



Department
for Environment
Food & Rural Affairs

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Setting the minimum and maximum numbers in Dorset for Year 1 of the badger cull

Advice to Natural England

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Contents

Overview.....	4
Estimating badger populations.....	4
Starting population in 2015.....	5
Conclusions	6
Annex A	8

Overview

1. Natural England is the licensing authority for the badger culls. It is a requirement of the Guidance and the licences to set a minimum number in advance of each year's cull in an authorisation letter that is issued to each cull company once the licensing authority is satisfied that the cull company's operations planning and funding are sufficient to deliver a successful cull. The purpose of setting a minimum number under the current licence is to ensure that the cull company delivers the required level of population reduction in order to achieve the expected benefits in controlling bovine TB.
2. This advice to Natural England sets out the approach for estimating the badger population in the Dorset cull areas in 2015 and the minimum and maximum numbers of badgers to be removed.
3. The minimum number is intended to correspond to a 70% reduction of the population relative to the initial starting population before culling. The culling objective is for no more than 30% of the starting population to remain on conclusion of the cull. The 70% target is derived from the Randomised Badger Control Trial (RBCT) where it was estimated that the culls achieved a mean of 70% control of the starting populations across seven of the ten areas, which resulted in reductions of bovine TB in the cattle herds in those areas.
4. Culling also needs to "not be detrimental to the survival of the population concerned" within the meaning of Article 9 of the Bern Convention on the Conservation of European Wildlife and Natural Habitats. For that purpose Natural England must set a maximum number of badgers to be removed from the licensed area.

Estimating badger populations

5. In setting minimum and maximum numbers we need to be mindful of the uncertainty in estimating badger populations. If the numbers are set too low, there is a risk that disease control benefits are not realised. Conversely, setting the number too high may risk a scenario where too many badgers may be removed. In order to optimise delivery of bovine TB control benefits, we need to manage the uncertainty in estimating badger populations appropriately, using the best evidence available.
6. The estimate of population size must relate to the whole culling area, including any land within that area on which no culling is planned to take place. Any population estimate will have some degree of uncertainty which leads to an interval around the population estimate within which the true population is likely to lie.

Starting population in 2015

7. In 2015, experienced APHA surveyors carried out a sett survey over a small part of the Dorset area and also quality assured (QA) the identification of setts located by the cull company over 36km² of the area.
8. The APHA QA found that the cull company survey tended to over-estimate both the number and activity levels of setts. However, the number of setts observed by APHA was typical of what one would expect from the National Sett Survey of an area with this mixture of landscapes. Therefore data from the National Sett Survey were used to estimate the population.
9. The National Sett Survey¹, which estimated the number of main setts across different land class groups, was combined with the Social Group Size study², which used hair-trapping and subsequent DNA analysis to estimate the range of the size of social group sizes across different landscape types, to provide an estimate of the population. In both the sett survey and the social group size estimation project, the landscape types were grouped into seven broad landscape types, known as Land Class Groups (LCG).
10. The Sett Survey and the Social Group Size estimation projects produced estimates of the mean number of social groups and numbers of badgers per social group respectively per LCG and for England and Wales. While these produced robust estimates of badger and social group abundance at the large scale, caution must be used when applying these estimates to smaller areas. This is because it is not possible to include the variation in numbers of main setts or badgers per social group at the smaller scale and so the level of uncertainty around the estimates in spatially clustered setts cannot be accurately calculated.
11. In order to try to account for the smaller size of Dorset and to allow the potential for the number of main setts and individuals in a social group to vary to a greater extent than simply using the averages produced by the two national surveys, a Monte Carlo resampling procedure using the raw data from the Badger Sett Survey and Social Groups Size project, was carried out to produce the estimates of population size. Ten thousand iterations of these random selections of squares and social group sizes were performed to produce the mean population size along with the 95% confidence intervals for the area.

¹ Judge, J., Wilson, G.J., Macarthur, R., Delahay, R.J. & McDonald R. A. (2014) *Density and abundance of badger social groups in England and Wales in 2011–2013*. Sci. Rep. **4**, 809; DOI:10.1038/srep03809

² Judge, J., Wilson, G.J., Macarthur, R. & Delahay, R.J. (*in prep*) Estimates of badger social group sizes in England and Wales.

12. The Dorset area is ~223km² and is predominantly Land Class groups 1 and 4 (see Table 1 in Annex A) and the resampling analysis indicated a population range (95% confidence interval) of 879 to 1547 (Table 2 in Annex A).

Conclusions

13. The process of estimating wildlife populations in order to set targets is subject to uncertainty. This point was recognised by the Independent Expert Panel (IEP) in its report³. However, operating with uncertainty does not prevent an effective cull from being carried out, as shown during the RBCT culls, where no minimum numbers or targets were set.
14. Taking into account the available evidence and following a similar rationale to setting the minimum and maximum numbers in the other cull areas this year, **we use the national sett survey method for estimating the population and define the population size at the lower end of the range.** This is a precautionary approach and assumes that this method is the most reliable one available. This would set the minimum number of badgers to be removed in Dorset at 615.
15. Given the overall uncertainty associated with the methods and the range (lower to upper limits), we consider that it is still more prudent to manage the uncertainty this year by defining a realistic minimum number that can be revised in the light of new data, than to define it too high, with a risk of removing too many badgers. **Therefore, we conclude that the minimum number of badgers to be removed in Dorset in 2015 is 615.**
16. The licence also requires Natural England to define a maximum number, for the purposes of avoiding the removal of too many badgers. In the first year of the culls in West Gloucestershire and West Somerset, NE defined the maximum reduction level at 95% of the initial starting population (as opposed to the 70% minimum number) to avoid local extinction in the area. Therefore all of the calculations for the minimum can be repeated for this purpose, simply altering the goal to leave 5% of the initial population rather than 30%. The calculations are shown in Table 2 in Annex A. **Therefore, the maximum number of badgers to be removed in Dorset in 2015 is 835.**
17. In the first year of the culls in West Gloucestershire and West Somerset we learned that we were dealing with more uncertainty than we anticipated, and therefore in defining minimum numbers in subsequent years we needed to

³ Badger Culls in Somerset and Gloucestershire. Report by the Independent Expert Panel. March 2014

<https://www.gov.uk/government/publications/pilot-badger-culls-in-somerset-and-gloucestershire-report-by-the-independent-expert-panel>

avoid false levels of confidence. Therefore we need to consider two realistic scenarios:

- a) that during the cull, there is accumulating evidence that the number of badgers in the cull area is low, and that the number of badgers removed, against a high level of contractor effort sustained across the whole cull area, is towards the lower end of our estimates. In this scenario, if the minimum and maximum numbers were set too high, Natural England would need to consider adjusting the numbers down to bring them in line with the actual circumstances being observed in the cull to manage the risk of too many badgers being removed; OR
- b) that during the cull, there is accumulating evidence that the number of badgers is higher than the minimum and maximum numbers suggest, either because the cull company quickly exceeds the minimum number, or because feedback from observations suggests there is a higher level of activity observed than expected. In these circumstances, Natural England would need to consider the need to compel the cull company to continue the cull by revising the minimum and maximum numbers upwards to ensure that the optimum disease benefits can be secured.

18. Daily data collected through the course of the cull about the level of effort being applied across the cull area and locations of badgers removed, will enable Natural England to build an assessment of progress towards the cull total. This will allow Natural England to assess whether the estimated population was a reasonable reflection of the true population.
19. The Badger Control Deed of Agreement will allow Natural England to adjust the minimum number during the cull, if required. If the evidence suggests that there are more badgers than the estimates indicated (e.g. because the number of badgers killed per unit effort is relatively high), Natural England will have the ability to revise the number upwards to ensure that the cull company is required to carry on the cull in order to achieve effective disease control, within the 6-week period.
20. Conversely, if the estimates are too high there will be a risk of removing too many badgers. In these circumstances, Natural England could, on the basis of careful consideration of the evidence and provided that the level of effort applied by the cull company has been sufficient, adjust the maximum number downwards before 6 weeks have elapsed.

Annex A

Table 1 Land Class Group distribution of the Dorset area

	LCG1	LCG2	LCG4	Total
Area (km²)	122	10	91	223

Table 2 Dorset population estimates based on re-sampling of the National Sett and social group size surveys.

	Lower level	Mid-point	Upper level
Population estimate from National survey	879	1187	1547
30% population level	264	356	464
Minimum number	615	831	1083
5% population level	44	59	77
Maximum number	835	1128	1470