

Natural England Board



Meeting: 92
Date: 6 November 2019

Paper No: NEB 92 03

Title: Bovine TB

Lead/s: Dr Tim Hill, Chief Scientist

1. Purpose

- 1.1. The purpose of this paper is to highlight the possibility of a shift in focus in the Government's policy for controlling tuberculosis (TB) in badgers following the '**Bovine TB Strategy Review**' chaired by Prof Charles Godfray (the 'Godfray Review')¹.
- 1.2. The paper also identifies a number of evidence needs that have emerged as Natural England has licensed successive years' culls, and proposes that Board formally commission NESAC to review the available evidence relevant to Natural England's roles as conservation advisor and licensing authority.

2. Role of the Board

- 2.1. Under the NFSOD on-Financial Scheme of Delegation, the Board stands over the approval of high level policies and strategies involving potential significant impact on the environment, the organisation or Natural England's reputation. This paper describes a proposition that will help inform our ongoing organisational position both on our delivery work and on our advice to Government – in what we recognise is a contentious area of public policy.

3. Recommendation

3.1. The Board is asked to:

- **Note**
 - .1. the key findings from the Godfray Review and expected Defra response; and
 - .2. the evidence needs relevant to Natural England's roles that have emerged as the badger cull policy has been implemented and evolved.
- **Agree** to commission NESAC to review the available evidence in order that it can advise Board on the weight of evidence underpinning potential approaches to reducing cattle TB to inform any future advice to Government and in support of Natural England's continued role as licensing authority.

4. Context and timing

- 4.1. Since the first two ‘pilot’ cull areas were licensed in 2013 badger culling has expanded to 15 counties and covers nearly 17% of England (see Figure 1). Culling now takes place over more than 20 times the area of proactive culling during the Randomised Badger Culling Trial (‘RBCT’), the primary source of evidence underpinning this policy. Such upscaling of culling has led to new evidence requirements and this, alongside legal challenges to the policy and Natural England’s licensing role, has tested the robustness of the original evidence-base (see **Annex A** for background on the development and implementation of the policy).
- 4.2. In 2018, the Government commissioned a review of its TB strategy by an expert panel chaired by Prof Charles Godfray¹. The Government’s response to the Review is expected shortly, however, in the interim the Secretary of State has refused an application to cull badgers in Derbyshire due to potential impacts on vaccination projects in the county. In parallel, Natural England’s Chair has made a number of public commitments to look at the evidence underpinning the control of TB in badgers. Collectively, these factors make it an opportune moment to bring a paper on this topic to the Board.

5. Godfray Review

- 5.1. The Review included a number of recommendations that are relevant to both badger culling and badger vaccination, both of which are conducted under licences issued by Natural England.
- 5.2. In the event badger culling remains an element of the Government’s future TB policy, the Review supported the current practice of culling being carried out over large geographic areas to reduce the relative effects of perturbation and utilising natural barriers to badger movement. Drawing on experience from the RBCT that the benefits of culling persist for some years after lethal control stops, the Review considered that periodic culling is a more promising strategy than continuous culling beyond four years.
- 5.3. The Review, however, considered a move from lethal to non-lethal control measures “highly desirable”, and identified injected vaccination as the only viable option at the present time. Highlighting the continuing uncertainty about the relative effectiveness of badger vaccination and culling as strategies to control TB the Review recommended that if culling continues then after four years of culling the Government should consider a programme in which badgers are vaccinated in half of the areas and, after a two-year pause, intensive culling resumes in the other half. The outcomes should be monitored and adaptively managed so should it become clear that vaccination is providing comparable benefits to culling then all areas should adopt it, with the opposite happening if vaccination fails to provide protection.

¹ The review team were: Professors Charles Godfray, Christl Donnelly, Glyn Hewinson, Michael Winter and James Wood.

Government response to Godfray Review

- 5.4. The Government's response to the Godfray Review is expected in the near future. How it will respond is uncertain. However, its recent decision to reject an application for a farmer-led cull in Derbyshire to allow time to further consider "to how best to manage the coexistence of vaccination projects and badger control projects in the edge area"; a response to concerns about the impact of culling on vaccination projects, suggests that the Government is actively reappraising the role of badger vaccination. Furthermore, as an increasing proportion of the TB High Risk Area ('HRA')² is culled, it is anticipated that the Government will wish to examine a range of options for long-term disease control in badgers.
- 5.5. Following the current trajectory, it is anticipated that in two years' time approximately 90% of the HRA could be encompassed within a cull area. If, for present purposes, it is assumed that the intensive cull policy has achieved its goal at this point and no new areas are licensed after 2021 (and all culling ceases four years later when 2021 licences end) then it is estimated that in the region of 225,000 badgers will be killed in total since the onset of culling in 2013. Figure 2 shows the expected pattern of culling under this scenario. In these circumstances, by the conclusion of culling in 2025 the badger population will have been reduced by 70-95%, at least temporarily, over nearly 25% of England.

6. Natural England's role

- 6.1. Natural England exercises a dual role in the development and delivery of this policy: that of statutory nature conservation advisor, and that of wildlife licensing authority. The following scenario illustrates the distinction between these roles:
- as conservation advisor we might choose to give advice on the implications of a culling or a vaccination focused policy on badger populations as well as the indirect effects on other species; while
 - as licensing authority we would need to be satisfied that whatever policy choice is made by government satisfies legal requirements for issuing a licence. In this scenario, the option selected would need to be capable of delivering a disease control benefit because the purpose for which licences are issued is to '*prevent the spread of disease*' (s.10 of the Protection of Badgers Act 1992).
- 6.2. Acting in both capacities Natural England advised Defra on the development of the original culling policy, offering formal advice to the Secretary of State in 2010 and 2011ⁱⁱ (see **Annex A** for background on our role and position).
- 6.3. It is important to note that as licensing authority Natural England is legally responsible for the licences that it issues. While Natural England is entitled to have regard to policy guidance provided by Defra, it must itself be satisfied that licences comply with legal requirements and are justified by the evidence.

² Map showing tuberculosis risk areas in England: <https://tbhub.co.uk/risk-map/>

7. Evidence Gaps

- 7.1. As implementation of the culling policy has progressed a series of evidence needs and gaps have emerged. Culling is taking place over an expanding area of England and, as we advised in 2010 and 2011, it means the Government is increasingly less able to rely on the evidence base provided by the RBCT. Implementation of the policy has also identified operational challenges for which the existing evidence base is proving unsatisfactory. Finally, intensive culling was never proposed as the long-term solution to controlling TB in badgers and – particularly in light of the Godfray Review – we need to revisit the available evidence to inform future strategies.
- 7.2. Four key evidence gaps are identified below. The Natural England role to which each ‘gap’ is primarily relevant is indicated, although all have relevance to both roles.
- (i) Estimating badger population size and cull numbers
- 7.3. The policy requires the removal of at least 70% of the initial badger population to achieve the disease reduction, but less than 95% of the population to avoid causing local extinctions. These two values define the minimum and maximum (min-max) number of badgers to be culled in each area. Badgers are, however, hard to survey accurately. In the early years of the cull, estimates of badger populations were based on sett surveys (multiplying the number of setts by the average group size). Later, population size for some cull areas were estimated by average badger densities according to land cover types using values from the National Sett Surveyⁱⁱⁱ. Repeated problems with both of these methods (with numbers needing to change significantly mid-cull due to evident inaccuracies) led to Defra switching in 2018 to setting cull numbers based on average cull success rate. In the first year of intensive culling in 19 areas the average number of badgers culled was 3.18 km⁻² (range: 1.81-7.21 km⁻²). This value is now used as the starting mid-point target value with a min—max cull range set to represent 70%-95% of this value. During each year of the cull the min-max numbers may be revised depending on success, effort and cull coverage measures for each area.
- 7.4. Min-max numbers are set to achieve an appropriate reduction in badger numbers during a four year intensive cull period. For each area, min-max numbers for years 2-4 are calculated by subtracting the number of badgers culled in the first (and subsequent) years from the estimated starting population, adjusting for estimated population growth rates (through reproduction and immigration) and further moderated by a sample sett survey (for Natural England these sample surveys also provide a level of confidence that the cull is not leading to localised extinctions). The calculations are complicated further because since 2018, cull areas do not have Year 1 population estimates; consequently, the surveys in Year 2+ are used to estimate the initial starting population (adjusted for the number previously culled).
- 7.5. After four years of intensive cull, a ‘supplementary badger cull (SBC)’ is carried out each year, which aims to maintain the population at the lowered level for a further five years. Min-max numbers for SBC areas are set based on a proportion of the badgers culled in the first year of the cull, currently 36%, and this value is derived from average values taken across later years of the intensive cull periods.

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- 7.6. In essence, the min-max numbers that determine the numbers of badgers culled are now more derived from effort-based measures relating to cull success rates than on a strong evidence base regarding badger population size (before or after cull), as used in the RBCT. This may be appropriate as effort-based culls might be more closely related to disease risk than culling a fixed proportion of the population regardless of its starting density, but this effort-based approach has arguably moved away from the evidence upon which the cull is based.
- 7.7. *Primary relevance to licensing role:* to provide confidence that we are setting appropriate min-max levels to achieve effective disease control without endangering badger populations.
- (ii) Impact of culling on badger populations
- 7.8. The badger is our largest terrestrial predator and the apex predator of many terrestrial ecosystems. The culling policy requires licensees to remove at least 70% of badgers and allows a population reduction of up to 95% within cull areas that average about 500 km². The growing number of cull areas are coalescing to create landscapes where badger numbers are significantly depressed over prolonged periods. Already covering 16.5% of England the policy allows culling to be expanded to cover more than 30% of the country.
- 7.9. While there is no evidence to date of local extinctions, to minimise the risk of this or other negative effects on the population we need to understand the implications of culling at this scale. This need is accepted by Defra and we have submitted a joint capital bid for research funding within the current Spending Review.
- 7.10. We understand that a new complaint has been submitted to the Bern Convention Secretariat claiming that the culling policy poses a risk to the badger population. While such complaints are for the Government to respond to, as both conservation advisor and licensing authority, Natural England has an interest in making sure the UK does not endanger its badger populations (see **Annex B** for background on Bern Convention obligations).
- 7.11. *Primary relevance to our advisory role:* to enable us to provide robust advice to government on the status of badger populations and necessary measures to avoid local extinctions.
- (iii) Wider ecological effects of badger culling
- 7.12. Our understanding of the wider ecological effects of culling is based almost exclusively on research conducted during the RBCT^{iv}. This identified evidence of increased abundance of foxes and hedgehogs, and concluded that there are potentially positive and detrimental effects on other species. These findings have relevance for the status of species of conservation concern and species that are notified features of designated protected areas within or adjacent to cull areas, such as ground-nesting birds. Such wider ecological effects may be more profound under the current policy than under the RBCT due to the geographical scale and duration of culling. It is important that we understand the nature of any wider ecological effects under the current culling regime.

- 7.13. This topic formed a key element of a legal challenge against Natural England in 2018. We successfully defended that challenge but in doing so made a commitment to the High Court that we would monitor and review wider ecological effects, particularly in respect to protected sites.
- 7.14. Natural England commissioned BTO to undertake an analysis of Breeding Bird Survey data in and near the cull areas in 2018. This found no evidence of a clear effect – positively or negatively - of culling on bird populations associated with culling in the first three cull areas. Further research is planned to examine effects in other areas, which is subject to the success of the bid for funding referred to above.
- 7.15. *Equally relevant to both roles:* so we can provide robust advice to government on wider ecological implications of culling and to give us confidence that the licences we issue are suitably conditioned to avoid adverse effects on protected sites and populations of species of conservation concern.

(iv) Vaccination

- 7.16. There is currently no oral vaccine available and vaccination requires badgers to be trapped and injected with a BCG vaccine (approved in 2010). Vaccination provides some but not perfect protection against infection but does not cure an existing infection, and we do not know the duration of immunity. Because of this and the need to inoculate new cubs, repeated annual vaccination campaigns are required (typically lasting 4 years). This operation requires a Natural England licence.
- 7.17. Modelling has shown that vaccination is potentially capable of reducing TB incidence in cattle, although not as effectively as culling^v. To date, however, there have been no large-scale trials of the impact of badger vaccination on disease risk in cattle comparable to the RBCT in England, although there is growing experience of vaccinating badgers. This comes from a large-scale deployment in the Republic of Ireland as well smaller-scale projects in England (including the as the sole Badger Vaccination Deployment Project trial area in Gloucestershire and projects part-funded through the Government's 'Badger Edge Vaccination Scheme')³.
- 7.18. Following the Government's decision on the Derbyshire cull licence Natural England paused the issue of new vaccination licences and requests for new vaccination sites while it reviews its approach to licensing these projects. The review will conclude before next year's 'open season' for trapping to vaccinate badgers starts on 1 May.
- 7.19. *Primary relevance to our licensing role:* While we would expect to give government advice on the implications of both culling and vaccination focused policies on conservation matters, our primary evidence need relates to licensing. If vaccination plays a more central role in future TB control policy then we need to be satisfied that it is capable of contributing to TB control, and we need to know what measures (e.g. size of area, frequency and duration of vaccination) are required to maximise the effectiveness of this approach.

³ In 2018 641 badgers were vaccinated, whereas 32,934 were killed under licence.

8. Commission for NESAC

- 8.1. In light of the evidence needs noted above and the expectation that the Government will seek our views on future policy options we propose that NESAC is commissioned to lead a review of evidence related to the four 'gaps' identified above.
- 8.2. The review should focus on the evidence required by Natural England to discharge its statutory roles as conservation advisor and as licensing authority. It is recommended that NESAC works closely with officers involved in these duties to ensure the scope of the review meets our requirements.
- 8.3. Once the NESAC review is complete, Board may wish to consider the evidence underpinning Natural England's organisational position on the control of TB in badgers (**see Annex C**) and take a view on whether it needs to be updated in light of new evidence.

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Figure 1: Summary of licensed badger culling 2013 – 2019. Culling data for 2019 are estimated on the basis of average removal levels for years 1 – 6, using information for all culling activity to date

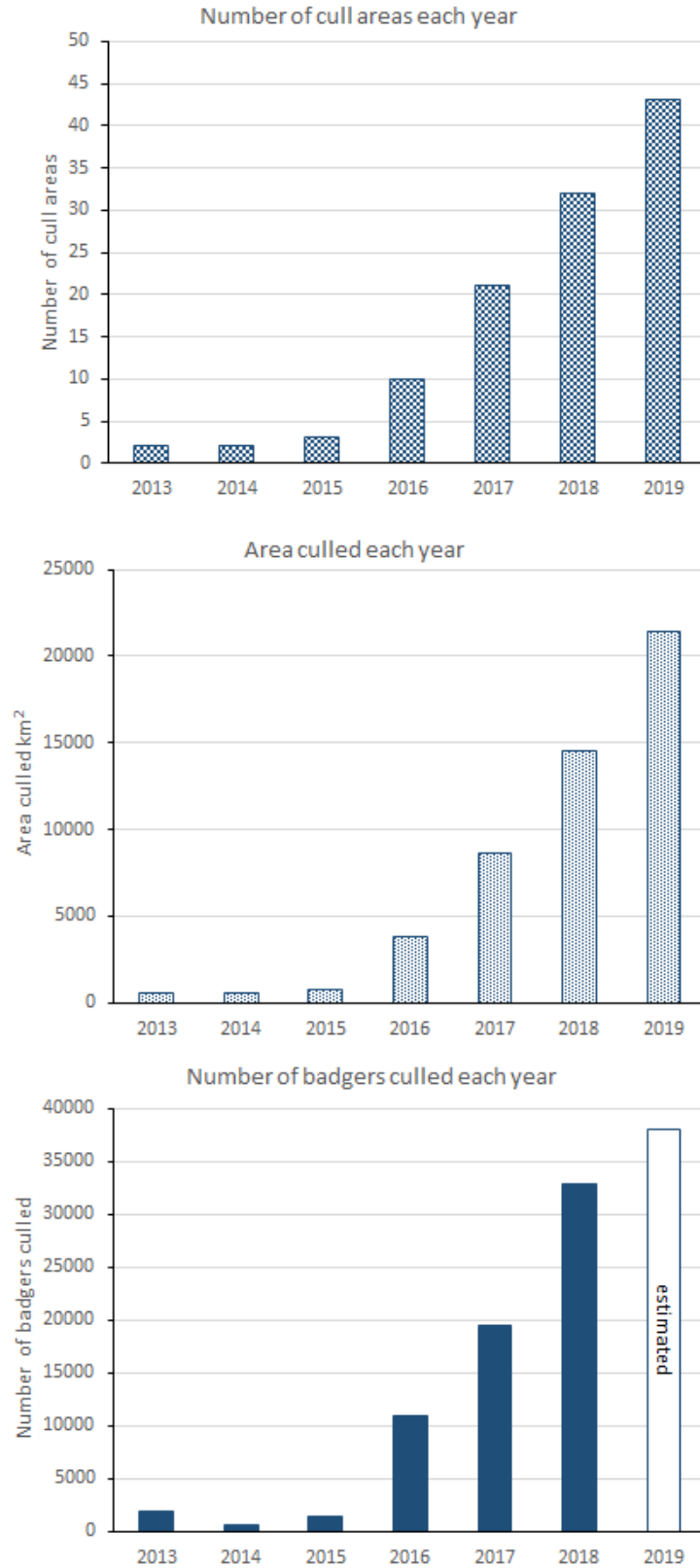
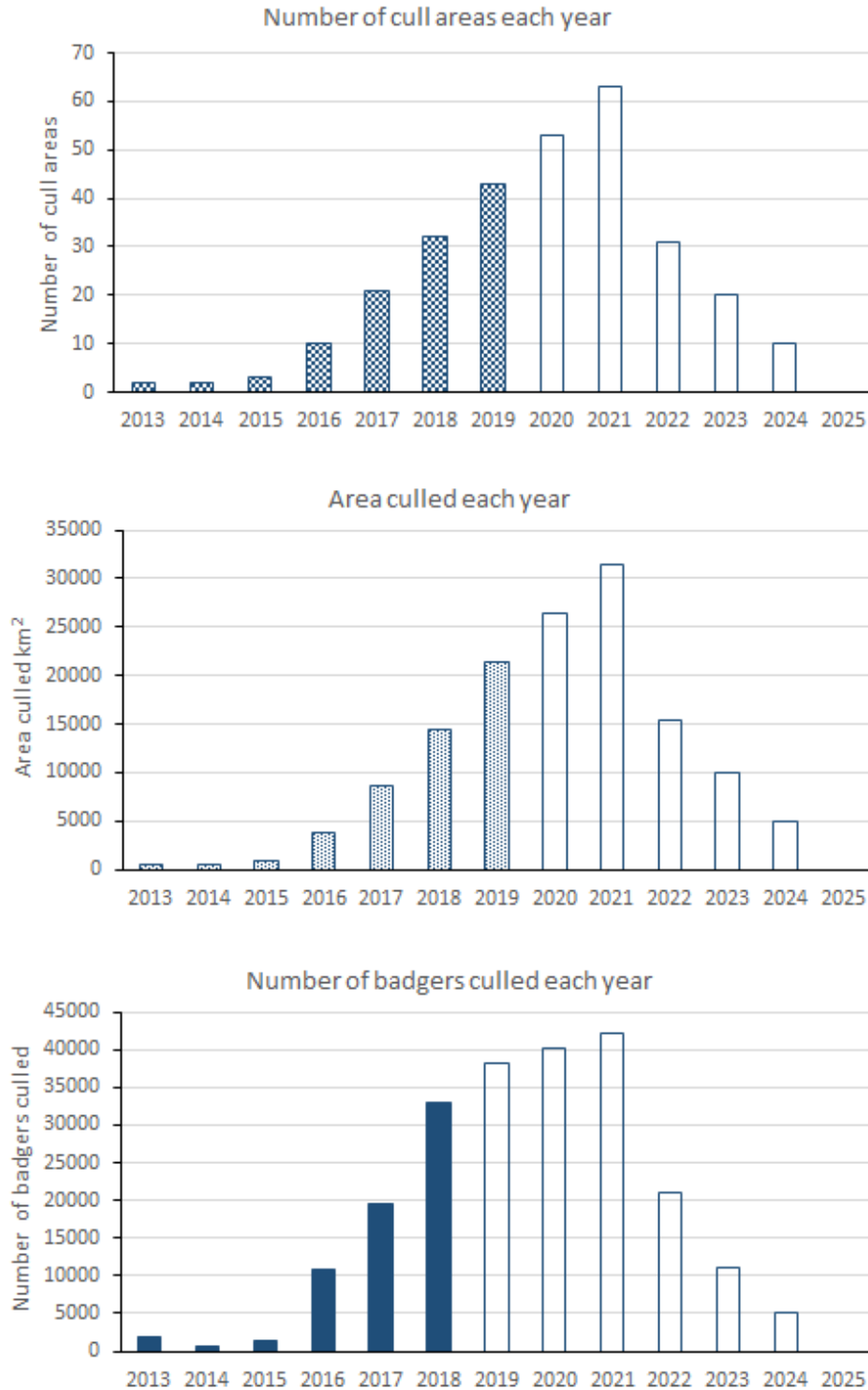


Figure 2: Badger culling under a policy allowing new cull licences until 2021. Where values are predicted (unshaded columns) it is assumed that 10 new areas are licensed in 2020 and 2021 (maximum normally permitted) and all areas conduct supplementary culs on the conclusion of the first four years culling until 2021 but not thereafter. Predictions are based on average values for culs conducted over the period 2013-2019 (except badger removal, where data are available only until 2018). The estimated total number of badgers culled by the conclusion of culling (assuming no additional areas are permitted under policy exceptions) is 225,000 badgers.



Annex A: Background on the current badger culling policy

History and context

1. In 2007, the Independent Scientific Group (ISG) headed by Prof John Bourne published its report of the findings of the Randomised Badger Culling Trial (RBCT)^{vi}. It found that reactive culling increased the incidence of bovine tuberculosis ('TB') in cattle while the benefits of proactive culling (a 23.2% reduction in TB) were partially offset by an increase in disease incidence in the surrounding un-culled 2 km buffer area (24.5% increase). It was estimated that the net effect of proactive culling for five years over 1000 km² was to prevent 14 cattle TB breakdowns.
2. Changes to badger ecology and behaviour, leading to increased transmission of the disease from the remaining infected badgers in culled areas to cattle and badgers in neighbouring areas (the so-called 'perturbation effect') were judged to be responsible for the increased disease incidence linked to culling.
3. Collectively, the findings of the RBCT led the ISG to conclude "*that badger culling cannot meaningfully contribute to the future control of cattle TB in Britain*".
4. The Government's Chief Scientific Adviser, Sir David King, examined the ISG findings but reached a substantively different headline conclusion, stating that "*the removal of badgers could make a significant contribution to the control of cattle TB...*" (July 2007)^{vii}.
5. The EFRA Select Committee also reviewed the evidence and in 2008^{viii} recommended that licences to cull badgers should only be issued if farmers could satisfy Government of their ability to meet a set of stringent conditions for a successful cull. At this point the Government decided against pursuing a policy of badger culling on the grounds that it considered the risk of making the disease worse too high. Instead the Government made a commitment to researching and trialling vaccination (including launching the 'Badger Vaccine Deployment Project').
6. In 2010, this position was reversed by the new Coalition Government. On the basis that it wished to "*use every tool in the toolbox*" to control TB in cattle and that in areas with high and persistent levels of TB in cattle, vaccination would not reduce the weight of infection in the badger population as quickly or effectively as culling^{ix} a policy to permit farmer-led badger culling was developed. This policy was announced in December 2011^x. In parallel, the Government reviewed and terminated the Badger Vaccine Deployment Project in 5 of the 6 planned areas^{xi}.
7. The culling policy was closely modelled on the evidence base provided by the RBCT. In practice, this meant a licensing regime that replicated the features of the RBCT considered important for achieving effective disease control – namely an intensive cull (removing >70% of badgers) carried out over large areas (>150 km²) for a minimum duration of four years. To make sure culling continued long-enough to achieve a disease control benefit legal agreements were used to secure access and funding to allow the Government to conduct the cull should licence cull companies fail to deliver an effective cull or cease culling activity prematurely.

8. Although the evidence is compelling that badgers are a source of TB infection for cattle, badger to cattle transmission is only likely to account for about 5% (range 1-25%) of TB outbreaks in cattle^{xii}. The majority of TB cases occur due to cattle to cattle transmission.

Natural England's role and position

9. Natural England has exercised a dual role in the development and delivery of this policy:
- (i) Natural England is the UK conservation body responsible for advising government relating to conservation matters in and relevant to England^{xiii}; and
 - (ii) Natural England is authorised to issue licences on behalf of the Secretary of State under the following relevant sections of the Wildlife and Countryside Act 1981 and Protection of Badgers Act 1992 Acts by a Part 8 Agreement^{xiv} under section 78 of the Natural Environment and Rural Communities Act 2006 and does so in accordance with government policy:
 - Section 10 (2)(a) of the 1992 Act “*for the purpose of preventing the spread of disease, to kill or take badgers, or to interfere with a badger sett, within an area specified in the licence by any means so specified*”; and
 - Section 16 (3)(g) of the 1981 Act “*for the purpose of preventing the spread of disease*” to use methods of killing or taking (such as cage traps and spot-lamps to illuminate targets at night) prohibited by section 11(2) of that Act.
10. Any conservation advice is given without prejudice to Natural England's licensing function. The conduct of our licensing function is set out in the *Agreement on Natural England's discharge of Wildlife Management Functions*^{xv}.
11. Acting in both capacities Natural England advised Defra on the development of the badger culling policy, offering formal advice to the Secretary of State in 2010 and 2011^{xvi}.
12. Natural England's publicly stated position on badger culling was set out in its 2010 advice. Issued prior to the onset of culling this emphasised that any culling policy should be based closely on the scientific evidence, which at that time was provided by the RBCT, and that “... *a long-term solution which involves an integrated and multi-faceted approach provides the best hope of effectively controlling the disease. This should include a programme of vaccination in badgers, combined with the diligent application of existing cattle-based measures ...*”. The statement is given in full in **Annex C**.
13. Having put in place licensing regime to deliver the Government's policy for badger culling Natural England issued the first licences in autumn 2013. In addition to policy guidance^{xvii}, Defra provides Natural England with advice on the minimum and maximum number of badgers to be killed in each cull area, each year. The minimum cull value aims to ensure the population is reduced by at least 70% and kept at this level for the duration of the licence, and the maximum number aims to ensure that culling is not be detrimental to the survival of the badger population (thereby contributing to satisfying obligations under the Bern Convention).

14. As licensing authority, Natural England is responsible for the licences that it issues. While Natural England is entitled to have regard to policy guidance provided by Defra, it must itself be satisfied that licences comply with legal requirements and are justified by the evidence.

Further policy developments

15. The Government's culling policy was subsequently revised to permit culling to continue beyond the conclusion of the first four year licence to prolong the duration of anticipated disease control benefits for a further five years ('Supplementary Badger Culling') and to allow culling in 'Low Risk Areas'. Natural England provided advice on the operational delivery of these revised policies, but not on the evidential basis for them. The reasoning for this is unclear from available documents, but it appears that Defra did not seek Natural England's advice and that Natural England did not offer it, having adopted a position that it does not have a role in developing TB policy, only in implementing it^{xviii}.

Badger culling

Culling activity to date

16. The first culls in 2013 under the policy took place in two areas, one in Somerset and one in Gloucestershire. Culls have since been authorised in a further 41 areas spread over a total of 15 counties⁴. The size of cull areas ranges between 194 and 1272 km² (average 499 km²) and the total area encompassed within all licensed cull areas reached 21,458 km² in 2019. This represents 16.5% of the land area of England and 56.9% of the 'High Risk Area' (HRA) for bovine tuberculosis.
17. By the conclusion of culling 2018, 67,300 badgers had been killed in total under the policy. This is expected to rise to approximately 105,400 badgers by the conclusion of the 2019 culling season. The pattern of culling activity to date is shown in Figure 1.

Effectiveness of culling

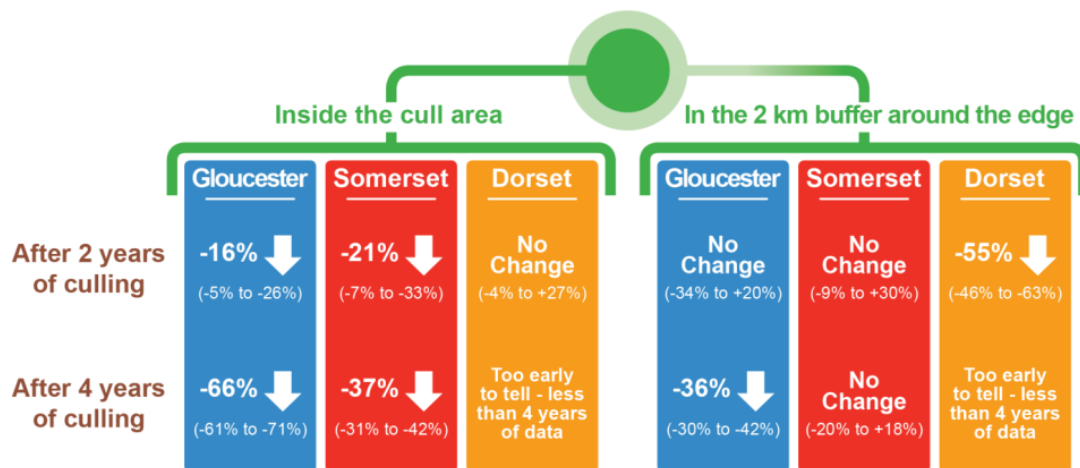
18. Unknown at the time of the ISG report, the benefits of proactive culling persisted after the final culls of the RBCT in 2005, gradually diminishing over a 6-year period^{xix}. Taking this additional benefit into account, the 5 years of proactive culling during the RBCT reduced TB incidence in cattle by 26% (95% CI -19 to -32) in culled areas but increased it by 8% (-14 to +35) in the surrounding 2 km buffer area over the entire 11-year period.
19. The Government's policy of farmer-led culling has only recently started providing evidence of a disease control benefit for cattle, and this benefit is only evident when known risk factors for cattle TB are taken into account in analysis (e.g. historical levels of TB, numbers of cattle in herds, badger density, % of dairy herds, historical culling).
20. The latest evidence, summarised in Figure 3, was published this October^{xx}. Reporting on changes in TB incidence in cattle since culling commenced in the

⁴ Avon, Cheshire, Cornwall, Cumbria, Devon, Dorset, Gloucestershire, Hampshire, Herefordshire, Shropshire, Somerset, Staffordshire, West Berks, Wiltshire, Worcestershire

first three cull areas (using data up to 2017) it shows a reduction in TB incidence of 66% (95% CI -61 to -71) in Gloucestershire and 37% (-31 to -42) in Somerset after 4 years of culling. No benefit has yet been observed in Dorset after two years of culling.

21. It is a significant short-coming of these findings that the analyses are not able to assess the relative contributions of badger culling, cattle movement controls and increased biosecurity to reduced disease incidence.
22. Significantly, however, there is no evidence so far of the increased incidence of disease in the surrounding 2 km un-culled buffer observed during the RBCT. The absence of a 'perturbation effect' may be due to the selection of boundaries that present a natural barrier to badger movement and / or a greater intensity of culling due to the use of shooting in addition to trapping.

Figure 3: Change in TB incidence rates in cattle relative to comparison areas. Data for the first three cull areas up to 2017. The data refer to changes in the OTF-W (official TB free – withdrawn) incidence rate (with 95% Confidence Interval). OTF-W incidents are TB breakdowns where *Mycobacterium bovis* infection has been confirmed in at least one animal from the herd by post-mortem tests. (Source: Downs et al. 2019. Assessing effects from the first four years of industry-led badger culling in England on the incidence of bovine tuberculosis in cattle, 2013 -2017. Nature Scientific Reports).



Annex B: Convention on the Conservation of European Wildlife and Natural Habitats 1979 (The ‘Bern Convention’) and obligations to badger populations

Natural England provided Defra with a detailed analysis of the implications of the badger culling policy for badger population and obligations under the Bern Convention in its 2011 advice to the Secretary of State^{xxi}.

There have since been two complaints to the Secretariat of the Bern Convention about the ecological risks to badgers and / or other species from the culling policy (in 2011 and 2013); neither were successful. We understand a third complaint has been submitted, but the details are as yet unknown.

Summary of the key provisions of the Bern Convention relevant to badger culling

The badger is not listed in Appendix II to the Convention as a species requiring strict protection, but it is listed in Appendix III, and its control or management is subject to certain constraints and obligations. The key provisions relating to badger conservation are:

- Prohibiting the use of all means capable of causing local disappearance of, or serious disturbance to, populations of badgers, and
- Exceptions (i.e. licences) will not be detrimental to the survival of the population of badgers concerned.

The key Articles are summarised below:

Article 7

This states that:

1. Each Contracting Party shall take appropriate and necessary legislative and administrative measures to ensure the protection of the wild fauna species specified in Appendix III.
2. Any exploitation of wild fauna specified in Appendix III shall be regulated in order to keep the populations out of danger, taking into account the requirements of Article 2⁵.

Article 8

States that in respect of the capture or killing of wild fauna species specified in Appendix III (such as the badger) Contracting Parties shall prohibit the use of all indiscriminate means of capture and killing and the use of all means capable of causing local disappearance of, or serious disturbance to, populations of a species, and in particular, the means specified in Appendix IV.

⁵ Article 2: “The Contracting Parties shall take requisite measures to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements and the needs of sub-species, varieties or forms at risk locally.”

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The following methods of killing and taking permitted under the culling policy are included the list of prohibited methods in Appendix IV. Their use requires require a licence under UK legislation⁶.

- Artificial light sources
- Devices for illuminating targets
- Traps (if applied for large scale or non-selective capture or killing)
- Sighting devices for night shooting comprising an electronic image magnifier or image converter

Article 9

Allows for exceptions to be made from the protection afforded by Article 7 and the prohibition of methods in Article 8 for a number of purposes, including:

“to prevent serious damage to crops, livestock, forests, fisheries, water and other forms of property”; “in the interests of public health” and “overriding public interests”.

provided that there is *“no other satisfactory solution and that the exception will not be detrimental to the survival of the population concerned.”*

Appendix IV

This lists prohibited methods (which may be allowed under an Article 9 exception), including snares, artificial light sources, devices for illuminating targets, electronic image magnifiers or convertors for night shooting, traps (“if applied for large scale or non-selective capture or killing”), gassing or smoking out and semi-automatic or automatic weapons with a magazine capable of holding more than two rounds of ammunition.

⁶ These methods are prohibited as means of killing and taking badgers under English law by the provisions of section 11 of the Wildlife and Countryside Act 1981 (as amended).

Annex C: Natural England's general position on badgers and bovine tuberculosis (TB)

The following position was stated in formal advice to the Secretary of State in December 2010.

- Natural England acknowledges that bovine TB is a serious infectious disease of farmed cattle, causing economic hardship and emotional distress to significant parts of the farming community, and that it needs to be controlled.
- We accept that badgers are a disease reservoir and their role in transmitting TB to cattle cannot be ignored. In the absence, to date, of an effective cattle vaccine, all measures that minimise cross-infection between cattle and badgers must form part of any disease control strategy.
- Past control strategies based on culling badgers proved ineffective at controlling the rising incidence of the disease in cattle. We believe that a long-term solution which involves an integrated and multi-faceted approach provides the best hope of effectively controlling the disease. This should include a programme of vaccination in badgers, combined with the diligent application of existing cattle-based measures, including surveillance, pre-movement testing, improving the ability to diagnose *M. bovis* in cattle and herd biosecurity. Cattle vaccination, though still some way off, will also be important.
- The Independent Scientific Group final report (published in 2007) of the Randomised Badger Culling Trial (RBCT) concluded that culling of badgers can exacerbate the spread of the disease in cattle through perturbation of the badger population, and that culling will contribute to disease control only where the risk of this is effectively mitigated, for example in circumstances where the scale of the area covered is sufficiently large, the intensity and duration of culling, is sufficiently high and there are adequate geographic buffers or barriers to limit badger movement at the periphery of the culled area.
- The benefits of culling on TB incidence in cattle persisted after the RBCT concluded and the latest analysis of breakdowns in the trial areas (published in 2010) has revealed that so far, culling has reduced herd breakdowns by about 13.5-17%. This remains a modest benefit, and if badger culling is to be undertaken in future for disease control purposes then the policy needs to be based closely on the evidence provided by the RBCT to be confident of replicating these benefits.

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- ⁱ Bovine TB Strategy Review. Godfray et al. Defra. October 2018.
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