REPORTS ON BADGER STATUS AND MASS KILLING FOR THE EUROPEAN UNION ATLANTIC AREA.

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1. General estimate of national badger population, past and present: population trends since 1997

In 2011, Natural England estimated there to be around 220,000 badgers in England based on a 2005 assessment by the Joint Nature Conservation Committee (JNCC). Under the Tracking Mammals Partnership, JNCC estimated the total UK badger population to be 288,000 (Battersby 2005). Based on a sample of main sett density in 1,614 1 km squares across England and Wales (2011-2013), using main setts as a proxy for badger social groups, the estimated mean density of badger social groups in England and Wales was estimated at around 0.5 per sq. km (Judge et al. 2014). The estimated abundance of social groups was around 71,600 groups. Since 1988, the annual rate of estimated increase in badger social groups was given at around 2-3%; a doubling in England with little change in Wales. The Scottish badger population overall is currently thought to be stable or rising according to the organisation Scottish Badgers, as there are areas where badgers appear to be recovering former range and density. There are no accurate figures for the total population in Scotland, but it has been estimated to be around 25,000. A working figure for England, Scotland and Wales of around 290,000 adult badgers is approximated for 2016 but a range estimate is not available.

2. Mortality and killing methods

2.1 Road Mortality: With increasing traffic volumes and travel speeds, greatest badger mortality appears to be caused on roads in vehicle collision, with the numbers killed estimated at up to 20% of the total population (c. 60,000) per year. Frequency of road fatalities varies in different regions depending on national distribution and density, i.e. higher numbers in south west England. This means that on average, a social group loses at least one member to traffic mortality every year. However, because of the distribution of badgers, many groups go years without loss, whereas some urban or high-density rural populations suffer constant losses.

2.2 Illegal persecution and sett destruction is also believed to remain widespread despite several decades of work by wildlife officers and a range of badger conservation and welfare charities across the UK. There are concerns that a return to badger-killing for bTB control by government in 2013 may encourage a badger-killing mentality within the previously partially dormant or otherwise engaged animal abuse groups and individuals. There are also concerns that work protecting, and rehabilitating injured or orphaned badgers, protecting sets and educating children and adults is being undermined by false information regarding badgers and disease, effectively diluting the past effort by government and the public. The capacity for police forces to get involved remains generally low with few exceptions and enforcement is at a low level. Badger abusers can be associated with vulnerable and deprived areas and communities, with hunting protagonists and others. The number of badgers per year being illegally gassed, dug out and killed with dogs is not known but may run into hundreds or more. Most badgers which are dug out are killed at the scene and a few removed for organised fights by criminal gangs for gambling, later. Most are killed by terriers at the sett or if they manage to or are allowed to escape above ground they are then hunted down with larger dogs. Most badger are killed at the scene for the "macho" image or reputation that the dog owners get as a result. The current value of supplying a badger for baiting is reported to be up to £1,000 per badger.

2.3 Killing in the name of disease control: Badger killing by government over the last 20 years has included 11,000 badgers killed during research in England. The current ‘pilot culls’ in England have
killed around approaching 4,000 badgers in the Gloucestershire and Somerset ‘pilots’ and the Dorset TB High Risk Area ‘measured extension’(2013-2015) and there are plans to extend culling in 2016 to many new areas.

2.4 Habitat loss: There are several cases each year where commercial, industrial and housing developments encroach on or destroy badger setts, often without the required processes for badger protection which is regulated and licensed by statutory agencies.

3. Organisations responsible for killing/culling

Badger culling post-2010 has been most strongly advocated by DEFRA Ministers, supported by the National Farmers Union, the British Veterinary Association and the Chief Veterinary Officer. The Department for Environment, Food & Rural Affairs (DEFRA) has been positioned in a facilitating role. The previous New Labour government had opposed badger culling. Details of how matters have developed over time since 2010 are documented on the Gov.UK website under “Policy paper 2010 to 2015 government policy: bovine tuberculosis (bovine TB)”.

Further supporting voices to badger culling have come from the ‘blood sport’ enthusiasts (those deriving recreational pleasure from killing wild or released animals). The royal family have been surprisingly proactive too. Private letters from one senior member have been published which show support for government-funded badger killing. On national television another member even appeared to support gassing of badger setts (BBC Countryfile April 2014). Wildlife Trusts and The National Trust too, despite their historic association with badger protection and involvement in vaccination schemes have some board members and honorary officials who actively promote the concept of badger culling. This is often against their organisations general opinions and policy and members opinions, creating a contradiction. In November 2013, National Trust chairman Simon Jenkins a non-scientist personally overruled the membership vote, to enable badger culling on NT land – causing many members to resign.

Killing in the name of bTB management for the English pilot culls is done with rifles and shotguns by small ‘cull companies’, instigated in many cases by senior NFU officials, often using a mixture of professional deer hunters, ‘pest’ control operatives, volunteers from the farming communities, some amateur gun club members and individuals. As a result, and even with some relatively brief training, the quality of marksmanship is reported officially to be highly variable. It was considered likely that over half the shots missed the target area, failing the tests set. This is a cause for considerable animal welfare and disease control concerns (Munro 2014).

Some journalists have made the link between the current governments stated aim of repealing the Hunting Act (The Hunting Act 2004 which bans the hunting of wild mammals (notably foxes, deer, hares and mink with dogs in England and Wales) and badger culling. The strong links between the Countryside Alliance (an organisation that lobbies to repeal the Hunting Act), the Veterinary association for Wildlife Management, politically influential landowning interests and the current government have also been questioned more openly by journalists and commentators since 2012.
The practicalities of badger culling have been managed by DEFRA, (who merged with the Ministry of Agriculture, Fisheries and Food (MAFF) in 2003) and their nature conservation agency - Natural England (previously, to-2006 English Nature). Professor John Bourne has stated recently in respect of managing badgers and BTB that “everything MAFF did between 1970 and 2000 seemed to make matters worse”. NE was established with a remit, as with all government departments, to promote and to conduct activities aimed at stimulating the damaged UK economy and this included, via licensing responsibility oversight of the protection of the nature conservation risks from killing badgers in large numbers, including decisions relating to population sizes and measurements.

Natural England have been given a range of roles in both determining badger killing quotas, issuing licences and managing many operational aspects for DEFRA, together with local police constabularies and other agencies involved in specialist areas. Responsibility for assessing impacts of culling on ecosystems is an important NE function. The disease control work fits awkwardly with the NE agency and effectively, despite the restating of its independence of thought and action in the High Court, is under direct management of central government on strategy implementation. For example the inability to determine badger population sizes has been waved away during the pilot process and replaced with a crude rule of thumb, whereas strict knowledge of badger numbers was always an essential part of the initial science-based policy.

Much of the ‘badger cull’ work has been done confidentially, because of NE’s perception of animal rights activist threats to landowners and NE staff. This secrecy has been criticised by the Information Commissioner and is used sometimes to cover badly handled science and administration. However, as with using dogs to chase and tear apart foxes, hares and deer, badger culling is universally unpopular to the public (GfK National Opinion Poll June 2011). On-the-ground opposition has tended to come more from individuals from across the board backgrounds, including professional, middle class and retired badger-sympathising objectors, and families with children concerned with helping injured badgers and making lawful patrols and interventions. Groups more used to intervention during criminal fox hunting activities are also involved and cages have been damaged and destroyed as sabotage. Interventions have included the civil offence of trespass against what most consider to be an illogical government process. With a few exceptions, significant threats towards landowners during the culls were notable by their absence and violence was given by blood sport supporters towards peaceful protestors. One police report after the initial year of badger shooting indicated;

"There was not extensive criminal protest in Gloucestershire, there were only three arrests from criminal offences during the entire period of the cull and most protest activity was conducted lawfully. The offence of trespass is a civil offence. All reports made to Gloucestershire Constabulary of intimidation and harassment have been fully investigated and there are no prosecutions pending."

Some information on cull-companies activity has been released by Natural England under Freedom of Information, including much that has undermined the competence of the controls on the culling process. Information has eluded to several bad-practice ‘cover-ups’, suggesting that the regulation of what was supposed to be a very precise disease control process, replicating the RBCT has been in many areas significantly out of adequate control. Hence it may have been potentially also unlawful, as unable to produce the disease control outcomes as required by the exemption from the Badgers Act 1992 to enable natural England to licence the killing. Reluctance and refusal by government to
release information on several aspects of the process has masked enquiries into the side effects and accountability of the actions taken. The government’s own Independent Expert Panel (IEP) documented many of the shortfalls in its report, before it was shut down.

4. Account of infection and eradication of bovine TB in England and Wales

The aerobic bacterium *Mycobacterium bovis*, is the causative agent of tuberculosis in cattle (Bovine TB). It is related to *M. tuberculosis*, the bacterium causing tuberculosis in humans. *Mycobacterium bovis* can however jump the species barrier and cause tuberculosis in humans and other mammals. *M. bovis* is usually transmitted to humans by infected milk, but heating (pasteurisation) kills most bacteria in infected milk. The risk to human health from *M. bovis* is now considered very low. There were around 2,000 human deaths a year in the UK alone in 1940s before pasteurisation was introduced. During the first half of the 20th century, *M. bovis* is thought to have caused a greater loss of farm animals than all other infectious diseases combined.

Bovine TB is a chronic infectious disease which affects a broad range of mammalian hosts, including humans, cattle, deer, llamas, pigs, domestic cats, and common mammals of lowland grasslands, including fox, mustelids, moles and rodents such as rats and voles. In many it may be a ‘spillover’ host. There is some evidence that in badgers and possibly deer and other species (across Europe) it may under certain conditions become at least for some years a maintenance host when bTB becomes out of control in local cattle herds.

Cattle react in two ways to the tuberculin skin tests and this is reflected in herd breakdowns. Upon slaughter, early bTB cases have no visible lesions in the lungs, and labelled *Unconfirmed cases*. It may take around one year for reactors to develop visible lesions at slaughter, called *Confirmed* bTB.

Initially in the 1990s, restocking after BSE culling, approximately 90 % of NHB (new herd breakdowns) were of *Unconfirmed* type. At the time the veterinary opinion made was that the missing factor was not the time delay involved due to disease progression but infection from badgers. This was because breakdowns could not be traced back to an immediate confirmed source of TB. Even with breakdowns in areas free of background TB in either badgers or cattle, the suspicion was placed on badgers rather than cattle movements from two years previous or longer.

bTB disease spreads from contact with exhaled air, sputum, urine, faeces and pus. However little research has addressed the manner in which disease is transferred. At the start of the RBCT a review (Gallagher and Clifton Hadley 2000) indicated some potential areas for research;

- Farm cats and dogs contract bTB and may be involved in some cases.
- Ingestion of bTB bacteria by cows on pastures could possibly enable infection in addition to aerosol transmission.
- bTB levels in badgers may rise when infected via their food (earthworms with bTB infected earth in their guts), and once infected, significant numbers may excrete disease.
- Active bacteria in badger faeces, urine and pus (from lung infections) may stay present where deposited on grass, notably in damp overcast spring conditions but also at other times.
Cattle tend to avoid grazing in badger dunging areas, other than when at high herd density or when overstocked and grazing becomes intense, when less dominant cows may feed in these otherwise avoided areas, usually close to boundaries.

Despite these associations, there has not yet been direct evidence of transmission from cats, dogs or badgers to cattle in open countryside, the frequency of such events, or the factors triggering and reducing the potential for transfer. There is no evidence that this occurs, even in extremely rare circumstances. Badgers dying with open lesions in cattle fields is also rarely reported.

The main methods of cattle-cattle transmission of bovine TB, based upon Phillips et al. (2003) are summarized below. Methods of transmission resolve into direct cattle-cattle transmission and potentially indirect cattle-cattle transmission.

- Within-herd transmission at housing
- Within-herd transmission at pasture
- Vertical (congenital) transmission
- Pseudo-vertical transmission (via milk)
- Spreading bovine excreta on pasture
- Between-herd transmission through cattle movements
- Between-herd transmission across farm boundaries
- From soil and silage
- Via drinking water
- Via arthropod vectors

Bovine TB was successfully brought under control in cattle during the 1950s and 1960s, using strict cattle testing and slaughter of infected herds with restrictions on cattle movements and mandatory risk based trading; allowing some movement between infected herds. The process was known as the 'Area Eradication Strategy'. This was before it was known that badgers could contract the disease. In the 1970's MAFF promoted the view that cattle-to-cattle transmission was unimportant, that it was not a self-maintaining infectious disease and that badgers were responsible for bTB. As a result, from 1970 a whole generation of farmers and vets were informed that 'badgers are the main problem'. However by 1986, some scientists were concluding that transmission of the tubercle bacilli from badgers to cattle was extremely infrequent.

At the start of the RBCT the fallibilities of the tuberculin skin test in bTB detection were not widely recognised. The direction and means of transmission of bTB infection between cattle and badgers or other wild animals and whether statistical correlations in infection levels are due to a common risk factor, remains a matter for conflicting hypotheses and it is quite remarkable that it has not been properly examined and tested.

Large-scale mistakes in the handling of livestock diseases in Britain have been rife over the last 20 years. In 2001 the viral Foot and Mouth Disease (FMD) epidemic occurred in Great Britain and Northern Ireland as well as in RoI. In the UK, 2,000 cases were reported, but many more farms were culled out under the contentious policy to cull livestock on contiguous land to outbreaks. As a result about ten million sheep, cattle, and pigs were slaughtered at a cost of around £8 billion. During this time the *M. bovis* testing regime was suspended. After the national herd was decimated, due to pressure from Farming bodies including the National Farmers Union, depopulated herds were
rapidly restocked with cattle that had not been bTB tested for many months and were not subject to pre-movement testing. It is clear that these events led to a tangible increase in levels of *M. bovis* amongst the national UK herd, something that a competent management process would have prevented. Such action will also have infected/re-infected wildlife in areas in open countryside around the infected herds, principally in some areas by the practice of ‘muck spreading’ bTB infected cow waste over grasslands as a fertiliser.

The increase in reactors slaughtered (below) demonstrates the increase in bTB levels after FMD. Figures from the year 2000 to 2005 (Defra TB Stats) show this and the extent of the disease when boosted via the decision not to test for a year. What is interesting as an outcome from these events is that once whole-herd depopulation is abandoned, it is the level of testing that then determines how fast the disease runs out of control.

<table>
<thead>
<tr>
<th>Year</th>
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</tr>
<tr>
<td>2001</td>
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<tr>
<td>2005</td>
<td>25,627</td>
</tr>
</tbody>
</table>

5. Research on bTB and Badger removal

In 1994, data was published for the ‘Thornbury badger culling trial’, where badgers were culled between 1975 and 1981 in an area over 104 km², encompassing part of Gloucestershire and Avon. Badgers setts were gassed for two years and re-colonisation was prevented by additional gassing for a further four years. As such, the culling was considered at the time to be thorough. However, insiders supervising the work later stated that many setts were missed, as dense thorn bushes on hillsides were not thoroughly accessed and treated, and so the proportion of badgers killed was not known or controlled. Preventative cattle measures in the area before the cull were failing. When the trials started, movement controls were tightened and other variables changed. Herd bTB incidence, dropped relative to incidence prior to culling more in Thornbury than elsewhere in South West England, but the lack of controls on a wide range of factors meant that, as in Ireland, the data was equivocal and scientists could not agree on the strength of the benefits allotted to badger culling.

Following concerns from the public about the real role of badgers in bTB disease, as well as the results from scientific tests that badger culling by cyanide gassing was both cruel and ineffective, by the mid-1990s the need for a fresh start was clear. There was widespread demand for a new way forward. John Krebs was appointed to design large scale field trials to identify the effects of badger culling on bTB in cattle. With hindsight, it may have been better for research to initially focus on whether or not badgers or other wildlife species pass bTB to cattle to any significant extent, and the role of other wildlife in the spill-over host - main host relationships.

5.1 The Randomised Badger Culling Trial (RBCT)
Partly in response to the shortcomings of the Thornbury information, the RBCT was set up under the New Labour government. It was at the time the largest trial and took place across central and west England. It took almost 10 years (1998-2008), costing £49 million and involved the killing of 11,000 badgers in 10 sets of ‘triplet’ areas. The results were presented as percentages to indicate that simultaneous proactive badger culls removing and maintaining low badger numbers over a large area, for an average of 5 years, might potentially bring about a net reduction of new confirmed TB outbreaks in cattle based upon a balancing of decreased outbreaks where culling was carried out and an increase around the periphery. The study detected clear signs of badger population upheaval or ‘perturbation’ in and around the culling areas and raised levels of infectiveness of bTB in badgers attributed to the stress and disturbance form culling. It brought about an immediate cessation to reactive culling trials (culling around bTB outbreaks in the reactive area) and a theory of ‘perturbation effect’ to explain increased levels of bTB in herds in 2.0 km buffer zones surrounding proactive culling zones. Proactive culling involved killing badgers across an area even where there is no herd breakdown or even herds present at all (ISGC 2007). This theory and the statistics around it have been questioned in the scientific literature (More et al. 2007, 2015) and also by amateur statisticians describing apparent anomalies on online blogs. Although the conclusions of the implications of the ‘perturbation effect’ theory further supports the many other valid objections to mass badger killing, controversy remains over the statistics involved in its description and hence its real live validity. Observed effects of bTB incidence changes attributed to culling and badger perturbation may simply be caused by the wide range of stochastic variables that were beyond control such as restocking and change in herd numbers, frequency of testing, pr-culling badger removal levels, together with factors that were unknown at the time such as the effectiveness of the tuberculin skin test. The possibility remains that the RBCT findings are statistically invalid.

Nevertheless, the scientists who oversaw the RBCT concluded that because of the minimal and temporary contribution to disease control and the cost of carrying out the work to the fine degree of accuracy needed, that killing badgers could make no meaningful contribution to cattle TB control in Britain;

"badger culling can make no meaningful contribution to cattle TB control in Britain. Indeed, some policies under consideration are likely to make matters worse rather than better...detailed evaluation of RBCT and other scientific data highlights the limitations of badger culling as a control measure for cattle TB. The overall benefits of proactive culling were modest (representing an estimated 14 breakdowns prevented after culling 1,000 km2 for five years), and were realised only after coordinated and sustained effort. While many other approaches to culling can be considered, available data suggest that none is likely to generate benefits substantially greater than those recorded in the RBCT, and many are likely to cause detrimental effects. Given its high costs and low benefits we therefore conclude that badger culling is unlikely to contribute usefully to the control of cattle TB in Britain, and recommend that TB control efforts focus on measures other than badger culling".
5.2 Cattle measures

Research in 2015 now shows that farms with herds of 150 or more individuals are 50% more likely to incur bTB breakdowns than those with 50 or fewer animals. Anecdotally many observers of both humans and livestock have long described tuberculosis as a disease of poor and crowded conditions; well-kept animals are more likely to retain natural immunity to disease. Commercial emphasis on increasing herd size is therefore under question in the livestock sector, despite the huge pressure for expansion from the food and livestock by-product industries and central government ambitions for ever increasing efficiencies within the agricultural sector.

One interesting comparison is the different approaches taken around the UK countries. In Wales, the Welsh government, has been stabilising bovine TB in terms of confirmed new herd incidence without mass-killing of badgers – through the introduction of stricter cattle measures, including more frequent bTB testing, tighter cattle movement restrictions, enhanced on-farm hygiene measures, and with stricter penalties for farmers who break the rules. The Welsh measures have seen the numbers of cattle slaughtered under the compulsory test-and-slaughter (depopulation) policy nearly halved over the four-years 2009 to 2013, from 11,671 cattle slaughtered down to 6,102, although very recently there have been increases in slaughter numbers as removal from herds proves a real challenge in comparison with herd depopulation.

Cattle based measures are central in tackling bTB in the future – wildlife and domestic animals as hosts appear to play a minor role. If bTB can be reduced by testing and slaughter in most areas of modest or low infection, the South West may be a special case where a range of new approaches may be needed, based upon the assumption that bTB will remain present in high density herds and require long term management. This is not the same as removing bTB by 2038. It is the acceptance that in some areas such as Devon, Cornwall and Somerset it may be better to create a special zone with specific rules, including reducing herd sizes, selected breeding of skin-test sensitive breeding stock, ultra-strict movement controls and enforcement and wildlife advisors involved in detailed herd-host intervention plans.

5.3 Vaccination of badgers

Since the introduction of the badger vaccination programme in North Pembrokeshire in 2012, Wales, new incidents of bTB have reduced but it is not possible to attribute this to the three years of badger vaccination. The rate at which bTB in badgers reduces following vaccination is likely to vary according to a wide range of factors that research will hopefully in time demonstrate.

In 2014, the The Badger Edge Vaccination Scheme (BEVS) was announced by government for areas outside what are currently considered to be the bovine TB high risk area. This area covers counties in the middle of the country such as Cheshire, Oxfordshire and Hampshire. The stated aim is to create a “buffer zone” of healthy badger populations, to help curb the spread of TB in cattle – however this assumes that badgers are involved in any meaningful way in lateral geographic disease spread. This is rather unlikely and has not been demonstrated – infection being mostly caused by infected cattle movements and generally trade of them over relatively short distances of under 10 km. This can be shown via the recorded creep of specific bTB DNA Spoligotype home ranges. The BEVS aimed to provide to programmes covering over 15km² of land, up to 50% of long term costs for the following;
vaccinating badgers, vaccination advice from experts, free loan of equipment such as traps, and free supply of vaccine. Only a handful of schemes were funded in the first years, however.

In spring 2015, alerts to a growing shortage of BCG vaccine in the EU were circulating, and at the end of the year the UK suspended the BEVS. The announcement was made at a time when government began to focus on badger killing on a much bigger scale via a ‘roll out’ of trapping, and shooting plans to a wider area. These plans were announced for 2016 at the same time. However, UNICEF indicated in late 2015 that due to massive production effort by the World Health Organisation in 2015, shortage of BCG vaccine worldwide had been overcome. All human vaccination programmes were now supplied and even stockpiles were being rapidly recovered. The UK could, if it wished, source the very small amount of badger vaccine needed from a supplier different to that currently used, including from one inside the EU. There is an indication that DEFRA may value mass-killing over vaccination as it incorrectly states that its hands are tied over sourcing, which they are not.

The recent go-slow on vaccination may reflect that DEFRA are now aware of the weakening strength of the RBCT findings and their modelling that if misleading, would make culling obsolete in terms of any significant contribution and vaccination similarly of limited value in most areas. It may be that the main problem now is how to handle the need to withdraw from these two areas of expenditure with cattle-based measures being the most neglected and essential area.

5.4 Vaccination of cattle

The UK government TB Free website states that the efficacy of the BCG vaccine in cattle is between 56% and 68% and that it needs to be 80% or over to be effective. Currently the option is the BCG vaccine (Mycobacterium bovis Bacille Calmette-Guérin). At present it is impossible to determine if a vaccinated cow is TB Free. Short-term use over say five years in association with herd depopulation could be a highly effective tool in disease reduction. The UK states on its TBFREE Website that it is currently illegal under EU law to vaccinate cattle with BCG. This is a reference to the Directive from the European Commission of December 13, 1977, prohibiting ‘anti-tuberculosis vaccination’ in any ‘plan for the accelerated eradication of tuberculosis’.

That the UK could not vaccinate cattle however is untrue. In October 2012, the chief executive of the RSPCA, and a delegation from the badger protection network Team Badger including scientist Brian May, met with Georg Haeusler, Chef de Cabinet for Agriculture. Mr Haeusler confirmed that the UK could take the course of action to vaccinate cattle if it wished, and indirectly criticised the UK approach avoiding whole-herd depopulation following bTB outbreak.

Of importance in the cattle vaccination issue is the need for a Divergence or ‘DIVA’ test, to distinguish between animals that are vaccinated, and those infected with bTB. This would be necessary to enable export of cattle or their beef/dairy products. A DIVA test that can differentiate between infected and vaccinated animals would require EU and international approvals. The repeated statement that this might take ten years is no longer credible because fo constant delay and the ability to do this quicker if determination was offered. International approval should be a final goal. The use of vaccine in cattle in conjunction with testing and other measures was, however, an option for government to adopt in 2011, at least in an area trial: this option was probably overlooked or rejected because of economic ambitions (see economics).
In 2012 a Defra spokesman said: ‘We’ve spent £43.7 million developing badger and cattle vaccines since 1997 and are spending £15.5 million over next four years. Veterinary advice is that vaccination will not be as effective as culling in quickly lowering the weight of infection in the badger population. While laboratory tests have shown vaccination [of cattle] could have an impact if used in conjunction with other measures, there is limited data on how effective it would be in the field.' In 2014 the Minister announced “Over this Parliament, we are investing £24.6 million in the development of effective TB vaccines for both cattle and badgers. Our scientists are leading the world in the development of a deployable cattle vaccine. I secured a clear programme from Commissioner Tonio Borg (DG-SANCO) on the work necessary to bring a cattle vaccine to the market.”

6. The role of economics in badger policy

In 2014, UK dairy exports rose by nearly 9% in value to £1.4 bn. Beef and veal exports were at around £0.4 bn. British beef and lamb exports to China alone could be worth up to £120 m to the UK economy each year. It is to the backdrop of these trade issues that decisions were taken post-economic crash, and after the 2010 general election, regarding the management of the livestock industries.

Normal epidemiological response to disease control in the face of rising bTB in England after, if not before 2000 would have been to restart whole-herd slaughter (depopulation) and to bring in better hygiene and testing, including use of the effective interferon gamma testing and with tighter movement controls. Circumstances in the Republic of Ireland were similar. In June 2015 there were around 7.0 million cattle, with an estimated 560,000 tonnes of beef produced in 2015, valued at over €2.2 billion. In 2015, 178,000 cattle were exported live from Ireland worth approximately €135 million. The RoI total milk output is around 6 million litres, with production of around 170,000 tonnes of butter 71,000 tonnes of skim milk powder and 215,000 tonnes of cheese; total dairy value about €3.2 bn.

The British and Irish livestock industries have been badly damaged by Bovine spongiform encephalopathy (BSE) causing ruinous stress to the farming communities and massive cost, largely at tax-payers expense. At the peak of beef trade in the mid-1990s, the UK was exporting 30% of the beef it produced. When BSE struck the British and Irish beef industry, an export ban effectively ended the export trades. On top of this, in 2007, increasing bTB spread was extremely bad news for both farmers and the economy in post Great ‘economic-crash’ Britain. The market forces meant that government would have to pay for most of the costs of bTB control rather than passing them onto the producers, wholesalers and commodity brokers.

Many observers think that the economic value of the UK and Irish (RoI) beef and dairy industries lies behind the policies towards the short-term avoidance of whole-herd depopulation and towards mass badger killing; this is not actually denied. The difference between the countries is that the RoI has been heavily culling badgers and can show no significant bTB reduction across the whole culling period, whereas the UK has only done a few local trials on culling and confirmed bTB incidence is stable or has reduced in two of the three countries where culling is prohibited.

In 2013 for example, when badger culling started in England, the bTB toll on farm businesses had already been declining steadily over five years. There had been a near 40% fall in new herd incidents
since 2008. Over the same period the number of individual cattle slaughtered was reduced by 44 per cent – from 39,015 to 21,512. Since no programme of badger killing had at this point taken place, no link from this decline in cattle bTB to wildlife can be made. In England there have been some declines in Gloucestershire and Hereford & Worcestershire since 2012 to 2014, and these have continued in 2015. Dorset has seen a slight increase in cattle slaughtered in 2015. Elsewhere in the SW the picture is very patchy – down one year and up the next but testing is still on the increase. Government has recently admitted that conclusions relating to badger killing will also be impossible to draw, because of the complexity of local management variables.

In 2011, the UK government could see growing opportunities for growth in the meat and dairy exports market due to the emerging world trade markets, including China and the far-East. It was looking for an approach which would allow recovery in the livestock sectors to boost profitability. Normal indicated methods to attack bTB via herd depopulation were a threat to the immediate business opportunity and were avoided. It is yet to be seen how dangerous this decision has been to the UK farming industry but at risk is the entire UK beef and dairy industries.

7. The pilot badger culls

7.1 Trapping and shooting effectiveness

In 2013, the cull companies paid to shoot badgers at night in Gloucestershire and Somerset were reported to have broken their license conditions, failing to kill the 'specified minimum number of badgers' (70% of the estimated starting populations) in a single six weeks period. They were given time extensions on advice from the Chief Veterinary Officer (CVO); and both then still failed to reach their required target. The Independent Expert Panel (IEP) convened to consider the first year culls and concluded that they had failed the effectiveness test. The Chairman of Natural England’s Scientific Advisory Committee described the culling efforts as an "epic failure". For the second year (2014) of culls, Natural England set very low culling quotas and in West Somerset the cull company just managed to achieve the minimum target. In Gloucestershire the cull company failed to reach half of its minimum target. Following two years of killing, including the extended cull periods in the first year, badger populations were reduced by an estimated 51-71% in Somerset, and 46-66% in Gloucestershire. However, the initial proposals had specifically required that a minimum of 70% of the initial population be shot within a six-week period in the first year, and that culling in subsequent years should "maintain the badger population at the reduced level achieved through culling in the first year". These requirements were not met, further leading to conclusions of failure of the experiments designed to see, under intense scrutiny, if a cheap way of mass killing of badgers was achievable against pre-set criterion.

The pilots in the two counties in 2013 failed to reach the standard of humanness required by the policy and strategy (with up to one in five badgers suffering a lingering death - unacceptable euthanasia), but the Independent Expert Panel (IEP) was closed down. The CVO then ruled that the level of cruelty was acceptable because it was at a similar level to that suffered by other free-shot wild animals. This decision was widely derided, not least because the consequences of injured badgers retreating into setts (close to where they were being shot) or dense undergrowth was not being taken into account, hence the near-impossibility of a second measured shot. Irrespective of the welfare issues, this decision is considered to have seriously damaged the CVO’s reputation.
Badger 200 was shot in the back and was found above ground later. One in five badgers are not humanely killed using the DEFRA and natural England regulated methods. Credit: Secret World

7.2 Cull costs

Killing badgers in Gloucestershire and Somerset was estimated to have cost the taxpayer nearly £16.8m 2012-2015. The figures, released under the Freedom of Information Act, were revealed by The Badger Trust, which said the cost to the public of killing each badger was £6,775, while others have put the true cost of killing at more than £7,500. Dominic Dyer, CEO of the Badger Trust, said: "Not only is the badger cull a disastrous failure on scientific and animal welfare grounds, it is also becoming an unacceptable burden on the taxpayer." Due to public disgust, very high policing costs were not only a huge factor in the financial analysis. Substantial police time is wasted, taking them away from public duties elsewhere.

7.3 Cull protests

Coordinated by The Badger Trust and with the supporting action of a wide range of UK charities and pressure groups, including the coordinating committee of badger protection interest groups, TEAM BADGER, dozens of peaceful protest demonstrations and marches have been held in central and southern England over the last three years, supported by tens of thousands of outraged badger protection workers, disenchanted professionals and members of the public. Popular television personalities, politicians and others have attended the rallies and prepared online, television and radio materials to highlight the governments’ departure from rational scientific standards. Wildlife celebrity Chris Packham notably tweeted in 2013 in relation to the commencement of badger killing “That brutalist thugs, liars and frauds will destroy our wildlife and dishonour our nations’ reputation as conservationists and animal lovers”. There have been very many celebrity endorsements of the various campaigns against the badger cull. More than 300,000 people signed a government e-petition to ‘stop the cull’ (at the time the largest online petition ever), entitling it to be considered for a debate in Parliament, which went on to roundly reject the government culling policy.

In addition the Badger Trust, SAVE ME and other charities have spent in excess of £0.5 million since 2010 challenging aspects of the law in relation to the pilot cull; principally on animal welfare and disease control effectiveness grounds but also more recently in relation to environmental damage from ecosystem disruption.
Protestors using FOI and other complaints systems have also pointed to apparent bias in some of the media, including newspapers and television concerning the facts on BTB and badgers and that programmes on rural subjects have been heavily loaded in favour of the opinions of a few favoured pro-cull organisations and lobby groups.

Dominic Dyer with some of the hundreds of ‘Badger Army’ anti-cull protesters at the Prime Ministers constituency of Witney in Oxfordshire in October 2013.

Complaints were made against the BBC for biased broadcasting in favour of government policy and against those opposing the badger cull. In 2013 and 2014 there was evidence that media broadcasts in some quarters was being manipulated in favour of the government policies, normally involving frequent repeating of misinformation regarding wildlife culling overseas and avoiding mention of the failure of the experimental culls and the governments published strategy.
7.4 Current methods of TB control in relation to cattle herd and wildlife populations management

Emphasis has been placed by some upon a rather singular interpretation of the results of the RBCT. Put simply, that a potential very small theoretical gain in bTB reduction from killing badgers in an extremely controlled manner, represents a sensible livestock management option for the present. This is the ‘every tool in the box’ reasoning, repeated frequently over the killing periods by Ministers, pro-cull MPs, pro-cull NGOs and DEFRA.

Subsequent to the publication of the main RBCT findings however, have been a range of further bTB publications that to some extent have added as much confusion as clarity to the matters. This might be expected in some popular publications. For example in ‘Badgerlands’ (Barkham 2013), the highly theoretical contribution of badger culling to BTB reduction is overstated, perhaps due to the brevity of its coverage, the complexity of the statistics and oversimplification of explanations by some of those involved in the RBCT and related studies who were interviewed.

From the anti-culling lobby perspective, and with respect to decisions made in the run up to the inclusion of badger culling in bTB control policy, concerns have originated from RBCT statistical analysis in 2010, 2012 and 2013. In the first of these (Donnelly and Hone 2010), looking at potential associations between badgers, cattle and bTB, detailed mathematical modelling is presented, but with the caveat “Those utilising the results of this and similar modelling studies need to understand the limitations of any model of interest, its structure and the details of the data used to estimate model parameters. In this case the data were observational,...”

For this reason, the associations and relationships are not shown as actual events, but are being theorised. The 2012 letter from Donnelly to the DEFRA TB programme in 2012, stating that “roughly 50% of bovine TB incidents could be attributed to infectious badgers” addresses the model but not reality. The predicted incidence figure was presented without confidence limits because they were so wide. This figure later dropped to 38% but the implication of high contribution to incidence had been made.

Some observers have described this as “schoolchild error”, but because it is theoretically derived, it cannot be described as negligent. The problem is that, not surprisingly, non-specialist administrators appear to have taken findings at face value rather than within the context of the model that it is based upon. Busy administrators who are not familiar with statistics often have trouble with models. The much-quoted statistic about the Bovine TB (bTB) transmission is that ‘it has been estimated that 50% of bTB incidents could be attributed to infected badgers’ appeared in the House of Commons debates on the subject, both in main debates and in committees and is still being used by some even today.

The ISG report (2007) page 36 accounts;

2.15 The statistical power calculations for the trial, originally presented in the Krebs report (Krebs et al., 1997) and adopted by the ISG to determine the size of the RBCT, were based on the simple but reasonable assumption that the variability of numbers of observed cattle TB breakdowns is essentially that found in the Poisson distribution, the
statistical distribution governing the count of events occurring totally at random. Based on the historical incidence of TB in cattle across Great Britain between 1992 and 1996 inclusive, the Krebs report had recommended that a minimum of thirty 100km² areas should be included in the trial. The ISG accepted this view but, in its early deliberations, considered the possibility that additional triplets might become necessary to deliver the required statistical power.

2.16 Based on the statistical power calculations it was suggested in the Krebs report that if the incidence of TB in cattle remained at the level observed over the previous five years, then a reduction in TB incidence as low as 20% in the trial areas subject to culling should be detectable within five years of observation in 10 triplets (i.e. with the accumulation of data amounting to 50 ‘triplet-years’). Higher TB incidence in the trial areas (but the same ratio of incidence rates between treatments) would reduce the number of triplet years required to detect a difference.

However, additional concerns in respect of the variables at play also relate to state of the livestock industry in 2001 as the Foot and Mouth Disease (FMD) took hold and to the evenness of levels of testing and cattle movements across the study triplicates in the wake of the epidemic. In, 2002 DEFRA records suggest that there were 453,000 cattle movements in southwest England, some 43% under 20 km, and some 13% outwards to the northeast, northwest, and Wales. Differing rates of cattle movements across the RBCT areas and FMD-related factors might usefully be considered in any new appraisal of the validity of the statistical strength of RBCT findings.

One major problem with the badger science, whatever its strength, is that the public, media and academic community have taken modelling values and treated them as fact and as a sound basis for extrapolation. This is a major pitfall in the applied use of modelling in real-time solutions.

However, even on its current published interpretation, many if not all of the RBCT scientists involved have indicated in the national press that their research, at face value, has been misused in relation to their understanding of its implications. Other researchers who have built on the RBCT modelled theory, despite its broad assumptions, have expressed views and positions that have gone on arguably to misinform the public. The RBCT has in some cases been quoted out of context by government representatives and officials too creating a heady mix of general confusion.

In October 2015, New Zealand’s First Minister’s Richard Prosser commented on the data from their mass poisoning of wildlife in attempted bTB control efforts, suggesting that they disprove the perception that introduced possums and wild pigs are a significant factor in bovine tuberculosis there. Over the previous eight years (to 2015) of sampling, only 18 wild pigs had tested positive out of a total of more than 7,700 examined - less than 0.25%.

Prosser said “There’s been a 40 percent reduction in the number of infected cattle since movement control was introduced in 2012. These numbers, supplied in response to questions to the Ministry for Primary Industries, are unequivocal and turn long-held perceptions about bovine TB on their heads. Coupled with the wild animal figures that we have from the government’s records, this strongly suggests that effective movement control has been the real answer to TB in cattle all
The single biggest reservoir and vector for bovine tuberculosis is cattle. It always has been cattle."

The misconstruction of science is something that is not new and that has happened before where financial interests are prevalent. Equally the risks from using theoretical modelling as a platform for significant policy decisions in livestock industry disease control has been shown to have failed badly before with FMD and the suspicion is that it is failing again, with some familiar common factors.

7.5 Veterinary perspective

Because of the scale and importance of bTB, the routine veterinary testing of cattle in England, particularly in rural areas has become a mainstay of income to small practices. It is recognised that bTB testing underpins the economic viability of dozens of small veterinary practices. bTB testing however is often given to the incoming veterinary workers as ‘the job fewest want to do.’ It brings bad news to farmers who may have the poorest hygiene standards or crowded conditions and is a stressful and difficult job for all concerned. Decisions may, in effect, result in loss-making years and even closing down a farm. To be told that ‘badgers are to blame’ is easier to take than ‘your hygiene and testing needs £££ spending on it’.

It is obvious to all involved to any serious extent that the tuberculin skin test, that misses a high proportion of diseased cows is not going to be that useful alone in preventing the spread of disease within a herd. Conducting a test that may produce 50% false-negatives is not a robust approach. Nor is the allowing of movement of cattle after just two clear skin tests, made 60 days apart likely to stop the movement of bTB infected cattle. This has now become accepted.

The lack of wider and complementary use of the more sensitive interferon gamma test in tandem with the skin test is partly a costs issue. But the lack of wider use of skin tests with the gamma interferon and other tests is a major stumbling block to any real progress. Gamma interferon use would be more productive expenditure, because it can pick up bTB infections at an earlier stage and enable isolation or removal before they become infective. It cannot, however, distinguish between bTB and other infection types, so is limited in its application. As servants of the livestock industry, vets are in a difficult place and avoid the politics and scientific debate most of the time. Nevertheless it is quite remarkable that (with few exceptions) an industry so close to the realities of the situation have not recognised the equivocal nature of the badger bTB science and pointed to both the lack of proof that badgers are significantly involved and the inadequacies of the current UK cattle-based approach. Several senior vets within the British Veterinary Association have spoken out, ashamed of their organisations intransigence on the issues and in particular expressing concerns as to the opinions of the Chief Veterinary Officer.

The BVA have recently published an Animal Welfare Strategy and with it a call has been made by members to re-evaluate its position on badger culling in this light (Jones 2016)

In October 2013, more than 30 disease scientists published a full page letter of objection in a national newspaper describing the badger cull pilots as a “costly distraction that risks making the problem of tuberculosis in cattle worse and that will cost far more than it saves.” The cull policy
was described as "mindless", according to Lord John Krebs, "The scientific case is as clear as it can be: this cull is not the answer to TB in cattle. The government is cherry-picking bits of data to support its case."

Professor John Bourne, who led the RBCT said "I just don't know anyone who is really informed who thinks this is a good idea". Lord Robert May, a former government chief scientist and president of the Royal Society, commented: "It is very clear to me that the government’s policy does not make sense. I have no sympathy with the decision. They are transmuting evidence-based policy into policy-based evidence." Even the then government chief scientist, Professor Sir John Beddington, refused to indicate that he felt that that shooting badgers was the right approach.

In a more recent development in relation to badgers, DEFRA has funded Warwick University in a £360,000 study to research bTB diagnosis. This uses DNA amplification (the polymerase chain reaction test qPCR), for identifying infective badgers at individual badger setts via testing badger faeces in latrines outside their setts. One concern is the impact that such a test could have on the UK government and its responsibilities to the Paris-based World Organisation for Animal Health – Organización Mundial de Sanidad Animal (OIE). If classed as a Grade 3 zoonotic disease in the British countryside, the UK government becomes entirely responsible for its eradication. If that is not the case, then Defra can at least share the costs for control with farmers. Decisions on wildlife disease detection and reduction may suffer from administrative purposes that shape the outcome of any given outbreak. In truth, eradication has never been an option and government policy should use the term ‘control’ recognising that eradication is not achievable with current technology.

7.6 Environmental Impact of the cull

One of the more significant and initially overlooked aspects of the pilot badger culls was the effect of the disruption of carnivores in countryside habitats, as a result of badger culling and particularly in nature reserves of international significance. The publishing of data from the RBCT showing that culling may bring about changes to the numbers of predators, including that the behaviour of a range of animals may alter or adjust. This may significantly influence the fate of rare and declining species, introduced a substantive new element of concern regarding environmental damage during any mass badger killing process.

Across much of northern Europe, large carnivores including bears, wolves and lynx have been greatly reduced or hunted to extinction. This leaves habitats devoid of many of the fundamental ecological influences that such carnivores have on the natural communities that they inhabit. While some areas of Europe are still losing these species, elsewhere they are being reintroduced. Realistically, these species can return only to some of the larger habitat fragments. In much of the heavily human inhabited and farmed lowland Europe, it is the middle-tier or meso-predators, badgers, foxes and large birds of prey that now hold the upper-tiers of predatory influence, and they are often present in greater numbers than when the larger carnivores were present.

While generally, prey availability may limit predator distribution and abundance, top tiers of food chains exert significant influence on the structure of many wildlife communities, their plants and invertebrates. Meso-predators interact both with each other and with herbivores, influencing
behaviour and vital processes such as grazing intensity. These relationships shape habitat structure, for example the ratio of tree saplings to open vegetation, and this influences micro-habitats and the distribution of many lower tier species such as shade-sensitive plants and specialist invertebrates.

During the RBCT in England, studies were made of the change in numbers of several species when the key predator (badger) was removed. These showed how in some cases, numbers of other animals (red fox and hedgehog) altered, due to the process known as Carnivore Release (Trewby et al. 2008, 2014). The conclusion from this work is that badger culling may give rise to important ecological changes both in surrounding countryside and nature reserves. Government experts concluded that this was a serious concern requiring detailed evaluation such as Ecological Impact Assessment (FERA 2011).

Although badgers may have a varied diet, they are principally earthworm specialists, making open grassland a place for them to forage in wet conditions where earthworms are active on the surface in particular. If removed, foxes are thought to breed in abandoned badger setts and even double in number. In one RBCT habitat, hedgehogs were observed to increase their activity and possibly in number.

The apparent lack of screening of the pilot culls by Natural England was subject to enquiry and heavily redacted documents were provided giving a less than convincing story about how the Somerset and Gloucestershire areas had been considered for Carnivore Release Effects (CRE). A legal challenge brought by Humane Society International and others was only refused in the High Court when the judge ruled it out of time and it to be a ‘merits’ issue. Subsequent enquires revealed that in England there is no written guidance on how two to assess carnivore release and so the subject is cloaked in secrecy and has an apparent lack of any basic ecological and nature conservation standards, being handles by ‘word of mouth’.

A complaint to the Bern Convention by the Humane Society International (following an historic legacy of complaints over the last 20 years) and others in 2014 ended in the view that in order to show that the law had been broken, that it was necessary for the nature of the damage done to be shown by the complainant, something that was not possible due to the confidentiality in which the UK culls were being handled. This did not particularly make sense in terms of the requirements of the relevant European Union Directives that complement the Bern Convention. The apparent impasse both in the UK and in the European infraction systems within the European Union is more a reflection of the current need for a high level of evidence to win a case, and hampered by the secrecy and evasiveness of many of the parties involved. The same applies to any form of censure by the (now heavily diminished) Council of Europe’s Bern Convention. This is despite the benefits of the 1998 Aarhus Convention ‘on access to information, public participation in decision-making and access to justice in environmental matters.’

Killing of meso-predators in Europe may be a major contributing factor to the instability and decline of wildlife in the remaining fragments of wildlife habitats. It is an area that despite its importance remains under-researched and yet a matter that could undermine many of the costly activities aimed at recovering and reintroducing species. Preventing their continued decline is ultimately a legal duty that all European (EU) countries have signed up to.
Carnivore Release problems joining the many other issues resulting for mass badger killing is further evidence that it is malpractice, potentially unlawful and hidden under the carpet of clumsy government.

8. Conclusions: Relationships between complex issues

Mass badger killing in the UK has become an intensely tangled issue, due largely to the awkward mixing of post-financial crash economic policy with evidence-based disease control practices. While politicians might argue they have a right to put economic considerations ahead of all other concerns, including best longer term interests, this brings great dangers. Current practices should put disease control first and financial considerations secondary until the disease is under control.

The political nature of cull management is consistent with a continuation of the process first frankly described by Richard Meyer in his book *The fate of the badger* (Meyer 1986), indicating influence of powerful agricultural non-government lobby groups. It details both the vested interests in ‘blaming’ badgers and the remarkable political position that was taken on the science reportedly adopted by Lord Zuckerman in the 1980s.

The current aim of assuming badgers to be central to the problem appears to be a response to placing a reduced emphasis upon the need for more onerous cattle control measures, including where appropriate whole-herd depopulation. The government objective in 2011/2012 appears to have been to keep the UK beef and dairy industry and export market going as fast as possible in the short, to bolster its contribution to the UK economy at any cost.

Having then set a long-term (to-2038) eradication timescale, rather than tackling the disease head-on in the previously proven ways and accepting that bTB eradication is not truly viable, the killing of badgers, popular in the minds of many anxious farmers, was eased into the political ‘tool box’ as an approach using a handful of highly dubious or misleading references to approaches taken in other countries. This was despite the evidence from Roi over decades that culling vast numbers of badgers at huge cost in the Roi had not eradicated or even reduced bTB rates in cattle as a result.

The enormity of confusion and dysfunction is perhaps best exemplified by words from the President of the National Farmers Union in 2015 who did not seem to realise that new herd incidence within the cull zones actually rose after the first year of culls in both Somerset and Gloucestershire and that there are no clear trends attributed to badger culling: "I want to stress that in the two pilot areas in Somerset and Gloucestershire we are already seeing that TB incidence on farms has declined. Not just by a small amount either - in the Somerset pilot area TB incidence on farm has decreased from 34% to 11% compared with two years ago. In Gloucestershire, vets are also reporting a reduction in TB in cattle too."

The UK is already becoming exposed to the world as incompetent in its approach to bTB control, and not just in Europe but beyond. For a wide range of reasons the mass badger killing should be condemned as illogical and investigated. It is surely now just a matter of time for the errors of the last 30 years to be recognised by government at every level and corrected. Such action is needed before more damage is done and huge costs again spiral out of control.
Increased cattle testing is an obvious need (recently approved but on a voluntary basis) as is the pre and post movement testing and over much longer periods – it is long known that the current system is unreliable and spreading the disease. Herd depopulation should return as the only proven method with the south west of England placed in special measures yet with no second-best attention with chronic outbreaks in the rest of the country. Most of all, the ridiculous conspiracy towards badgers, whipped up via a combination of scientific misuse, minority interest scaremongering and opportunism must end and be replaced with informed sustainable management. Only then can the UK move away from yet another spate of embarrassing treatment of the livestock industry and give farmers and the public truth, justice and a healthy future that they are entitled to. A healthy cattle industry will be profitable. A forced, diseased industry will collapse in ruin. The choices offer stark contrast.

9. Checklist of urgent actions needed in England

Total prevention of cattle movements out of the High Risk Areas (HRA).

1. Adopt more regular skin, gamma interferon and other testing for all herds.

2. Adopt longer and more frequent pre and post movement testing for all cattle movements.

3. Bring in promptly the phased herd depopulation in HRA for problem herds and all herds if trends do not improve.

4. An immediate total stop to all badger culling.

5. Ensure all RBCT data is openly available.[Recent progress]

6. Re-evaluation of the RBCT data by independent statisticians.

7. Acceleration of all vaccination options with immediate field testing and pilots.

8. New specialist bTB Wildlife & Farming advisors to create farm bTB guidelines and plans.
10. References


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EUROBADGER – A NEW REPORT ON BADGER STATUS AND MASS KILLING FOR THE EUROPEAN UNION ATLANTIC AREA.

NORTHERN IRELAND REGION

(compiled by Mike Rendle, Northern Ireland Badger Group)

1. General estimate of Northern Ireland badger population, past and present

The badger population in Northern Ireland was estimated in 1994 at 38,000 individuals with a mean sett density of 3.51/km². It was found that a high preponderance of setts occurs in hedgerows and it was postulated that this increases the proximity of badgers to cattle, and therefore, the potential for inter-species transmission. The badger population in Northern Ireland during 2007/2008 is estimated at 33,500 individuals in 7,500 social groups giving a mean estimated density of such groups as 0.56 per square kilometre. It was observed that there was a positive association between badgers and areas of improved grassland and arable agriculture, and cover. Density was correlated with land class, the highest densities found in drumlin farmland areas and marginal uplands. Due to the prevalence of favourable landscape features, Counties Down and Armagh had the highest density of badger social groups.

No official programme to reduce badger numbers has ever been implemented in Northern Ireland.

2. Observations on welfare issues and problems

Farmers are still reported to be occasionally gassing setts with vehicle exhausts and other means. A search could only find reference to a single conviction for badger crime. Wildlife crime figures are not recorded, so it is difficult to verify, although prosecutions would have been noticed when reported if they had occurred. Badger digging by gangs with dogs occurs sporadically but at unknown levels. Wildlife crime is often linked to organised crime which makes it more difficult for the public to report than more casual offending, for fear of recriminations.

3. Areas (districts/regions/department/counties/lander etc.) where killing is/has been worst

No official programme to reduce badger numbers has ever been implemented in Northern Ireland.

4. Organisations responsible for killing/culling

No official programme to reduce badger numbers has ever been implemented in Northern Ireland.
5. A brief history of Bovine Tuberculosis in Northern Ireland from 1949

Despite over 40 years of research, not one herd breakdown in Great Britain or Ireland has ever been proven to have been caused by badgers. 15% of bovine TB in the Northern Ireland herd is currently officially attributed to badgers, however this figure is based solely on the opinion of the veterinary officer attending the breakdown and not on any quantitative data.

The voluntary Tuberculosis (Attested Herd) Scheme was launched in NI in 1949. This was designed to encourage the establishment of cattle herds officially certified as being free from tuberculosis. In 1956, 1209 herds were registered and lists of attested herds were published. In 1958 a decision was made to end the voluntary Attested Herds Scheme and declare eradication areas where compulsory testing would be carried out. A transitional period was established from April to August 1959. This resulted in a great increase in voluntary attestation and, by April 1959, more than 50% of NI herds were attested or supervised. Areas of NI were in turn declared as areas of compulsory eradication. Antrim and Londonderry were scheduled as eradication areas on 1 September 1959. Down, Armagh, Fermanagh and Tyrone were scheduled as eradication areas on 1 January 1960.

By March 1960, 88% of cattle in Northern Ireland were attested (disease free) and, on 25 November 1960, NI was declared an Attested (disease free) Area.

Since the introduction of compulsory testing in 1959, bovine tuberculosis has been reduced to, and maintained at, a much lower level, but not eradicated. Animal incidence rates have fluctuated between 0.4% and 1.0%.

The period of the late 1990s saw a steady increase in herd incidence, to a peak in 2002/2003 of some 10%. This was after the Foot and Mouth Disease outbreak in 2001. On-farm testing was suspended for 6 months, followed by a further period when the considerable backlog of testing had to be cleared. This caused infected cattle to spread more TB and restocking after F&M Disease was done from cattle with high TB rates. The Republic has active live trade in cattle.

The NI Department of Agriculture & Rural Development (DARD) saw there was a problem and reacted with a robust cattle test and slaughter programme. Since 2004 there was a steady trend in reducing herd bTB incidence until 2007. Since 2007 the trend has remained reasonably level until late 2011, when TB herd incidence was reduced to 4.99%.

In 2009, DARD announced that cattle testing ‘inconclusive’ for TB would be removed along with reactors. Subsequently, 2010 saw small but sharp rise in incidence across the province to peak at 7.5% in late 2012, before starting to decline again.

DARD has been carrying out long-term surveillance of TB prevalence in badgers by sampling road kill (RTA) carcasses across the province. It is notable that the recorded prevalence of bovine TB in badgers followed the TB incidence trend in cattle in the aftermath of the Foot and Mouth outbreak in a manner consistent with badgers being a spill-over host of cattle infection.

6. Current TB status of NI herd (as of October 2015)

Operational herds that are officially tuberculosis free (OTF): 89.7%
Cumulative animal incidence in year: 0.62%
Cumulative herd incidence in year: 6.67%
7. Current methods of TB control in relation to cattle herds

NB – there has been no wildlife TB control intervention in Northern Ireland to-date but DARD has committed considerable effort and resources to research bovine TB in cattle and wildlife.

Testing
Annual testing of all herds is mandatory. TB testing is undertaken only by DARD-approved Veterinary Surgeons, using the Single Intradermal Comparative Cervical Test (SICCT or ‘skin test’). All animals slaughtered for human consumption undergo Post Mortem Examination (PME). Results are available on the Animal and Public Health Information System (APHIS) immediately. All herds in NI at all times are allocated an official tuberculosis (OT) herd status, a herd status reason, and a next test type. The herd status may only be officially tuberculosis free (OTF), officially tuberculosis free status suspended (OTS), or officially tuberculosis free status withdrawn (OTW). Failure to test a herd on an annual basis results in the OTF status being suspended immediately in all cases. Further delay in testing will result in automatic increased movement sanctions and downgrading the herd status to OTW. A non-negative (inconclusive) result at a second consecutive skin test for an animal results in mandatory removal as a reactor. Herdkeepers may be advised to slaughter the animal at any time during this period. Contiguous tests are undertaken in herds that are deemed at risk to adjacent infected herds.

The other live surveillance diagnostic method employed by the Programme is the interferon gamma blood test (IFN-g), which is used in conjunction with the skin test to improve diagnosis of bTB in certain situations. Use of the IFN-g is voluntary and it is not compulsory for farmers to give up any IFN-g positives that are detected, unless they are also skin test positive.

Slaughter
TB reactors are removed by DARD subcontracted hauliers for immediate slaughter. Slaughter may occasionally include full herd depopulation if considered necessary to stop spread of the disease.
In the case of total herd depopulations the following action is taken:
- no animals are allowed to move into the premises for 60 days following the depopulation. A no stock restricted herd test must be completed at this stage prior to the level of movement restriction being amended to allow purchase of cattle.
- a full cleansing and disinfection is required after depopulation. This must be inspected by a DARD Veterinary Officer and passed as satisfactory.
- the herdkeeper is advised of the control of risk from slurry.
- two months after re-stocking a TB test is required. If this test occurs within a year of the breakdown it is classed as a 2nd restricted herd test (RH2) test. If the RH2 is clear the restriction is removed and then a post restriction test (CHT) is set for six months later and an Annual Herd Test set twelve months after the completion of a clear post-restriction test provided no risk factors are identified. If a farm premises is depopulated for more than 12 months then the restriction is removed at 12 months and the test following the purchase of animals is classed as an Annual Herd Test.

Movement controls
All calves born after 1 January 1998 must be identified with an ear tag in each ear within 20 days from the birth of the animal. All cattle identification numbers are authorised by DARD and recorded on the Animal and Public Health Information System (APHIS) computer database so that no duplication should be possible. Movement control from all herds, at all times, is controlled by a combination of the OT herd status and status reason applicable to
the herd. As all movements must be recorded on APHIS, including those to market and abattoir, immediate movement control is applied.

Since the year 2000 the implementation of movement control documents require a producer to notify the Department within 7 days of any animals either leaving or arriving on his/her farm. Markets are required to notify movements on and off to the Department by the end of the next working day. However, in the case of a restricted animal the producer is required to obtain a movement licence from the Department in advance of moving the animal out of his/her herd. All movements are recorded and can be traced on APHIS. Herds with either OTS or OTW status applied are both subject to movement restrictions immediately. This is controlled through APHIS.

Where a non breakdown herd test becomes overdue, increasingly stringent movement controls are applied routinely as below:
- immediately overdue, no live moves to market, export, or other holdings.
- 1 month overdue, no live moves to market, export, other holdings or slaughter. No moves in are allowed except one breeding bull on exceptional licence.

All animals over 42 days are subject to the single intradermal test and interpretation within 30 days of export.

**Compensation**
Currently DARD pays compensation for animals testing positive for TB at 100% of the market value for the animal/animals involved.

**8. Current use of badger TB vaccination**
TB vaccination of badgers forms one component of the Test-Vaccinate-Remove project, which commenced in 2014. This is a 5-year research project limited to a 100 Km2 zone – it is not a pilot, scheme or trial. TVR is subject to an annual progress report.

**9. Other people with information/active in Northern Ireland**
Stephen McCabe, Northern Ireland Environment Link
Connor McKinney, Ulster Wildlife

**10. Additional information**
The TB Strategic Partnership Group (TBSPG) is a high level advisory group appointed by the Minister of Agriculture and Rural Development with developing a strategy and implementation action plan to effect a progressive and sustained reduction of TB in the NI herd. The TBSPG published an interim report in 2015 and is expected to complete its work in 2016.
References

These DARD web links provide much more detail and links to further information.

1. General estimate of national badger population, past and present

Around 1900 the dutch badger population was estimated approximately 12,000 animals. Fierce control measures dropped numbers to approximately 2,500 around 1960 and a sad 1,200 around 1980. Populations were dispersed and consequently extinct in several areas.

2. Population trends since 1997

Around 1990 numbers increased to approximately 2,200 again and continue growing. Currently the dutch badgers population counts an estimated 6,000 animals. Recent research predicts a further increase in numbers.

3. Reason/s for change

In 1981 Stichting Das&Boom ('Badger and Tree Foundation', the dutch equivalent of The Badger Trust) was erected. Together with a coalition of nature conservation groups they persuaded the dutch government to execute a badger conservation project ('dassenbeheersplan'). It consists of better legal protection, traffic measures in dedicated locations, re-introductions and financial compensations for farmers.

4. Numbers killed and methods

In The Netherlands the badger, the den and it's environment are protected by law. We estimate that approximately 15-20% of the population is killed in traffic accidents every year, currently about 1,000 animals per year. To our knowledge poaching and illegal hunting hardly exist or do not exist at all; there are no numbers available.

5. Observations on welfare issues and problems

In spite of the legal protection sometimes badger dens are destroyed purposely
by farmers or accidentally by forestry workers. Occasionally badger dens are mistaken for foxholes and therefore destroyed accidentally, even though foxholes have a protected status as well.

The most pressing welfare matter however are young orphans in spring time, e.g. after a traffic accident in which their mother was killed.

6. Areas (districts/regions/department/counties/lander etc.) where killing is/has been worst

Illegal killing of badgers probably occurs in all areas of the country, but we believe it to happen more often in the far south (Zuid-Limburg and Noord-Brabant) and far north (Friesland).

7. Organisations responsible for killing/culling

Not applicable.

8. Account of eradication of TB in my country

During the early 20th century around 50% of cattle were infected with bovine tuberculosis (bTB). In 1951 approximately 30% of our cattle holdings were identified bTB infected using skin tests. In this year a five year eradication program was initiated: annual testing of every animal with the improved version of the skin test (PPD tuberculin, purified protein derivative). Positively tested animals were culled; however, for economic reasons initially not all infected animals were culled immediately. Nevertheless, already by the year 1955 the number of positive farms decreased to 3%. Throughout the years the frequency of testing could be reduced following EU guidelines. In 1992 the skin testing could be officially abandoned as a monitoring tool. On July 1st, 1999 The Netherlands were declared free of bTB. To maintain this status inspection of all animals after slaughter and a reliable animal track and trace system are mandatory.

Wildlife, including badgers have never been considered to play a role in bTB eradication. Hence, neither badgers nor other wildlife has been involved in the eradication program.

9. Current TB status

The Netherlands still holds its bTB free status. During the country's free status a number of positive farms has been detected; most of them as a result of
importation of infected animals and usually after a 'trace-forward-call' from the exporting authorities.

There is no tuberculosis in other farmed animals, but occasionally tuberculosis is detected in exotic animals and zoo animals, with *M. bovis*, *M. tuberculosis* or *M. pinnipedii* as the causative agent.

In the period December 2012 - April 2014 the Pathology department of the Faculty of Veterinary Medicine of the Utrecht University examined 104 badgers on the presence of bacteria from the *Mycobacterium tuberculosis* complex (culture and PCR). From the 104 badgers not a single one tested positive. Therefore there is no evidence for the presence of (b)TB in badgers.

10. **Describe current methods of TB control in relation to cattle herd and wildlife populations**

bTB’s zoonotic character makes it a notifiable disease and therefore every (clinical) suspicion has to be reported to the Central Veterinary Institute. A suspected farm is immediately quarantined and animals or animal products may not leave the farm; milk forms an exception, since pasteurization of milk is mandatory for all producers, including bTB suspected farms. All animals are tested with a skin test. Animals with a positive or ambiguous skin test are killed and infection is confirmed in the following three ways (Bio-safety level 3):

1. detection of bacteria by culturing
2. detection of genetic material by molecular techniques
3. (immuno)histology of post mortem samples

After 60 days the remaining animals on the farm are skin tested again. If no further animals test positive the quarantine is abolished and the farm retrieves its free status. When, however, further animals test positive, the entire procedure is repeated.

In case of a confirmed (b)TB infection automatically a trace-up and trace-back procedure follows, as well as examination of all people who may have been in contact with the infected animal.

There are no control programs in badgers and other wildlife.

11. **Current use of TB vaccination**

Vaccination of cattle or wildlife is not applied.

12. **Other people with information/active in my country**

All information is available through Das&Boom
1. General estimate of national badger population, past and present and population trends since 1997. Reason/s for change

Widespread across France. An estimate of 80,000 national population (Bourand 1989) was considered too low (Griffiths and Thomas (1993). More recent figures have not yet been located. May exceed 100,000 in 2016.

2. Numbers killed and methods

-Digging

Badgers are killed by digging with dogs (September 15th - January 15th). However, 76 of the 96 departments of France can dig badgers from May 15th or June 15th. There are thought to be around 3000 gangs digging for badgers with dogs, taking an estimated 2000 badgers per year. However due to poor reporting mechanisms the real figures are obscure and could be much larger.

-Trapping, night shooting and sett destruction

Orders of the Prefect can be given to kill badgers in response to claims of agricultural e.g. maize damage, damage to domestic gardens, dens built in inconvenient places. Figures not known but several Departments (in particular the Somme and Aisne), kill in excess of 1500 badgers every year.

-Attempted bovine tuberculosis control

Orders of the Prefect can be given to kill badgers in response to bTB outbreak. Numbers are not fully recorded but 15,000 badgers have been killed since 2010 in Côte d'Or (Bourgogne) alone.

5. Observations on welfare issues and problems

The situation in France is terrible. There is a big problem. We have a lot of difficulty getting access to official figures. In the department of Oise, every year, killing is commonplace, misinformation is prevalent and everything seems false. As the badger has no protection, it is very difficult to obtain finance to obtain information from reliable studies.
6. Regions/department where killing is/has been worst

Not known but is likely to include Somme and Aisne, Haute-Normandie, Dordogne, Charente, Ariège, Côte-d’Or, Pyrénées-Atlantiques,.

7. Organisations responsible for killing/culling

There is a complex arrangement of hunters, farmers and local administrators who have a powerful control of how things are done.

8. Account of eradication of TB in France

Since 2001 France has been considered officially free of TB Mycobacterium bovis (M. bovis). However, bovine infection has continued with a low prevalence but with a local resurgence of bTB since 2005 in several Departments. Close to certain of these cattle outbreaks, infected wild animals has also been detected for the first time in 2001 in the Brotonne forest in Haute-Normandie and in seven other departments: Dordogne, Charente, Ariège, Côte-d’Or, Corse-du-Sud, Corsica, Pyrénées-Atlantiques,. bTB has been detected in Wild Boar Sus scrofa, Deer Cervus spp and Badger Meles meles.

Similarity of M. bovis strains identified by the National Reference Laboratory (NRL) ANSES Maisons-Alfort indicate an epidemiological link between wildlife and domestic animals, the latter has generally been the source of the contamination of wild species. In this context, the General Directorate for Food (DGAL) of the Ministry for Agriculture established in September 2011 a national monitoring of TB in wildlife, appointing the private company Sylvatub, whose coordination has been entrusted to the National Platform epidemiological surveillance in animal health (ESA Platform) Sylvatub has the general duty of detecting the presence of M. bovis infection in wild animals, both in areas at risk but also the presumably free zones, and to follow the change in areas where its presence in wildlife has shown.

The objectives of Sylvatub device are:

- To detect the presence of bovine tuberculosis in different sensitive wildlife species (Badger, Wild boar, red deer, roe deer) in France;
- Monitor the level of infection in susceptible wildlife species in areas where it has detected in wildlife;
- Sharing scientific information and technical knowledge about bovine tuberculosis in wildlife;
- To characterize isolated tuberculous mycobacteria strains in wild animals the entire French territory;
- To harmonize national monitoring in order to improve the overall quality of activities supervision, centralization and data interpretation.
- The implementation of the departmental level monitoring activities is subject to adjustments in the level of risk vis-à-vis bovine tuberculosis (EB / SDSPA / NS-556).
-Networks of those involved in bTB surveillance

1. Nationally

The DGAI is responsible for the device and instead the animation and technical management within the ESA platform. A technical coordination unit and a steering committee chaired by the DGAI are set up to monitor the project results and to adapt the methods of surveillance provided by the device. A national leader is recruited by ANSES (UCAS Unit Direction laboratories) and placed in the operational team of the ESA Platform (EB / SDSPA / NS2015-556).

The national steering committee is chaired by the General Directorate for Food; DGAI and includes representatives of the following organizations: the DGALN (Ministry of Environment), ANSES (The French Agency for Food, Environmental and Occupational Health & Safety), ONCFS (National office for wildlife hunting), FNC, the Association of louveterie lieutenants of France (hunting), the Association of Chartered scavengers France (hunting), GDS France (Agricultural organization for health and animal hygiene), National Veterinary Society Technical Groups SNGTV, Coop de France (Farming) and the French Association of Directors and Executives of Veterinary Laboratories Public Analyses (ADILVA).

The National Convenor of the Sylvatub network: Edward Réveillaud (Anses)


9. Current TB status

Studies show a slight increase in detection of bTB in wildlife between 2011 and 2015. Generally the Sylvatub report does not address the importance of BTB in wildlife to herd infection, but indicates a reservoir of bTB at low levels in locations of historic bTB outbreak, something that is generally recognised. The reference to higher with BTB levels in locations with BTB herd breakdowns, serves to indicate wildlife being infected by livestock and not the other way around, however the report does not discuss the data at all. Nevertheless it is important reference research that may help point to the futility of badger culling.

http://plateforme-esa.fr/?q=filedepot_download/35354/808

10. Describe current methods of TB control in relation to cattle herd and wildlife populations

Currently detection is followed by whole-herd culling and extensive wildlife culling around the herd breakdowns. Exact details are not known.

11. Current use of TB vaccination

It is suspected that there are no vaccination efforts in France.
12. Other people with information

Phillipe Charlier in Alsace Lorraine has been campaigning as an individual and made an unsuccessful compliant to the Council of Europe in 2014; La plainte n° 2013/8 concernant l’éradication abusive de blaireaux d’Europe (Meles meles) en France, en violation alléguée de l’Annexe IV

We have a need to find an English speaking expert who is aware of the issues in France.

Preliminary Bibliography


