillance efforts for these species.'

Conclusion

The impacts of this project are significant, wide-ranging and far-reaching. The research has already informed debate and improved best practice amongst conservation professionals and volunteers. The new protocols are being adopted into policy guidance in England, Wales and Scotland. They will help improve the management and conservation of important amphibian and reptile species; and they also have economic advantages for planners, developers and environmental consultancies who will benefit from the more streamlined and science-based approach to monitoring. Moreover, the protocols are likely to have a wider impact, for example in informing initiatives such as the National Ecosystem Assessment, and with strong potential for international adoption in future.

5. Sources to corroborate the impact

A. Countryside Council for Wales (CCW) detailing the adoption of standardised methods.

B. A new website is currently being developed by the ARC Trust, and this will include a section on survey and monitoring protocols that will stem directly from the research. As two members of the research team (Griffiths – Kent, Beebee – Sussex) are ARC Trustees, on-going research outputs will be incorporated as they emerge. The website (still under construction) can be found at http://www.arc-trust.org/get-involved/surveys/general-protocols.

C. Guidance notes are currently being drafted by the ARC Trust that will be adopted by government agencies. These guidance notes will incorporate the results of the research (to follow when released). A statement from Jim Foster, Amphibian and Reptile Conservation indicates the importance of the NERC KE project.

D. Scottish Natural Heritage (SNH): John McKinnell indicates the importance of the protocols for SNH.

E. Natural England: Paul Edgar states that the protocols developed by Griffiths' team have had an immediate and outstanding impact.