

Red Kites and rodenticides

– a feeding experiment

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ABSTRACT Scavengers such as the Red Kite *Milvus milvus* are at risk of secondary poisoning by feeding on dead or dying rodents in areas where poison bait has been used. Red Kites from the reintroduced populations in Britain are regularly found dead as a result of ingesting modern anticoagulant rodenticides, and future population increase and range expansion could be affected by the continued extensive application of these poisons in the British countryside. A feeding experiment carried out in the Chilterns, in southern England, has highlighted the vulnerability of the Red Kite to this threat. It has confirmed that Brown Rats *Rattus norvegicus* are an ideal source of food for Red Kites and that dead rats are frequently taken from close to farm buildings, where poison baits are often used. Measures are suggested to minimise the risk to Red Kites and other species vulnerable to this threat.

Introduction

There is considerable evidence to show that some birds of prey and predatory mammals are vulnerable to secondary poisoning by the highly toxic anticoagulant rodenticides that are now widely used in Britain (e.g. Shore *et al.* 1995, Newton *et al.* 1999, Burn *et al.* 2002). Poisoning occurs when predators and scavengers feed on rodents which have themselves been poisoned. It has been suggested that the Red Kite *Milvus milvus* may be especially vulnerable to this threat because of its scavenging habits and tendency to feed close to human settlements where rodent poisoning campaigns are often carried out, and it is known that Red Kites are regular victims of secondary rodenticide poisoning (e.g. Carter *et al.* 2003).

Red Kites have become a common sight over villages and the edges of towns in the Chilterns, in southern England. Many people put out food in village gardens and have succeeded in attracting regular visits from Red Kites. These raptors have even become a familiar sight in the centre of large cities, such as Reading, Berkshire, on the edge of the Chilterns, a reminder

that in medieval times they were common scavengers in London and other urban areas (Carter 2001).

This short paper describes a study carried out in the Chilterns to test the food preferences of the Red Kite by providing 'field restaurants' which offered a range of animal carcasses of different types and size. A further aspect of this study was to determine how readily Red Kites would come down to take food close to buildings, where rodenticide poisons are often used and rodents containing poison are likely to be encountered regularly. The results of the study are used to discuss the vulnerability of the Red Kite to secondary poisoning owing to its food preferences and foraging habits, and to suggest measures by which the risk of secondary poisoning may be reduced.

Study area and methods

Fieldwork was carried out during June and July, when many Red Kite nests contain young and the demand for food is at its highest. The feeding experiments took place at Shirburn Farm, a mixed grassland and arable farm near

Watlington, Oxfordshire. Animal carcasses were placed in two adjacent fields of stubble, which allowed birds passing overhead a good view of the food items and did not restrict foraging kites from landing in order to feed.

A total of 180 dead animals of four different species was used for 16 diet-preference experiments during the period 11th–27th June 2003. Food items consisted of large, medium and small Brown (or Common) Rats *Rattus norvegicus* (approx 450 g, 150 g, 50 g respectively), House Mice *Mus domesticus* (25–30 g), Rabbits *Oryctolagus cuniculus* (1.2–2.0 kg) and birds, mainly Rooks *Corvus frugilegus* (250–350 g). Batches of between 40 and 50 mice and rats of different sizes were supplied on a weekly basis by the School of Animal and Microbial Sciences at the University of Reading. Initial experiments showed that dark-coloured rats were apparently preferred to white or pale brown individuals by foraging kites and so pale rats were used only when no dark animals were available. Rabbit and Rook carcasses were provided by local gamekeepers and farmers. Depending on the number of food items available, one or two feeding stations were set out each day (plates 248 & 249). Each feeding station typically consisted of four Brown Rats (two medium and two small), two House Mice, two Rabbits, and two Rooks. The specific location of food items within the feeding areas was randomised. One experiment involved large numbers of Brown Rats and House Mice without the other species, and in two experiments each carcass taken was immediately replaced with a fresh one of the same species and size. Observations were carried out from a

hide on a small hill overlooking the fields.

The second part of the study involved placing a total of 24 medium-sized Brown Rats within 12–20 m of farm buildings between 12th June and 21st July 2003 to assess whether Red Kites would forage in close proximity to buildings. Seven farm buildings on several different estates around Watlington were used so that individual Red Kites did not habituate to a single location where food was provided regularly. In the first series of experiments, carcasses were left from 08.00 to 20.00 hrs around buildings but removed overnight. In a second series of experiments, carcasses were left overnight on a bed of soft sand in order to determine whether they were removed by nocturnal scavengers.

Results

Foraging behaviour and numbers

Foraging started extensively after 09.00–10.00 hrs, and tended to reach a peak in the middle of the day (see fig. 1). Weather conditions affected foraging activity and fewer birds were observed during rain and strong winds. The feeding trials attracted a maximum of 28 Red Kites at any one time (though average numbers were much lower), so it is unlikely that the results were unduly influenced by the food preferences of a few individuals.

Most carcasses were taken in a steep dive on folded wings, following an often prolonged period of circling over the area. Birds would either land briefly to pick up the carcass or snatch it up in flight. Only occasionally would birds land on the ground to tackle the larger carcasses, which were too heavy for them to pick up intact. Birds seemed reluctant to fly down to carcasses when only a small number of kites were present and feeding on the ground occurred mainly at times when large numbers of foraging birds were in the area. This behaviour is common in other scavenging birds of prey, notably various species of vulture

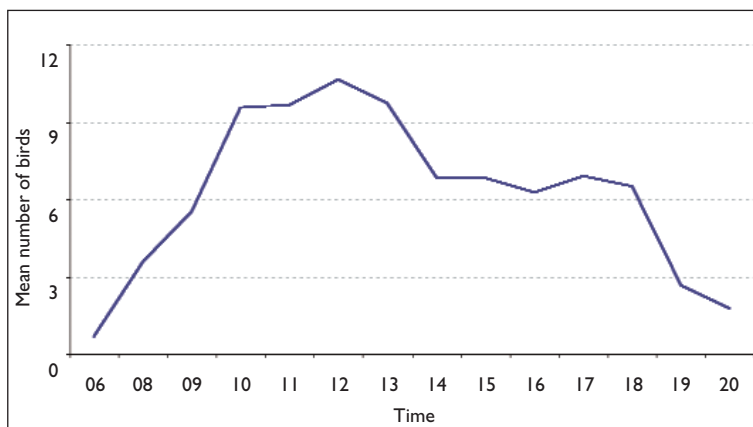


Fig. 1. Variation in numbers of foraging Red Kites *Milvus milvus* during the day; observations at study site in Oxfordshire, June–July 2003.



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246. As this photograph demonstrates, Red Kites *Milvus milvus* will take food from confined spaces, close to buildings, which makes them particularly vulnerable to rodenticide poisoning.

where ground predators are a constant threat at carcasses. The presence of large numbers of birds in the area seems to provide reassurance that it is safe to come down to feed (Snyder & Snyder 2000). Red Kites which fed on the ground would often fly away with manageable parts of a carcass once it had been sufficiently broken up.

A considerable amount of food was taken by Red Kites on some of the trial days. On 27th June, for example, 23 carcasses, mostly of Brown Rats, were put out at 08.00 hrs. By 18.00 hrs, all these food items had been picked up by Red Kites. On this day, the peak number of birds

was recorded at 13.00 hrs, when 20 Red Kites were present in the air above the fields. Several of the Brown Rat carcasses were dropped by birds that found them difficult to carry away in flight. One rat landed in the field and was retrieved by the same bird but the others fell in thick vegetation where they were inaccessible to foraging Red Kites.

During all observations the Red Kite was, perhaps surprisingly, the only species recorded taking food put out for the feeding trials. Corvids of various species and Common Buzzards *Buteo buteo* were seen regularly in the area

Table 1. Food preferences for Red Kites during the feeding trials. Lower mean rank values indicate the more preferred food items. Feeding trials were carried out on 16 days. For each trial, ranks from 1 to 10 were given to each carcass. The most preferred food item was given the rank of 1, the second choice rank 2, and so on, with the least preferred given the rank 10.

Food item (n); weight	Mean of ranks		
	Feeding station A	Feeding station B	Overall mean
Rabbit (32); 1.2–2 kg	7.8	7.6	7.7
Large rat (6); approx. 450 g	7.3	7.0	7.1
Rook (29); 250–350 g	9.2	8.7	8.9
Medium rat (35); approx. 150 g	2.1	3.4	2.7
Small rat (41); approx. 50 g	3.4	3.1	3.2
House Mouse (37); 25–30 g	4.3	4.0	4.2

and the Buzzards circled directly above the food on several occasions but did not drop down to feed.

Diet preferences

Carcase size was a significant factor influencing choice by Red Kites (table 1); medium and small Brown Rat carcasses and those of House Mice were generally preferred, usually snatched from the ground in flight to be consumed elsewhere, or perhaps taken back to the nest. Medium-sized rats (around 150 g) were the most preferred food item, while Rabbits, Rooks and large rats were the least preferred items, being too heavy to be picked up and carried away whole. During almost all of the feeding trials, Red Kites landed on the ground to feed at Rabbit, Rook and large Brown Rat carcasses only when no smaller food items were available.

Carcasses near buildings

Brown Rats placed close to farm buildings were taken regularly by Red Kites, often within a few hours of being left out and almost always within two days. The mean time for carcasses to be taken was approximately 12 daylight hours (i.e. not including the hours of darkness, when Red Kites are not able to forage), based on a sample of 24 carcasses. The mean time increased significantly to almost 20 daylight hours when

carcasses were placed in long vegetation or in proximity to dense vegetation, fences or trees. This probably reflected reduced visibility from the air and perhaps a reluctance to take carcasses from areas where thicker cover may have concealed ground predators. The Red Kite was the only species recorded taking carcasses, at least during daylight hours. Several carcasses left out overnight were removed by Red Foxes *Vulpes vulpes*.

Discussion

The Red Kite is a highly adaptable, generalist scavenger, taking a wide range of food items depending on local availability (Carter 2001). This study has, however, shown that Red Kites in the Chilterns have a clear preference for animal carcasses within a certain size range, at least in the breeding season. Kites were reluctant to land on the ground to feed at large carcasses, preferring instead to pick up and carry away small and medium-sized carcasses; Brown Rats were most preferred in this trial. Carcasses of this size are likely to be especially important during the breeding season when food is in demand for growing young but must be suitable for carrying back to the nest-site. Larger items, such as Rabbits, were too heavy for the adults to carry and were generally taken only when smaller prey was not available. In some



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247. Red Kite *Milvus milvus* – a victim of rodenticide poisoning, Oxfordshire, January 1996.

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248 & 249. 'Field restaurant', Shirburn Farm, Oxfordshire, June 2003.

cases, the kites flew off with parts of large items once these had been partly dismembered.

Our results showed that Red Kites took carcasses left near buildings readily, often within a few hours of being left out and almost always within two days. This highlights the extreme vulnerability of the Red Kite to secondary poisoning by rodenticides. Other birds of prey, including Barn Owl *Tyto alba* (Newton *et al.* 1990), Common Kestrel *Falco tinnunculus* (Shore *et al.* 2001) and Common Buzzard (Burn *et al.* 2002), are also at risk from secondary poisoning, as dead birds subject to analysis have been found to contain rodenticide residues. Nonetheless, no other species shares the Red Kite's combination of being primarily a scavenger, favouring food items as large as the Brown Rat, and foraging regularly around human settlements. It was notable that, in feeding trials involving well over 100 food items, the Red Kite was the only bird recorded taking carcasses, even though Carrion Crows *Corvus corone* and Common Buzzards were common in the area.

Other studies have confirmed that Brown Rats can account for a significant proportion of the diet of Red Kites in Britain (Wildman *et al.* 1998; Carter & Grice 2002), and that a high proportion (around 70%) of dead Red Kites in England and Scotland contain rodenticide

residues (Sharp & Hunter 1999; Shore *et al.* 2000). While it is clear that many birds had residue levels that were sub-lethal, it is also known from post-mortem examination that some birds are killed by the anticoagulant effects of rodenticide poisons. During 1998–2000, when reintroduced populations in England and Scotland were still small and vulnerable, intensive studies revealed that at least seven birds in England and eight in Scotland were killed by rodenticide poisons (see Carter *et al.* 2003); clearly, many more that were not analysed may have been similarly affected.

In order to reduce the threat to Red Kites and other species, alternative forms of rodent control should be considered where infestations occur. It is the so-called 'second-generation' rodenticides that are the most highly toxic and present the greatest threat of secondary poisoning. First-generation poisons, such as those based on warfarin and coumatetralyl, are still effective in many areas (though resistance is a problem in some parts of the country, including parts of the Chilterns) and should be used in preference to more toxic products where possible. Trapping also offers an alternative, safer form of control.

In situations where the highly toxic rodenticides must be used, it is vital that the manufacturer's (legally binding) instructions are

followed. These include a requirement to undertake 'regular' searches for dead rodents so that they may be disposed of safely, by burning or burying, and do not pose a risk to scavengers. The term 'regular' is not defined on rodenticide label instructions but this study suggests that, as a minimum, daily searches are necessary if the risks to the Red Kite are to be minimised.

Further advice on the safe use of rodenticides and alternative forms of rodent control is available in a leaflet published by English Nature and RSPB (go to www.english-nature.org.uk/pubs/publication/PDF/RatPoisonBirdsLflt.pdf or contact the English Nature Enquiry Service on 01733 455100). (See also p. 446 of this month's News & comment.)

Acknowledgments

Fieldwork was undertaken by DN as part of an MSc project supervised by Colin Prescott at the University of Reading. Colin is thanked for his help and guidance during the project. Special thanks are due to Nigel and Margaret Lawrence for allowing the feeding trials to take place on their estate. We would also like to thank Pam Rummings at the University of Reading for the weekly provisioning of rodents, and the residents of Watlington and Shirburn area for their enthusiasm and help during this study. Finally, we would like to thank all the individuals and organisations, too numerous to mention, who have played a role in the Red Kite Reintroduction Programme since it started in 1989.

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