NATIONAL FEDERATION OF BADGER GROUPS

Bovine TB in deer

National Federation of Badger Groups

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1.0 Executive Summary

This report from the National Federation of Badger Groups examines the possible role played by deer as a reservoir and vector of bovine TB (bTB) in the UK. It's key findings are:

- Five out of the six species of deer in Britain are affected by bTB, with infection detected in between one per cent and 15 per cent of sampled deer;
- A scientific report, published on 9 July 2004, concluded that deer should be considered as a potential source of infection for cattle. It found that in fallow deer, when whole carcasses were examined, the estimated prevalence of infection could be as high as 16.22%;
- There are between 1.25 and 2.6 million wild deer in Britain, compared to around 300,000 badgers;
- Deer are particularly vulnerable to bTB infection and exhibit symptoms which mean they can be highly infectious. They also frequently share the same pasture, feed and water troughs as cattle;
- European scientists have suspected deer of transmitting bTB to cattle and even to badgers since 1938;
- The Government has known for more than 10 years that deer are very susceptible to bTB, but has only just begun to examine the problem. It has spent just £750,000 on the latest study, but continues to spend much of its annual £20 million bTB research budget on research involving badgers, including over £7m each year on the so-called 'Krebs trial';
- There is no regular monitoring of bTB in wild, park or farmed deer and financial disincentives are likely to deter deer managers from reporting the disease. It is highly likely that suspected bTB in deer is significantly under-reported and current legislation does not give DEFRA powers to compulsorily sample deer;
- Between 70,000 and 100,000 wild deer are culled annually. Venison from these deer can enter the domestic human food chain without examination by the Meat Hygiene Service;
- DEFRA appears to have focused media attention on badgers even in bTB cases where it knows that deer and cattle are the primary focus of suspicion;
- MAFF – DEFRA's predecessor – left two herds of park deer, on the same premises, under movement restriction for 11 years after bTB was found in a red deer hind. MAFF declined to examine the carcasses of the deer when they were culled out during foot and mouth disease, but the owner's privately commissioned examination of the carcasses revealed likely bTB infection in more than 30% of the stock;
- Cattle are almost certainly the primary source of bTB in wildlife. The Government needs to work with stakeholders to formulate a bTB control strategy that effectively controls the disease in cattle while making the best use of limited resources.

2.0 Introduction

This report from the National Federation of Badger Groups examines the possible role played by deer as a reservoir and vector of bovine TB in the UK. It uses information from published sources and facts gathered in the course of our own research.

This report contends that:

- the Department for Environment, Food and Rural Affairs (DEFRA) and its predecessor (MAFF – the Ministry for Agriculture, Farming and Food) have known for more than a decade that deer could be a significant reservoir of bTB in the UK;
- the departments appear to have actively avoided confronting the issue and, in one major case, may have actively directed the media's attention towards badgers when farmed deer triggered a bovine TB investigation whose origins were found to be in cattle;
- DEFRA is powerless to investigate the possibility of bTB in park or wild deer without the authority of the landowner;
- the prevalence of bTB in deer, coupled with their high numbers, the pathology of the infection and the fact that they frequently share grazing with cattle, demands that bTB in cattle is monitored and controlled more effectively, in order to reduce the risk of infected livestock seeding the disease into deer populations across the UK.

The role of deer as a reservoir of bTB is of great interest to the NFBG. For decades, it has been asserted that badgers are the primary wildlife reservoir for the disease and much of the Government's bTB research budget still focuses on badgers. For example, more than £7 million a year is being spent on the so-called Krebs trial, assessing the possible contribution that badgers make towards spreading the disease amongst cattle.

But, although deer have been implicated in the transmission of bovine TB to and from cattle since 1938, and in the UK since 1980, the Government has only recently initiated two scientific studies into the risks presented to cattle by wildlife other than badgers. The results from one of these research projects were published on 9 July 2004. The report indicates that deer may be a significant risk to cattle.

That the Government and others have effectively dismissed deer as a possible reservoir of bTB is perverse. Several factors indicate that deer in the UK are susceptible to bTB infection from cattle and could then pose a significant risk of reinfecting cattle. Those factors include the abundance and distribution of deer, the prevalence of the disease in these animals, the occurrence in deer of progressive lesions (indicating they are infectious) and the ecology and behaviour of deer.

For example, roe deer can live alongside cattle with little more than a hedgerow for shelter. Fallow deer form large grazing groups on cattle pasture. Red deer can sustain a high prevalence of bTB. In New Zealand, where bTB is also a problem, farmed red deer are subject to routine bTB testing. This is not the case in the UK. Most significantly, wild deer numbers in the UK have soared from around 450,000 in the 1970s to at least 1.25 million today.

The NFBG believes that the Government has avoided investigating the role of deer in bTB for the same reason that few resources have been devoted to studying the spread of bTB amongst cattle: both cattle and deer are economic assets to landowners. Badgers are a more convenient scapegoat: they have no easily defined economic value and, compared to deer, are easier to locate, trap and kill.

In this report we recommend that DEFRA should urgently review the effectiveness - or otherwise - of current measures to diagnose, report and control bTB in deer. This must include a review of the current legislative framework regarding bTB in deer which, we argue, needs urgently updating.

We also recommend that DEFRA implements a detailed randomised study of wild, park and farmed deer, both within and outside traditional bTB hotspots, to properly assess the level of bTB in these animals and the possible risks of transmission to cattle and other wildlife. The study could be readily undertaken because deer are already routinely culled across the country. The resulting information should be used to inform future policy options.

This report also outlines serious weaknesses in the current system by which culled deer are inspected for bTB. While many organisations train their staff and members to recognise bTB in deer, this is not the case

for every deer culled – and certainly not for every deer destined for human consumption. For example, we were shocked to discover that wild and park venison can routinely enter the domestic human food chain without inspection by the Meat Hygiene Service. We recommend that all deer be examined by individuals fully trained to identify bTB and that all venison can be traced to its source. Financial disincentives discourage the reporting of suspected cases of bTB. These disincentives should be removed as a matter of urgency.

Finally, we argue that the discovery of bTB in deer and other wildlife requires that the bTB problem be considered in the broadest context. Bovine TB is found in such a wide range of wildlife species, that it is almost certainly endemic in the environment. Cattle are almost certainly the primary source of the disease. They are also the easiest animal in which to monitor and control bTB. The Government therefore needs to work with stakeholders to formulate a bTB control strategy that effectively controls the disease in cattle while making the best use of limited resources.

3.0 Bovine TB in deer – a brief history

Bovine tuberculosis (bTB) is caused by the bacterium *Mycobacterium bovis*. Roe deer were first identified as possible vectors of bTB in Germany in 1938 and in Switzerland between 1961 and 1964, where they were thought to have picked up infection from infected cattle faeces and to have reinfected cattle and possibly badgers with the disease (Schmidt, 1938; Kutze, 1961; Bouvier, 1963; Bishofburger and Nabhdy, 1964). A number of minor but inconclusive studies were carried out in subsequent years, but no major research was undertaken in the UK.

Then, from the mid-1980s, reports suggested that deer were not significant reservoirs of bTB and could not infect cattle. It was claimed that deer avoid cattle (Williams, 1987), have differing feeding habits (Proud and Davis, 1998) and that bTB in deer was at low levels or absent. For example, researchers reported that the examination of hundreds of carcasses by MAFF found no evidence of bTB in a range of wild mammals. This was cited as evidence that these species could not constitute wildlife reservoirs of any significance (Thomas and McDiarmid, 2000).

Therefore, in the absence of any objective or systematic scientific research, very few conclusions could be drawn about the potential role of deer as a reservoir of bTB at the turn of the century, even though a review of existing literature by Government researchers had confirmed that deer are 'highly susceptible to *M. bovis*' (Clifton-Hadley and Wilesmith, 1991).

Throughout much of the twentieth century, there was little systematic surveillance for bTB in deer: few deer were tuberculin tested and bTB in deer was not notifiable. But in 2002, scientists from the Government's Central Science Laboratory (CSL) published a review of bTB infection in UK wild mammals (Delahay *et al*, 2002). Their conclusions cast serious doubt on many of the long-held beliefs about bTB in deer.

First, they concluded that, in the past, species other than wildlife 'had only been investigated in a piecemeal and generally unsystematic manner'. For example, although Thomas and McDiarmid (2000) reported finding no bTB in a range of wild mammals, Delahay *et al* pointed out that, 'many of the carcasses were only subjected to *post mortem* examination for visible lesions, with no subsequent bacteriological tests. This methodology is clearly inadequate'.

It has been known for almost 20 years that tuberculous lesions in infected cattle are not always visible and infection can only be confirmed from bacteriological culture of tissue samples (McIlroy *et al*, 1986). The same is true for deer and other wildlife. For example, in France, bTB was recently cultured from 24 wild boar and 11 wild red deer. Worryingly, 'very few of the infected wildlife showed any visible signs of infection even in the lymph nodes; it was only by isolation that infection was proved' (Hars *et al*, 1993, cited in Fletcher, in press). The recent report from CSL confirms that 'a high proportion of confirmed positive cases had no visible lesions on post-mortem examination' (CSL, 2004).

Second, Delahay *et al* concluded that risks to cattle from wildlife relate to ecological factors and not just to prevalence of the disease, pathological characteristics and disease distribution. They pointed out that deer frequent grazed pastures and have even been observed grazing alongside cattle. They also cited examples where deer have been implicated in the transmission of bTB to cattle and other wildlife, such as badgers.

Third, Delahay *et al* reported that bTB was found in 18.5% of fallow deer examined by MAFF between 1988 and 1996. It was difficult to draw meaningful conclusions from this result because biases existed in sample sizes and the effort devoted to obtaining samples. However, perhaps the most astonishing fact is that bTB

had been found in deer for 25 years and no one had examined the risk in more detail. As Delahay *et al* noted: 'Although Gallagher (1980) was able to state that *M. bovis* had not been identified in deer in the UK, despite exhaustive examinations, from 1981 onwards MAFF investigations reported many cases of infection in deer.'

It seems extraordinary that, although alarm bells should have started ringing in MAFF more than three decades ago, the Government has only in the last five years begun to properly examine the possible role that deer might play in transmitting bovine TB to, and sustaining the disease within, cattle.

Worryingly, it was the discovery of bTB in deer in New Zealand, rather than the UK, which compelled the British Government to recognise the risk of bTB in deer. In 1989 MAFF introduced the Tuberculosis (Deer) Order 1989. This followed pressure from UK deer farmers, who were concerned that increasing numbers of infected deer were being diagnosed in New Zealand, having originated from herds in the UK.

Prior to 1989, existing UK legislation allowed MAFF to impose movement restrictions on affected deer herds, but it did not give them powers to order the compulsory slaughter of deer. Many farmed deer herds were therefore placed under movement restrictions with no prospect of them being lifted or of receiving compensation. The 1989 Order made bTB in deer 'notifiable' and comprised a package of measures including: powers for MAFF to compulsorily slaughter deer; 50% compensation for compulsorily culled deer; and the creation of a Deer Health Scheme, involving routine use of the tuberculin skin test. For a more detailed review, see Fletcher (in press).

However, a major flaw in the 1989 Order is that it does not allow for the systematic, scientific surveillance of bTB in deer. First, the Act primarily covers farmed deer, so park and wild deer are not bTB tested. Second, very few farmed deer herds are registered under the Deer Health Scheme, so few farmed deer are routinely bTB tested. Third, the UK Government relies on stalkers, deer managers and the Meat Hygiene Service to identify and report suspect lesions. However, as we reveal later in this report, this system has serious weaknesses.

The lack of rigorous and systematic surveillance of bTB in deer has until now, has resulted in very few data to provide reliable information on the true prevalence of bTB in deer in the UK. Given the known history of bTB in deer, this is extraordinary.

4.0 Bovine TB in deer – the current situation

In 1999/2000, on the advice of its Independent Scientific Group on Bovine TB (ISG), the Government initiated two major research projects to systematically investigate bTB in wildlife other than badgers. One study has been conducted by DEFRA's Central Science Laboratory (CSL) and the other by Oxford University. In 2002, both published preliminary results (DEFRA, 2002). The results of the CSL study were published in full on 9 July 2004 (CSL 2004).

The CSL study makes for startling reading:

> 'A total of 4831 mammal carcasses were collected from throughout south-west England, and of these 4714 were examined and tissue samples cultured. Infection was confirmed in foxes (3.2% of 756), stoat (*Mustela erminea*) (3.9% of 78), polecat (*Mustela putorius*) (4.2% of 24), common shrew (*Sorex araneus*) (2.4% of 41), yellow-necked mouse (*Apodemus flavicollis*) (2.8% of 36), wood mouse (*Apodemus sylvaticus*) (0.6% of 333), field vole (1.5% of 67), grey squirrel (*Sciurus carolinensis*) (0.4% of 450), roe deer (1.0% of 885), red deer (1.0% of 196), fallow deer (4.4% of 504) and muntjac (*Muntiacus reevesi*) (5.2% of 58). The prevalence of infection was significantly higher in adult fallow and roe deer, and in female foxes. Sample sizes varied widely between species and consequently so did confidence limits associated with prevalence estimates. For example small sample sizes for polecat, common shrew, yellow necked mouse and muntjac, mean that confidence limits were wide so the extent of infection in the population cannot be reliably estimated.'

The prevalence of infection must be regarded in the context of three other key variables:

- the population and density of the species;
- the pathology of the disease in the species; and
- the ecology of the species.

4.1 Population and density

The number of wild deer in Britain exceeds one million animals and bTB has been detected in five out of six species (Delahay *et al*, 2002). Table 1 provides population estimates for Britain (and England in brackets):

Table 1: Estimates of deer populations in Britain (and England in brackets) (Wilson, 2003)

Species	**Population est. 1970s**	**Population est. 1990s (England)**
Red deer	190,000	360,000 (12,500)
Roe deer	200,000	500,000 (150,000)
Fallow deer	50,000	100,000 (95,000)
Sika deer	1,000	11,500 (<2,500)
Muntjac	5,000	40,000 (40,000)
Chinese water deer	None given	480-650 (480-650)
Approx Total	**450,000**	**1 million (300,000)**

These figures are almost certainly an underestimate. The British Deer Society estimated that there were 1.25 million deer in Great Britain in 1997 (British Deer Society, 1997). Others have estimated an annual population growth of around ten per cent (Adams, 2002). The population could therefore be as high as 2.6 million today.

With the prevalence of bTB ranging from 1%–5.2% in four species in CSL's study, an average bTB incidence of just 1% in deer could mean that there are between 12,500 and 26,000 infected deer in Britain. As CSL points out, the number of deer and their distribution are 'rapidly expanding'. Given that deer are highly susceptible to bTB, can shed bacteria into the environment and share so many habits with cattle, it is possible that they are a much more significant reservoir of bTB than has previously been acknowledged.

In contrast, it is estimated that there are approximately 300,000 badgers in Britain. Badger populations are not rapidly increasing, despite alleged (but unsubstantiated) claims by farming unions. The Government has confirmed that, "the badger population is not undergoing 'unrestrained growth' as it will be subject to limits imposed by natural and human phenomena." (Bradshaw, in Hansard, 2004).

4.2 Pathology

CSL reports that 'gross pathology was only observed in one fox, one stoat, and the four species of deer'. This is critically important information. Although the incidence of bTB in foxes and stoats sounds surprisingly high, the absence of gross pathology indicates that they may not spread the disease very readily (although they may do so through faeces).

But for deer, the results were alarming:

> 'in deer *M. bovis* was isolated from lesions in a variety of lymph tissues and organs. Visible lesions were common in confirmed positive deer, particularly in fallow. Infection in roe and fallow deer was most frequently associated with the lungs and associated lymph nodes. For example, of the 12 fallow deer with confirmed lesions identified in specific lymph tissues and organs, ten exhibited involvement of the lungs and associated lymph nodes (i.e. retropharyngeal, bronchial and mediastinal). Evidence of generalised widespread TB was found in 41.6% of confirmed positive roe deer and 35.7% of confirmed positive fallow deer.

With so much gross pathology in the lungs, it is not hard to imagine how readily deer might transmit bTB to cattle through coughing over pasture, feed and water troughs. CSL also noted that they think it likely that the levels of bTB in deer were under-estimated because they received many incomplete carcasses: 85.2% of deer carcasses submitted to the study were incomplete. Typically, the researchers received 'a combination of the head, lungs, heart and abdominal viscera'.

The NFBG has been informed that the internal organs of deer are often buried close to where they are culled 'in the field'. We wonder the extent to which foxes and badgers may acquire bTB through digging up and eating infected viscera.

4.3 Ecology

Deer frequently associate with cattle, sharing pasture, feedstuffs and even water troughs. In Michigan, in the US, where white-tailed deer are a significant wildlife reservoir of bTB, measures have been taken to minimise the concentration of deer in areas frequented by cattle. Measures include feeding deer away from grazing cattle and banning the supplementary feeding of wild deer. A similar strategy might be required in the UK. The ecology of deer is covered in more detail, below.

Meanwhile, the CSL study prompts many new questions. First, what is the true incidence of bTB in deer? One of the most significant problems which the scientists faced was the difficulty of confirming *M. bovis*. The authors explain:

> 'If microbiological culture of a sample yielded growth with the morphological characteristics of *M. bovis* then this was considered a positive culture result. However, no case was considered as a 'confirmed positive' unless this isolate was subsequently confirmed as *M. bovis* by spoligotyping.'

In more than 25% of cases, no spoligotype could be identified from the culture. The Veterinary Laboratories Agency is to investigate this phenomenon because, as the authors point out, 'prevalence estimates were substantially higher for grey squirrel, roe, red, fallow and muntjac deer when unconfirmed positives were included'. As the authors point out, their study used 'a very conservative definition of a confirmed *M. bovis* positive case.'

Second, the spatial distribution of bTB in the samples varies widely. For example:

> 'A prevalence of 2.7% was found for roe deer in an area of approximately 25 km^2 in Gloucestershire but was absent from those collected in an area over twice as large in the Mendips, Somerset. The spatial clustering of *M. bovis* infection has been observed before in wildlife populations and can be problematic for the estimation and interpretation of prevalence data.'

This suggests that bTB does not spread from one area to another through transmission by wild animals. If it did, different spoligotypes of the disease would be distributed more widely and more consistently. This lends weight to the NFBG's belief that cattle are the primary vectors for bTB, seeding the disease locally into wildlife populations through livestock movements. We speculate that weaknesses in the bTB testing regime in cattle may allow local densities of the infection to build up in livestock and consequently in wildlife.

5.0 Bovine TB in deer – species by species

Figures in this section are derived from Delahay *et al*, 2002 op. cit. and Wilson, 2003 op. cit. (unless otherwise stated).

5.1 Fallow deer (*Dama dama*)

'Fallow are widespread but patchily distributed, often still associated with ancient deer forests or deer parks.'

- Bovine TB was first isolated in a fallow hind in County Wicklow, Republic of Ireland, in 1974.
- Between 1982 and 1984, 15% of fallow deer sampled in West Waterford were infected with *M. bovis*.
- A survey of 132 fallow deer shot in five counties of Northern Ireland in 1995-96 revealed an overall prevalence of 12%.
- Between 1988 and 1996, in England and Wales, MAFF found infection in 18.5% of fallow deer, including farmed and parkland deer.
- Wild fallow deer with bovine TB have been found in Buckinghamshire, Herefordshire, Worcestershire, Gloucestershire, Monmouthshire and Cornwall.

The CSL report states that the highest risks of transmission to cattle are posed by red and fallow deer and conclude that fallow deer present a particularly high risk: 'Fallow deer however exhibited the highest frequency of cases with generalised tuberculosis, are more widespread across south-west England than red deer and more likely to be found in agricultural grasslands also frequented by cattle.

The CSL report also states that 'Maintenance of infection is likely to be enhanced in the more gregarious species such as fallow and red deer.' Although fallow deer spend much of their time alone or in small groups in woodland, at dusk and throughout the night they can form very large aggregations, sometimes hundreds

strong, on pasture (Putnam, 1988). Individual animals have been known to associate with specific cattle herds over a prolonged period. And wild deer may have nose-to-nose contact with park deer through deer fences. In some cases, park deer mix freely with local wild deer.

Park or farmed fallow deer could present a significant reservoir of infection over many decades, since there is no legal requirement for compulsory bTB testing. It is also extremely difficult to handle park deer – and stressful for the animals – so bTB surveillance of wild and park tends to rely on the examination of carcasses when the deer are culled, rather than using the tuberculin skin test. The CSL study specifically excluded park deer but did sample wild fallow deer from areas adjacent to park deer, where a significant prevalence of the disease was found. An urgent investigation into the prevalence of bTB in park deer is highly desirable.

Suspected bTB infection is 'notifiable' and should be reported, but no assessment has been made as to the extent to which infection is properly diagnosed or reported by park deer managers, by farmed game handling and processing facilities or by the large numbers of individual gamekeepers and farmers who cull deer and either sell the meat through local outlets, such as pubs, or give it away to family and friends. The NFBG suspects that many – and possibly most – fallow deer carcasses are not inspected by the Meat Hygiene Service.

5.2 Roe deer (*Capreolus capreolus*)

'Roe are probably the most numerous species and widespread throughout much of England except for central parts of the country.'

- In 1938, it was suggested that roe deer might become infected from the ingestion of faeces from tuberculous cattle.
- In Switzerland, roe deer have been implicated in the infection of badgers and re-infection of cattle.
- Advanced lesions containing large numbers of bacteria often accompany infection.
- Infection was found in a roe deer shot near Salisbury in 1980.
- Roe deer were linked to bTB in cattle at Castle Combe and Salisbury around 1985, when infected deer were shot following an outbreak of bovine TB in cattle.
- Infected roe deer have been reported in Dorset, Somerset, Herefordshire, Avon and Cornwall.

The CSL report found that in roe deer, in some locations, 'pathology and levels of infection …indicate a potential risk of disease transmission to cattle'.

NFBG believes that wild roe deer have the potential to acquire and spread bovine TB because they are particularly widespread and share pasture with cattle, although they are primarily browsers rather than grazers. Putnam (1998) states that roe deer are opportunists and notes: 'All it really needs is the smallest amount of cover and an area of rich feeding … even a ditch or a hedgerow may provide sufficient cover, and Man's agricultural crops, by definition, tend to be fast-growing and of high nutritional quality … they remain solitary while in the woodland itself, but may form temporary associations of up to seven to ten animals when foraging out in agricultural crops'. Roe deer also feed on maize crops that may later be fed to cattle.

5.3 Red deer (*Cervus elephus*)

'The main red deer populations in England are in the South West, East Anglia and the Lake District.'

- The first recorded case of bovine TB in farmed deer was in 1988, in a farmed red deer imported to Gloucestershire from Hungary.
- It has proved difficult to recover bacilli from infected red deer, except those with severe disease.
- MAFF has reported bTB in wild red deer in south west England and south west Scotland.
- Bovine TB was isolated from 2.6% of 340 wild red deer culled in a national park in Ireland in 1997.
- In Northern Ireland, 12.8% of red deer culled in 1996-97 were positive for *M. bovis*.

The CSL report states that red and fallow deer pose the highest risks of transmission to cattle. They also point out that 'Maintenance of infection is likely to be enhanced in the more gregarious species such as fallow and red deer'.

Farmed red deer are not subject to routine bTB testing because very few herds are members of the Deer Health Scheme, even though it is well known that they are particularly susceptible to the disease. Later in this paper, we reveal how a financial disincentive deters deer farmers from bTB testing.

5.4 Sika deer (*Cervus nippon*)

'Sika are more locally distributed with main populations in Cumbria, Dorset and the New Forest.'

- Pulmonary bTB was found in three sika stags and a hind culled in the Purbecks, Dorset, in 1986 and 1987.
- Sika have been found with gross lesions containing large numbers of bacteria.
- In Scotland, bTB has been found in sika deer from the Mull of Kintyre and Kilberry forest.
- In Northern Ireland, 3.9% of sika deer culled in 1996-97 were positive to *M. bovis* in County Tyrone, but none from County Fermanagh.

The NFBG notes that the three sika deer (and one roe deer) found to carry bTB in Dorset in the mid-80s were sharing an area of rough grazing with cattle. Yet a 'subsequent, serious [bTB] breakdown in the cattle was initially attributed to badgers, even though *M. bovis* could not be isolated from those that were culled'.

5.5 Muntjac deer (*Muntiacus reevesi*)

In the last 30 years, muntjac 'have shown the greatest range expansion and increase in numbers of all the deer species'.

- Bovine TB was first reported in muntjac deer from Gloucestershire, where other deer are known to have bTB (Delahay *et al,* 2001).

CSL concluded that muntjac deer pose an intermediate risk to cattle. Although the prevalence of infection was high (5.2%), the sample size was small and there was little gross pathology. However, the muntjac does have high, localised population densities and is steadily increasing in number. It is certainly a species that demands further examination.

5.6 Chinese water deer (*Hydropotes inermis*)

'Chinese water deer are confined to small populations in Bedfordshire, Cambridgeshire and the Norfolk Broads.'

- Bovine TB has not been found in Chinese water deer in the UK.

6.0 Monitoring bovine TB in deer

Given the catastrophic effects of foot and mouth disease and other contagious livestock diseases, it seems reasonable to expect that bovine TB in deer should be closely monitored. Nothing could be further from the truth.

Government requirements for monitoring bTB in deer are minimal and rely largely on the goodwill of those involved in the slaughter of deer and the trade of their meat.

There is no legal requirement to examine deer for TB – only to report suspicious lesions. Monitoring takes place largely because responsible bodies such as the National Trust, the Forestry Commission and the British Deer Society publish detailed guidelines for their staff and members on the proper inspection of carcasses for bTB. These bodies also provide training to ensure the effective identification of bTB in deer. From our conversations with a range of individuals and organisations involved with deer, it is clear that the majority of deer stalkers, deer park managers and deer farmers work hard to act responsibly and to observe the limited regulations.

However, there has been no assessment as to whether or not the system is working, particularly in circumstances where individuals may be culling deer on their land and not subjecting the carcasses to a detailed examination. In addition, significant financial disincentives exist to deter people from reporting bTB infection in deer. So, whilst it is unclear whether any infected carcasses are 'slipping through the net', it is clear that significant loopholes exist.

6.1 Wild deer

Bovine TB is a notifiable disease in deer. However, legislation on bovine TB in deer only recognises farmed deer and does not cover wild and 'park' deer. Stalkers are not required by law to look for signs of bTB, but they are required to report suspicious carcasses, and submit samples, under The Tuberculosis (Deer) Order 1989 (Statutory Instrument 1989 No. 878).

The NFBG suspects that there may be severe deficiencies in this system. The mathematics are simple enough. The recorded prevalence of bTB in wild deer ranges from zero to 18.5%. The estimated combined annual cull of red, fallow, row, sika and muntjac deer in England alone is 70,000-100,000 animals (Wilson, 2003). If we conservatively estimate that the average bTB prevalence is just 1%, we would expect at least 700–1,000 suspected animals to be reported annually. But in 2003, there were only 64 reported suspect cases, of which 22 were confirmed as *M. bovis* (DEFRA, 2004d). A separate DEFRA report has also reported low reporting figures, with only one to five confirmed cases each year (Wilson, 2003).

Stalkers have confirmed to the NFBG that 'there is a financial disincentive' to reporting suspected cases of bovine TB because the carcass may be condemned whilst waiting for the results of *post mortem* examination and culture. The owner will therefore lose revenue from the meat. Compensation is not payable because the deer are wild.

It is not hard to imagine how word might get around that certain free-roaming deer herds had bTB, deterring fee-paying clients from visiting those areas. It has been suggested to us that suspect deer may be 'buried' rather than reported.

6.1.1 DEFRA's deer management consultation

DEFRA has recently carried out a consultation on deer management. Its consultation document suggests that the department is aware of the inherent weaknesses and risks in the reporting system (DEFRA, 2003). The italics in the following extract are ours:

> '(m) Monitoring of statutory submissions of deer for bovine tuberculosis (TB) testing should continue and *efforts made to ensure adequate reporting*.
>
> (n) Carcass examination for signs of disease, including TB, *should* form a major part of the training provided for deer stalkers & managers.
>
> (o) Disease contingency plans should remain flexible enough to allow sampling, testing and possible emergency control measures *where deer population density or other local circumstances suggest that deer may pose a risk*.
>
> (p) The supplementary feeding of wild deer should be discouraged to avoid causing *artificially high concentrations of deer which might increase disease transmission risk*.'

6.1.2 Public health issues

Weaknesses in the surveillance system may mean that the true prevalence of bTB in deer has gone unreported for many decades. In addition, there are implications for the protection of public health, which DEFRA claims to be the key reason for its strategy to control bovine TB in cattle.

Below we outline a number of possible problems for the protection of public health.

- **Not all infected animals show visible lesions**

Some infected deer – like cattle - do not show clinical symptoms, such as lesions. Infection can therefore only be confirmed on culture. For example, Fletcher (in press) reports that bTB was cultured in France from wild red deer and wild boar, even though very few of the infected wildlife showed any visible signs of infection even in the lymph nodes. Similarly, the recent CSL study reported that 'a high proportion of confirmed positive cases had no visible lesions on post-mortem examination' (CSL, 2004).

The possible consequence of the lack of visible lesions is the failure to detect bTB, even when inspections are carried out by properly trained individuals who adhere fully to the regulations and best practice guidelines.

- **Not all deer meat is inspected by properly trained experts**

Not all venison destined for human consumption is subject to inspection by the Meat Hygiene Service (MHS). Cattle are slaughtered at an abattoir and carcasses subject to routine inspection. Similarly, farmed red deer are often slaughtered at an abattoir and are subject to *ante* and *post mortem* examination. However, park or wild deer are usually culled 'in situ' and the carcass or meat may be passed directly on to a client who has paid to shoot the animal, or sold at the property gate, farmers' markets or to local butchers and restaurants.

The NFBG has been advised by the Food Standards Agency (which oversees the work of the MHS) that deer intended for the domestic market are not inspected by the MHS. As a consequence, they are subject to 'a lower level of control' but are covered by basic food hygiene regulations.

In contrast, wild game intended for export is subject to MHS inspection so that it may receive an 'EU health mark'.

Table 2 shows how many such premises were licensed by the MHS in each of the last three years to process wild game meat and how often the performance of the MHS was audited at such premises.

Table 2 – Premises licensed to process wild game meat and MHS subject to an audit (MHS, 2001-3)

Year	Licensed wild game processing facilities				No. of wild game processing facilities at which MHS was audited			
	Eng	Scot	Wales	GB	Eng	Scot	Wales	GB
2000-1	16	15	1	32	0	0	0	0
2001-2	19	16	1	36	2	0	0	2
2002-3	28	15	1	44	0	1	0	1

The performance of the MHS is typically audited at ten per cent of licensed premises each year, but MHS performance was audited at between zero and 5.5 per cent of premises licensed to process wild game, in each of the last three years. This lack of auditing may be of concern, given the onus on MHS inspectors to identify suspected bTB lesions in many thousands of wild deer.

6.2 Park deer

The NFBG has not been able to find a legal definition that clearly distinguishes between park and farmed deer. It appears to be the choice of the deer manager as to which category a herd falls into. This may have very serious ramifications for bTB, as our research reveals.

Park deer often include fallow deer and the herds tend to be managed as 'wild', insofar as they are rarely handled and management is minimal. As the British Deer Farmers Association website notes:

> 'At its extreme, when inputs are minimal the deer may be classified as being wild and not farmed, as a consequence the slaughter and carcass handling procedures are those applicable to wild deer. Venison from these parks may enter the domestic market without any supervision from the Meat Hygiene Service' (BDFA, 2004).

The Food Standards Agency has confirmed to the NFBG that culled park deer, destined only for the domestic market are, like wild deer, not subject to examination by the MHS. Given the potentially high prevalence of bTB in park fallow deer in particular, the public health implications may be significant.

It also appears to be the case that DEFRA has no legal right to inspect or sample park (or wild) deer that are suspected of harbouring bTB. If the owner of the park deer, or owner of the land containing the wild deer, does not give permission to DEFRA to cull and examine the deer, DEFRA can apparently do nothing.

As with wild deer, there is a financial disincentive to report suspect carcasses to DEFRA. If infection is confirmed, park deer will be placed under movement restrictions. But because park deer cannot easily be TB tested, and there is no legal requirement to do so, such herds may be placed under movement restrictions indefinitely. Deer and deer carcasses can then only be moved off the premises under licence.

6.3 Farmed deer

In farmed herds, red deer predominate and are often managed in a similar fashion to cattle, sometimes being housed during the winter and benefiting from supplementary feeding. Many farmed deer are destined for the export market and are subject to an *ante* and *post mortem* examination by the MHS.

We are not aware of any risks to public health from farmed deer. However, it is interesting to note that the auditing of MHS performance at licensed farmed game handling / processing facilities is negligible, as shown in Table 3:

Table 3 – Farmed game handling / processing facilities licensed and audited

Year	Licensed game handling / processing facilities				No. of audited at game handling / processing facilities at which MHS was audited			
	Eng	Scot	Wales	GB	Eng	Scot	Wales	GB
2000-1	64	6	7	77	2	0	0	2
2001-2	65	5	7	77	2	0	0	2
2002-3	72	5	7	84	0	0	0	0

It might be argued that park deer managers or deer farmers have even less incentive to report suspected cases of bovine TB in deer than the stalker. First, they are obliged to pay for the bTB test – a cost that rises rapidly when there are several hundred deer in the herd. Second, the available compensation is only 50% of the animal's market value. A quality stag might be worth £1,200. Third, the farm faces the prospect of losing irreplaceable bloodstock built up over many years. Fourth, the farm will be placed under movement restrictions until the outbreak is cleared up. As one deer farmer told us: 'If you step into the testing regime, you have to test your way out of it again.' And fifth, there is no practical way of bTB testing park deer because they are usually too wild to handle. Culling is the only option and may involve the slaughter of the entire herd.

A further control on bTB in deer theoretically exists in the form of DEFRA's Deer Health Scheme. This voluntary scheme was set up in 1989 at the same time that bTB in deer became notifiable. The scheme requires deer farmers to have their herds routinely tested for bTB and allows the herds to be registered as 'TB attested'. This aids in the export of deer products: New Zealand, for example, will only import embryos from herds subject to this scheme.

But, extraordinarily, the NFBG could find no reference to the scheme when it searched DEFRA's website. No mention of it is made on the website of the British Deer Farmers Association. Indeed, the only information that the NFBG could locate online about the Deer Health Scheme, was through documents downloaded from New Zealand web sites. We understand that no more than 15 deer farms have ever been members of the scheme in the UK at any one time. We have also been told that there are currently five members out of a total of around 300 farmed deer herds in Britain.

Why is the scheme so poorly supported? The main reason appears to be financial. The scheme is expensive: it is entirely farmer funded (although DEFRA pays for the tuberculin). To become an attested herd, three whole herd tuberculin tests must be passed within two years and the test repeated every two years (Fletcher, in press). And if bTB is found in a herd, only 50% compensation is payable.

6.4 Additional weaknesses in bovine TB controls in deer

The NFBG has identified three other possible loopholes which may propagate or conceal bovine TB in wild, park or farmed deer.

1. *Mycobacterium bovis*, which causes bovine TB, has a close relative – *Mycobacterium avium*. Deer are known to be highly susceptible to *M. avium* but, because this disease is not generally regarded as a zoonosis that can regularly affect humans, it is not notifiable. We understand that it is not unusual for farmed deer herds, particularly in the west of England where bTB is commonplace, to be placed under movement restrictions when *M. bovis* is suspected. Often, bacteriological assessment reveals the infection to be *M. avium*. This strongly suggests to us that the clinical symptoms of *M. bovis* and *M. avium* are similar. We therefore wonder how often a case of *M. bovis* is dismissed as *M. avium* and is

therefore not reported. The costs of being placed under movement restrictions may discourage even the most responsible deer farmers from reporting suspected cases.

2. If bTB does exist, even at a very low level, in wild deer, the NFBG has identified a possible route by which it might enter a farmed deer herd. Whilst DEFRA advises cattle farmers to isolate new stock and test it for bTB, its advice to deer farmers is starkly different. DEFRA specifically encourages deer farmers to mix newly caught wild stock with existing tame stock, so that tame stock can 'teach' the wild stock to consume concentrates (DEFRA, 2004). The opportunities for disease transmission are obvious. The NFBG has no data as to how often farmed deer herds are supplemented with wild stock.

3. The third and most likely transmission route by which bTB might reach wild, park and farmed deer is through contact with cattle. Wild deer frequent cattle pastures (see 6.0). Park deer can escape and frequent cattle pastures (see Case study 2). The NFBG understands that deer farming is often an adjunct to other livestock farming activities, including beef and dairy cattle, camelids (llamas etc), sheep and pigs. The same land and facilities may be used by different animals from different locations at different times, posing opportunities for infection to spread from one species to another. Some deer parks, for example, may offer land up as grazing lets to other farmers.

7.0 Not now, deer: how the Government has avoided dealing with bovine TB in deer

The following pages detail two case studies which reveal how MAFF and its successor, DEFRA, seem to have intentionally ignored the fact that deer are not only susceptible to bovine TB but may also play an important role in harbouring and distributing it.

7.1 Case study 1: Bovine tuberculosis in cattle and deer in Cumbria

On 31 December 2003, DEFRA announced that it was launching an investigation into badgers on the Furness peninsula, in order to identify a possible source for 'unexplained' outbreaks of bTB in local cattle. The press release made no mention of farmed deer in the headline or introduction and subsequent news reports consequently focused almost entirely on badgers (BBC, 2003). This seems extraordinary because, between 1972 and 1998, MAFF/DEFRA examined 157 badger carcasses submitted by the public in Cumbria. Only one tested positive for bTB (DEFRA, 2004b).

The NFBG has now discovered that farmed deer were at the centre of the outbreak, but DEFRA neglected to mention this fact. It appears that the national and regional press were misled over this outbreak.

The NFBG understands that, in late 2002, a red deer farmer at Farm A, in Cumbria, noticed that some red deer recently acquired from the Furness peninsula were sick. The deer had been acquired to replace stock slaughtered out during foot and mouth in 2001. On *post mortem* examination, high levels of bovine TB infection were confirmed in the deer. The entire herd was slaughtered out for a second time.

DEFRA has confirmed that the new stock was traced back to two farms: B and C. At Farm B, no evidence of bTB was found in either the remaining deer or in cattle also kept on the farm. At Farm C, on the Furness peninsula, as all of the farmed red deer had been removed to Farm A. DEFRA advised us that 'further investigation was limited'.

Early in 2003, DEFRA began surveying cattle herds in a three kilometre radius of Farm C. Bovine TB was discovered in three contiguous herds. DEFRA reports that infected animals were removed. Movement restrictions have been lifted on all three farms. But by mid-June in 2004, 13 farms were under movement restrictions on the Furness peninsula, with bTB having been confirmed in seven of them (Westmoreland Gazette, 25 June, 2004). By early July, restrictions had been lifted on just two herds in which bTB had previously been confirmed.

During our initial inquiries in June 2004, DEFRA advised the NFBG that Farm C had been 'completely depopulated of farmed red deer'. This wording was judicious. DEFRA only subsequently confirmed that Farm C still hosts a park herd of fallow deer after we had discovered this fact through our own research.

DEFRA now confirms that:

> ‘Farm C was completely depopulated of farmed red deer but still has a herd of fallow park deer. The State Veterinary Service at Carlisle are maintaining communication with the owner of Farm C which has a movement restriction notice in respect of deer.’

The NFBG understands from DEFRA that it has no legal powers to test the park fallow deer that remain on Farm C. DEFRA has told us:

> ‘Defra can actually require by notice, an owner to arrange for any deer which may be specified in the notice to be tested for Tuberculosis at his own expense and in such manner and within such period as may be so specified. The result of any such test to be reported to the Divisional Veterinary officer as soon as practicable. Article 7 of the Tuberculosis (Deer) Order 1989. However in the circumstances relating to the park deer at Farm C this is not a realistic proposition as these are animals that have never been handled neither are there facilities available.’

Because DEFRA very publicly focused its attentions on badgers, 15 badgers and only one deer have been submitted for bTB testing. To date, bTB has not been cultured in nine badgers or the single deer (Westmoreland Gazette, 25 June, 2004). We are awaiting the results from the remaining six badgers.

Given the case history of this very serious bTB outbreak, the NFBG is astonished that DEFRA has only managed to investigate a single deer from the Furness peninsula. In the whole of Cumbria, 55 cattle herds were under movement restriction as at 31 May 2004. DEFRA has attributed at least 60 per cent of recent bTB outbreaks to cattle movements (DEFRA, 2004c). The remaining 40 per cent of outbreaks are, presumably, currently unattributed. There is clear evidence to justify a more detailed and urgent examination of the status of park and wild deer in the Furness peninsula, but DEFRA is powerless to do so.

There is also a very clear connection between the outbreak in farmed deer and an earlier outbreak in cattle, which DEFRA has neglected to mention. The NFBG has learned that Government scientists believe the bTB strain in the Furness peninsula arrived in the area more than a decade ago, probably through imported cattle. The NFBG has been told:

> ‘Although the isolates from the Furness peninsula share the same spoligotype with isolates from Shropshire (and Herefordshire) they have a unique VNTR profile. We have never seen this profile anywhere else in GB. We first saw this pattern in an isolate taken from a cow in the area in 1990 and subsequently have detected it in deer in the same area in 2002. The pattern has now appeared in isolates from cattle outbreaks in 2003. Geographically this strain is clustered around the Furness peninsula. At present we are trying to trace the origin of the cow from the outbreak in 1990. It is likely that this is probably an import (the spoligotype is most commonly found in France and Spain and is frequently transmitted between cattle and wildlife. It may also be present in Ireland).’ (Glyn Hewinson, pers. comm.).

It is possible that bTB might remain concealed in badgers or deer, but given that the spoligotype was first confirmed in cattle, then in deer and then in cattle once again, it seems perverse that such effort has been devoted to badgers whilst deer have been virtually ignored.

7.2 Case study 2 – Bovine TB remains in a park deer herd for 11 years

When bTB became a notifiable disease in farmed deer in 1989, one of the first reports drawn to the attention of MAFF was a herd of park deer, with a breeding stock of 250 fallow and 150 red, in central England.

After bTB was first detected in a red deer hind in 1990, MAFF simply placed the herd under movement restrictions in 1990 and it remained so for 11 years. No bTB testing regime was implemented: park deer cannot be easily handled for TB testing and there was no legal requirement to do so. Instead, surveillance for bTB was confined to the routine examination of deer that were culled each year as part of the herd management programme. Such examinations are a standard procedure on this estate and stalkers have carried out meat hygiene and inspection training, focussing on the detection of bTB.

In April 2001, the owner made the decision to cull all the red deer. This followed the discovery of a number of red deer with spinal lesions, indicative of ‘swayback’, possibly caused by a copper deficiency. It was suggested that the condition had resulted from the high deer density in the park and the culling was therefore carried out as part of existing plans to reduce the stocking density of the deer. On *post mortem* examination, 24 per cent had ‘lesions typical of bovine TB’ whilst overall 35 per cent were ‘probable’ cases of bTB. Because the herd comprised park deer, rather than farmed deer, no compensation was payable.

MAFF was consulted for guidance on the fallow deer herd that remained on the premises. MAFF could not insist on a cull and no compensation would be payable. However, the owners made the decision to slaughter and dispose of the entire fallow deer herd in 2002. A major opportunity to assess the bTB status of a herd of park fallow deer was missed: MAFF expressed no desire to examine the slaughtered stock for bTB or take samples for culture. This was compounded by the fact that the foot and mouth crisis meant that no samples could be submitted to government laboratories for analysis. At their own expense, the owner's vet therefore removed and preserved a number of tissue samples that allowed a subsequent histological analysis. The results confirmed bTB infection.

Half the deer park is on a floodplain with no permanent badger setts, but dairy and beef farms are close by. Wild fallow, roe and muntjac deer live on the land immediately around the deer park.

It is particularly interesting to note that there appears to have been sporadic mixing between the wild and park fallow deer, although the significance of this in terms of disease transmission is not clear. The owners have now installed higher fencing along with improved deer booms on the rivers, to prevent the ingress of wild or escaped park deer into the new herd.

The NFBG is not aware of any bTB outbreaks in surrounding cattle herds.

8.0 Conclusions and recommendations

If deer prove to be a significant reservoir of bTB, the NFBG predicts some familiar reactions:

1. We can expect the farming unions to promptly accuse badgers of spreading the infection to deer, even though there is no evidence that this occurs;
2. We can expect the farming unions to deny that there is a significant link between bTB in cattle and deer, even though there is evidence that transmission does occur;
3. There may also be calls for the mass culling of deer.

We suggest that the problem be considered in the broadest context. The CSL study suggests that bTB is found in such a wide range of wildlife species that it is almost certainly endemic in the environment. This poses the question: what is the best way of controlling the disease in cattle and how best should limited resources be used? Below we make a number of key recommendations.

- Surveillance of bTB in farmed deer must be improved. We support the British Deer Farmers Association's wish to have bTB testing paid for by the Government, and for TB compensation to be equitable with that received by cattle farmers. These improvements would be likely to encourage more farmers to join the Deer Health Scheme, thus helping to identify extant cases of bTB in farmed deer herds, and have broader benefits in terms of international trade and in maximizing the welfare of farmed deer.
- We support the view of the British Deer Society that, where a bTB outbreak is suspected, DEFRA should have the powers to sample other deer in the area. The low sample size of RTA deer (one) on the Furness peninsula has shown the ineffectiveness of arbitrary checks on RTA carcasses.
- We recommend that the Government examine the possible use of a gamma interferon test for farmed deer in the UK. In 1998, the manufacturers of the test developed a version specifically for deer (Wood and Jones, 1998). The gamma interferon test has many cost benefits because it is more reliable than the skin test, requires less handling of livestock (a particular advantage with deer), yields rapid results and almost certainly helps to eliminate infection in herds at an earlier stage than the skin test.
- We recommend that surveillance of bTB in park and wild deer be improved, if necessary through a revision of the TB Order. Use of a live bTB test is impractical for such deer and may present risks of injury to both the deer and the people trying to handle them. Consideration must therefore be given to improving the inspection of carcasses. Improved measures should include the examination of <u>all</u> deer carcasses by properly trained individuals (including animals that will not be entering the human food chain) followed by the bacteriological testing of a specific number or proportion of deer carcasses, even when there are no obvious signs of disease.
- We recommend that the deer management industry sets a minimum standard of training for stalkers and others who cull and inspect deer. This should include setting standards for both trainers and trainees. At present organisations set their own standards and some will inevitably be more rigorous than others. We

further recommend that all individuals culling deer are registered with a Government body and can demonstrate that they meet specific standards of training and competence.

- We support the introduction of EU regulations in 2006 which will require all deer carcasses destined for human consumption to be inspected by trained individuals.
- We recommend that the tracing of all culled deer – especially wild and park deer – be improved. Every culled deer should be identified through a tag, providing details including its source and the results of an on-site inspection. Such a system already exists for farmed deer in the Quality Assured Farm Venison Scheme, and for wild deer managed by organisations such as the Forestry Commission, but is not used by the large number of gamekeepers, farmers and stalkers that cull deer professionally and recreationally.
- The reporting of suspect deer carcasses must be improved by the removal of financial disincentives that discourage reporting. All those involved in the management of deer, including stalkers, park managers and deer farmers, should be rewarded with fair compensation when they comply with reporting regulations for bTB. It is clearly not acceptable for the existing financial disincentive to continue.
- A knee-jerk reaction to slaughter deer should be avoided. As is the case with badgers and bTB, there is insufficient reliable scientific information on which to base a culling policy. Instead, information must be gathered on which to make assessments relating to the effectiveness, cost effectiveness, practicalities and public acceptability of a range of options.
- The latest evidence indicating the extent of bTB in wild animals underlines the need to more tightly control bTB in cattle in order to reduce the risk of bTB being seeded into wild animal populations. We believe such a strategy must comprise an enhanced cattle bTB testing regime, including an improved diagnostic test, coupled with effective movement controls (NFBG, 2003; NFBG, 2004). In terms of labour, organisation and application, this is clearly the most straightforward way to manage bovine TB.

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'Deer taken from the wild

18. Deer taken from the wild are likely to be very nervous and will therefore need very careful handling until they become acclimatised to the farm situation.

19. Newly-captured deer should be left in their new surroundings for a few days with the minimum of disturbance. It is preferable that they are released carefully into enclosures large enough to allow them to find cover and to become gradually familiar with human presence. It may be advantageous to include a few 'tame' deer in the enclosure who can 'teach' the others to take concentrates but careful supervision will be needed to ensure that the feral deer are not bullied and thereby prevented from feeding.'

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