# The Red Fox in the United Kingdom

## Its Pest Status and Control

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### The Red Fox in the UK

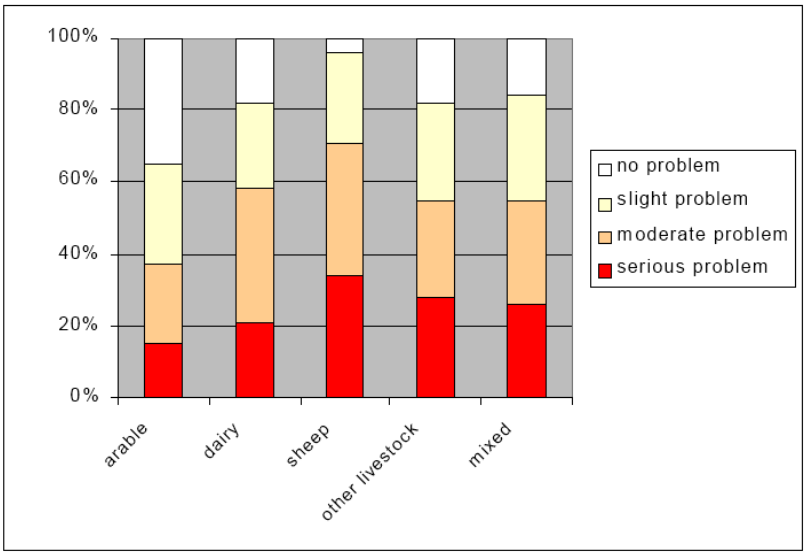
The ***red fox*** (***Vulpes vulpes***) is the largest wild predator in the UK and is also the most widespread member of the *canidae* family in the northern hemisphere. It is an adaptable animal, which thrives throughout the British Isles in both rural and, increasingly, urban areas. There are few wild animals that are able to arouse such contrasting emotions as does the red fox in the UK. Loved by some and loathed by others, this single species now lies at the centre of a fierce debate that encompasses human rights, animal rights, conservation, economics and public health to name just a few. In this essay it is my aim to avoid the hyped media coverage and emotive discourse on this subject and explore in more detail the scientific evidence for the classification of the red fox as a pest in the UK. In addition, I will assess the need for red fox population control in the UK and describe the ways that this can be best achieved.

Red foxes are generally regarded as a pest for one or more of three reasons: as a ***predator***, as a ***nuisance*** or as a ***carrier of disease***. In the following section I will be exploring the reasons why red foxes are regarded as a pest species and the differences between their perceived pest status and the evidence that they are actually a pest.

### The Red Fox as a Predator Pest

Foxes have historically been regarded, and still are by many, as a major pest of ***agricultural livestock*** (MacDonald, 1984). They are often held responsible for the loss of lambs, piglets and poultry to a degree that has a serious economic impact (McDonald, 1997). To determine whether these accusations are true there have been many studies performed to assess the perceived levels of fox predation among the farming community and the economic impact that it has. In the majority these studies have used a questionnaire approach, in conjunction with surveys of local fox populations.

In the early 1970s NOP Market Research performed a survey of 892 farmers in the UK (NOP, 1974). Of these, 70% did not believe that the numbers of foxes on their farm were harmful, 64% reported no financial loss due to foxes, 2% stated that they suffered fox damage in excess of £100 in 1974, and 36% stated that they believed foxes to be useful in controlling other species such as rabbits and other small mammals. More recent studies, however, have revealed somewhat different attitudes of farmers towards foxes. The results of a survey of 831 farmers performed in 1995 by Produce Studies Limited (shown below) indicate that the proportion of farmers who see foxes as a serious problem is generally far greater than it was in the 1970s (adapted from MacDonald, 2000).




A survey performed in 1986 revealed that 70% of them believed that they had lost no lambs to foxes, 16% believed they had lost less than five and 14% believed they had lost more than five that year. Despite this, 80% said that they had no ***evidence*** that foxes took lambs at all (MacDonald, 1984). In a more recent survey, which was specifically directed at ***sheep farmers***, perceived fox predation levels ranged from 0.0008 to 0.26 lambs per ewe with 59% of respondents reporting that they had lost at least one lamb to a fox in their most recent lambing (Moberly *et al*., 2003). Other studies have reported that between 0.5% and 3% of lambs may be taken by foxes (Hewson, 1984). The findings of these surveys, which do not indicate that fox predation is regarded as a serious threat to agricultural productivity by farmers, are supported by those of the Ministry for Agriculture Fisheries and Food (MAFF). They estimate that 20% of newborn lambs die soon after birth (MAFF, 1983) and that of these only 5% die as a result of 'misadventure and predation', which includes dog and fox predation. MAFF have also stated that around £103 million of gross income is lost by farmers as result of lamb deaths every year in Britain by means that do not involve fox predation and concluded that, compared to this, the losses that do result from fox predation are not therefore significant.

The predation of foxes on ***poultry*** is often perceived to be where they have the greatest impact on agricultural livestock and is perhaps the greatest contributory factor to the antipathy of farmers towards the fox. The reason for this is that foxes, particularly when confronted with a great many poultry birds, will perform the behaviours of 'caching' and 'surplus killing', which involve killing all of the prey available before taking it away and storing it for later consumption (Wildlife online, 2004). Unfortunately, these behaviours manifest themselves in a way that is very upsetting for poultry farmers. However, despite the catastrophic effect of such an attack on a small poultry flock, fox predation on poultry in the UK is estimated to be less than 2% per year (Moberly *et al*., 2004).

In comparison to sheep and poultry farming, almost no detailed studies have been undertaken to determine the degree of fox predation on ***piglets***. Fox predation on piglets has been reported and is believed to be increasing as pig farming is increasingly being undertaken outdoors, but it has also been pointed out that there is little evidence that foxes take live piglets and if they do how many (wildlife online, 2004). One report in 1993, commissioned by the Agricultural Economics Unit in Exeter, concluded that the pig farming industry loses £5.3-6.8 million of its profit each year to natural causes compared to only £150,000 to fox predation (only ~3% total losses) (Sheppard, 1993).

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The predation of ***game birds*** by foxes is a very controversial issue and there is much contradictory evidence as to the true extent of the problem. Studies have shown that bird remains were only found in 2.4% of fox scat (droppings) in Saudi Arabia (Williams et al., 2002) and that in Canada that on only 2% of hunting trips did foxes target birds (Henry, 1985). However, the intensification of both agriculture and the shooting industry in the UK since the Second World War has led to alterations in the feeding behaviour of foxes and has brought them into serious and direct conflict with gamekeepers.

Wild populations of game birds are naturally resistant to high levels of predation (including by foxes) (McDonald *et al*,. 1997), but intensification of agriculture has resulted in the dramatic degeneration of our farmland ecosystems in which wild game birds and animals such as small mammals and insects live. This habitat destruction has led to a dramatic reduction in the number of wild game birds, an effect that has been exacerbated by fox predation and further reinforced because, while rodents and small mammals are usually the most common food of the fox, they will switch to preying on game birds when these species are reduced in number (Reynolds and Tapper, 1996). The response of the game bird shooting industry has been to introduce large numbers of hand-reared game birds into the countryside, but this has actually made the situation worse as foxes thrive on this readily available food source, which has poor survival skills in the wild. The magnitude of this problem is highlighted by several studies performed on the 20 million pheasants released in the

UK each year (Tapper, 1992). In Hampshire 36% of released pheasants were eaten by foxes within a year (Hill and Robertson, 1988) and in Dorset 16% of fox diet was estimated to be game bird derived (Reynolds and Tapper, 1995). In Ireland the problem is even worse with an estimated 85% of released birds taken by foxes within a year (Robertson, 1997). These levels of predation represent a serious loss of revenue for the shooting industry and are what inspired 63% of gamekeepers to say that foxes were a serious pest in a recent survey conducted for the National Gamekeepers Organisation (reported by Macdonald, 2004).

There are cases where excessive or inappropriate fox predation can have a major impact on ***wildlife*** and particularly on endangered species. As I have already discussed, fox predation on farmland species that are already threatened because of the destruction of their habitats can further depress their numbers and this is also the case for other species, particularly birds, which reside in other damaged habitats. Three examples of species that have been studied are the lapwing, the Sandwich tern and the field vole.

It has been shown that lapwing chicks will be only be taken by foxes in an 'incidental' manner. However, in areas where the density of ground nesting seabirds is very high, fox predation is much more of a problem (Seymour *et al*., 2003). At one Sandwich tern (right) nesting site on Scolt head Island in Norfolk no successful breeding was achieved between 1989 and 1991 as a result of fox predation of tern chicks on the nest (Musgrave, 1993). The field vole also provides a good example of how increased fox predation could be detrimental to other species. The field vole population is estimated to grow by between 677,000 and 982,000 each year and the consumption of field voles by predators is estimated to number 980,000 (Dyczkowski and Yalden, 1998). Of these taken by predators, 85% are thought to be taken by foxes and feral cats. While increased fox predation may not necessarily threaten the total field vole population of Britain, localised reductions in number may occur, which would in turn have serious implications for other species such as owls that are far more dependent on voles as a food source.

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In urban areas foxes are seen by some as representing a threat to ***household pets***. There is evidence that occasionally pets such as rabbits and guinea pigs will be killed by foxes if they are not securely housed (Burns *et al*., 2000), but the perceptions of many that foxes kill cats are in the main thought to be false. In a study of 5,000 people in Bristol, Stephen Harris determined that an adult fox will kill a cat approximately once every six years and in almost every case the cats were less than six months old (Harris *et al*., 1995). It has also been pointed out that in many instances where a fox is seen with a cat the cat is likely to have been already dead (NFWS, 2004)

**The Red Fox as a Carrier of Disease**

There is a widespread perception that foxes carry many diseases and that they may act as a reservoir from which infectious agents can spread into humans and domestic animals. In 1995 Baker and MacDonald asked 92 farmers if they thought foxes should be controlled because they spread disease (Baker and MacDonald, 2000). 30% said that they should and identified 14 diseases of concern to them. However, almost none of these diseases represented a serious threat to livestock or human health. Despite these findings, there are some diseases that do pose hypothetical threats to human and domestic animal health, particularly in urban areas where there is more potential for foxes to come into contact with people and their pets.

One disease that can be transmitted to domestic dogs and which often occurs in fox populations is ***sarcoptic mange***, a condition caused by an infestation of the sarcoptic mite (*Sarcoptes scabeii*)(NFWS, 2004). Mange is not transmissible to humans (or cats), and is easily treated in dogs, but it can have serious effects on fox populations, particularly in urban areas where high population densities mean that it spreads quickly (*Stone et al*., 1972). In Bristol in 1994 an outbreak of mange was estimated to have killed 90% of the foxes in the city (McDonald, 1997).

It is well established that foxes also carry a wide range of ***parasites*** which are potentially transmissible to other species, particularly domestic dogs and other livestock. In 1995, a study of 843 rural and urban foxes found that 86.8% of the foxes harboured parasitic helminths (thirteen different species of helminth worm were found, including four that have not previously been found in the UK)(Richards *et al*., 1995). Of the species found five were identified that are known to infect domestic dogs and one ***Toxocara canis*** caused particular concern as it has been associated with the human disease ***toxocarosis***. Another more recent study of foxes from all over the UK determined that ***Toxocara canis*** occurred in 61.6% of them and also found 588 foxes infected with another parasite ***Echinococcus multilocularis***, which can also potentially infect humans (Smith *et al*., 2003). It is important to note that the authors of these studies do point out that very little is known about the transmission of these parasites to other animals or humans and therefore that the risk to human health of increasing fox numbers, particularly in urban areas, is only hypothetical.

Perhaps the greatest potential threat to human health from foxes is that they are the natural reservoir for ***rabies***. Although currently eradicated in the UK, there is

always the threat that rabies could re-emerge and spread rapidly through the fox population. This would be of particular concern in urban areas where fox population densities are high and detailed contingency plans have been put in place to control the fox population in response to a rabies outbreak (Wilkinson and Smith, 2001).

**The Red Fox as a Nuisance Pest**

Most complaints about foxes in urban areas stem from the fact that they are a nuisance due to their activities primarily at night. In addition to their piercing calls, they set off security lights, dig in gardens, raid bins, steal fruit and vegetables, chew garden furniture, leave pungent smelling urine and excrement in gardens, and have been known to dig up buried pets (Wildlife online, 2004).

**The Benefits of Red Foxes**

In the previous sections I have discussed the evidence relating to the red fox as a pest, but I must point out that there are also benefits of having foxes as a component of habitats in both rural (Andersson and Erlinge, 1977) and urban areas (Wildlife online, 2004) of Britain. The best example of this is in the ***control of rabbits*** which were estimated by MAFF to inflict £120 million of damage per year in the 1980s on crops and forestry, a figure that may have as much as doubled in more recent years (Mills, 1986). It has been shown that although fox predation alone cannot bring rabbit numbers under control, once they are low fox predation can keep their numbers in check (Trout and Tittensor, 1989). In his report to the hunting inquiry, MacDonald performed a simple calculation and determined that fox predation on rabbits could save arable farmers between £48 and £608 per fox per year (MacDonald, 2004). Fox predation can also control the numbers of other potential pest species such as voles and mice on arable land (Hewson and Leitch, 1983) and mice and rats in urban areas (wildlife online, 2004).

**Red Fox Control**

It has been estimated, based on the assumptions that the red fox population of Britain trebles every year and that the pre-breeding numbers are approximately stable, that between 330,000 (Harris *et al*., 1995) and 400,000 (Burns *et al*., 2000) foxes die in the UK every year. In light of this fact it has been stated that unless this level of mortality is maintained, the fox population of the UK will increase (MacDonald, 2004). It has been estimated that humans account for 285,000 of these annual fox deaths, with 100,000 being killed on roads and the remainder being culled using a variety of methods.

**Current Fox Control Strategies and Their Efficacy**

By far the most widely adopted fox control method is ***shooting***. Three main techniques are adopted when shooting foxes (reviewed by MacDonald, 2000). ***Lamping*** involves the use of a high powered rifle with a telescopic sight and a powerful torch. The light is reflected in the eyes of the fox allowing it to be located and shot. The method of using ***standing guns*** involves foxes being driven from cover by

beaters or dogs towards a line of people armed with shotguns and culling at the ***cubbing earth*** involves driving the foxes and their cubs out of the earth with terriers and then shooting them with a rifle or shotgun.

Depending on the area of the country, it has been estimated that between 46% (mid-Wales) and 68% (west-Norfolk) of the total fox cull in the UK is taken by ***shooting*** with either a rifle or a shotgun (Heydon and Reynolds, 2000b). This would equate to 85-125,000 of the estimated total cull of 185,000 foxes each year (Pye-Smith, 1997).

The most widely known and traditional method for culling foxes is ***hunting with dogs*** (reviewed by White, 2000). This can be undertaken with three breeds of dog: hounds, lurchers or terriers. ***Lurchers*** are used principally at night on open ground and in conjunction with a lamp which is used to locate the fox. ***Terriers*** are used to corner foxes in their dens while the hunters dig them out and then kill them by shooting or beating. This method is used most commonly to kill vixens and their cubs during the breading season. ***Foxhounds*** drive foxes out from cover and chase them until they are caught and killed or they go under ground at which point they are dug out with terriers. Hunting with hounds is watched by spectators who follow the pack of hounds on horseback or on foot.

It has been estimated that around 10,000 foxes are killed by lurchers, 50,000 are dug out with terriers and 15,000 killed by foxhunts with hounds each year (Pye-Smith, 1997). This means that only around 4% of total fox mortalities each year is the result of foxhunts with hounds and only ~18% are hunted in any way with dogs. The foot and mouth disease epidemic, which struck the UK in 2001, meant that fox hunting with hounds was banned for ten months that year. Baker, Harris and Webbon (2002) have reported that during this hunting ban there were no significant changes in fox numbers in the UK and they inferred from this that hunting with dogs does not play a significant role in controlling UK fox populations.

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Foxes can be caught in wire ***snares*** placed around a route that foxes are known to take (reviewed by White, 2000). Snares that do not loosen and which strangle their victim or which catch the fox around the foot are illegal under the Wildlife and

Countryside Act (1981). It is also illegal to set them in areas where badgers may be caught under The Protection of Badgers Act (1992). Snares must be checked everyday by law and the foxes caught must be dispatched humanely, usually by shooting.

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Foxes can be caught by ***trapping*** them alive in wire mesh cages that are often used in conjunction with bait (reviewed by White, 2000). Traps must be checked everyday and foxes are usually humanely killed by shooting. Traps such as this are extremely inefficient (Harris, 1985) and are most often used in urban areas. Other traps which are spring operated and foothold traps are inhumane and are illegal under the Pests Act (1954).

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The ***poisoning*** and ***gassing*** of foxes is now illegal in the UK, but it is still considered to be the most effective method of controlling foxes in urban areas in the event of a rabies outbreak (MAFF, 1988). In light of this, the uptake of bait by foxes, particularly in urban areas, has been studied in some detail. However, these studies have demonstrated that lethal doses of poison may not actually be deliverable using this approach (Trewhella, 1991). The gassing of rabbits with hydrogen cyanide is still legal in the UK and it cannot be ruled out that some foxes are killed during the course of rabbit control using this technique (White et al., 2000).

**The Future of Red Fox Control in the UK**

When considering the future of red fox control, there are two main issues that need to be addressed. First, it must be determined whether there is actually a requirement for fox control to be undertaken and second, what strategy represents the most appropriate, effective and socially acceptable means of achieving that control.

The issue of whether or not foxes actually need to be controlled in the UK is the subject of much discussion. The argument that fox ***culling*** must continue to prevent fox numbers increasing is a persuasive one and it is clear that there are instances where specific foxes must be controlled to prevent their predation on valuable resources or endangered wildlife. However, there is evidence that the degree of fox culling currently undertaken may be, at times, both unnecessary and ineffective.

There are those who believe that the culling of foxes should be stopped altogether and that, if this were to occur, the fox population would remain stable as a result of limitation by factors such as the availability of food and death through natural causes (Harris *et al*., 1995). There are, however, two major problems with is argument. Firstly, a cessation of culling could have potentially catastrophic ***short term*** effects on sensitive populations of other wild species and on valuable livestock, as huge numbers of starving foxes search for alternative food sources. Secondly, if the carrying capacity of a certain habitat is artificially enhanced by the presence of an

additional potential food source, then the fox population will exploit it, particularly if it easy to obtain. Although this could be a good thing, for example as a control of rabbits, most often the additional food available will in some way be of value to people and feeding on it will mean that the fox is regarded as a pest.

Although a complete cessation of culling may be impractical, it seems that fox populations in the UK could be managed using a far more ***proactive*** management strategy, where targeted ***reactive*** culling is used in conjunction with a wide array of other non-lethal fox control techniques. A survey of farmers throughout the UK has shown that the level of fox culling is often disproportionately higher than the perceived pest status of foxes (White *et al*., 2003), while another survey of farmers in Wiltshire revealed that a third of them thought foxes should be controlled even though they were not a pest to them personally (Baker and MacDonald, 2000). These studies suggest that much indiscriminate and unjustified culling of foxes may currently be undertaken.

In 1986 Hewson argued that a more targeted and less indiscriminate culling strategy could be adopted that was, in fact, more efficacious than the current approach (Hewson, 1986). He determined that indiscriminately culling foxes, particularly in the winter, had no effect on the number of breeding dens in the spring, because many of the foxes killed were sub-dominant vixens that would not have bred the following spring anyway. He suggests that targeted culling of foxes and their cubs at the breeding den is far more efficacious at a local level in reducing fox predation on lambs.

Another way of reducing the threat of foxes as a pest in both rural and urban areas is to use improved ***animal husbandry*** and ***non-lethal*** methods of control. In agriculture, it has been suggested that changes in the way that farms are managed represents a far more cost effective means of reducing fox predation than fox culling (Moberly et al., 2004b). Whether to protect poultry, piglets, wild birds or domestic pets the use of fox-proof ***physical barriers*** such as ***fencing*** can dramatically reduce fox predation. Of fifty free-range chicken farms with electric fences in 1993, none reported a single case of fox predation on their birds (MacDonald et al., 1997). Another electric fence, erected to protect the breeding sites of Sandwich terns in Scotland, reduced fox activity to just 16% of that observed before it was erected (Patterson, 1977). In the case of sheep farming it has been demonstrated that moving ewes indoors for just one day, while they are lambing, is sufficient to significantly reduce the losses of lambs to fox predation (Moberley et al., 2004a). More experimental non-lethal fox control methods that are being developed include ***chemical repellents***, such as Bitrex™ (MacDonald and Baker, 2004), levamisole hydrochloride (Massei et al., 2003) and Renardine (NFWS, 2004), which can be used to deter foxes particularly in urban areas, and ***fertility-controlling*** bait additives (Pech et al., 1997; Tuyttens and MacDonald, 1998).

**Summary**

The use of culling to control red foxes in the UK is currently maintaining their pre-breeding population density at stable level. The effectiveness of this control is

reflected in the relatively low levels of fox damage sustained in many areas of the country. However, while there are clearly local cases where foxes are both a predator and a nuisance pest that must be controlled, it is clear that their perceived status as a pest is actually disproportionately high and that much of the culling undertaken is ineffective and unnecessary. In the future, under increasing pressure from an animal welfare-conscious public, farmers and wildlife managers will ***have*** to adopt more proactive and non-lethal control strategies as they seek to manage one of the UK's most unique and controversial wild animals.

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