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An assessment of two methods used to release red kites (*Milvus milvus*)

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ABSTRACT

Between 2003 and 2005, we released 12 red kites (*Milvus milvus*) to the wild in Hampshire, England. Four kites were captive-bred and released as fledglings in artificial nests ('hacking'). The remaining birds were mature and released from a large aviary. Interaction with electricity power-lines killed two of the captive-bred birds three weeks post-release and a third captive-bred kite died as a result of head injuries six months post-release. One mature kite died 10 days post-release. We suggest that the different release methods of the two groups amplified the behavioural variation between individuals and exposed them to different risk factors. We concluded that releasing mature flight-fit kites from aviaries is likely to be a superior method to hacking pre-fledged kites in artificial nests. The flight skills of the mature kites, developed prior to release, enabled them to avoid potentially lethal interactions with power-lines and aggressive inter-specific encounters. Modifying or adapting release methods to incorporate behavioural variation between individuals within a release population should be a consideration for reintroduction practitioners, particularly where release numbers are small.

Keywords: *red kite, Milvus, hacking, release, mortality, behavioural variation*

1. INTRODUCTION

During the late 18th and 19th centuries the red kite *Milvus milvus*, once a numerous and widespread raptor in the UK, was exterminated in England and Scotland, primarily due to human persecution (Lovegrove, 1990; Carter, 2001). A relict population survived in Wales.

Following an improved public perception of the species and a major reduction in persecution, a reintroduction programme using translocated birds from Europe began in the UK in 1989. This programme re-established successfully populations of red kites to a number of locations in the UK (Carter *et al.*, 1999; Carter, 2001; Wotton *et al.*, 2002).

Despite the success of the reintroduction programme, red kites remained scarce in Hampshire in southern England. Between 2003 and 2005 we released 12 red kites into the wild in this area, in two stages. The first stage consisted of young pre-fledged captive bred birds. Stage two consisted of mature captive birds and one rehabilitated wild bird. In this paper we outline these two methods and describe post-release observations, mortality factors and survival rates for all release birds. We examine the consequences of each release method for the two release groups and discuss the implications of these findings for reintroduction planning.

2. METHODS

Planning and preparation for both release stages included close work with local farmers and landowners to outline the project, develop links and ensure community involvement and support. We contacted 32 farmers and landowners in the vicinity of the release area by letter, telephone or in person to discuss the release and highlight the key features of red kite ecology. In recognition of the local support for the project, the kites were named after the farms surrounding the release site (*e.g.* Manor, Haydown, *etc.*). Local landowners (and their children) occasionally participated in tracking the kites. Apart from contact with local landowners we undertook a programme of public awareness through talks, general publicity and information for visitors to The Hawk Conservancy Trust.

Following health checks and screening for disease and parasites, four young captive-bred kites were transferred to artificial nest sites ('hack sites') in pairs at a pre-fledging age of 41 to 45 days. The kites were fitted with leg rings and radio tags (Biotrack, Dorset, UK) attached by backpack with perishable cotton stitches. Food was supplied to the nest site remotely and consisted of local carrion types. Each pair of kites had a separate release site and was monitored during all daylight hours for eight months after release. Food

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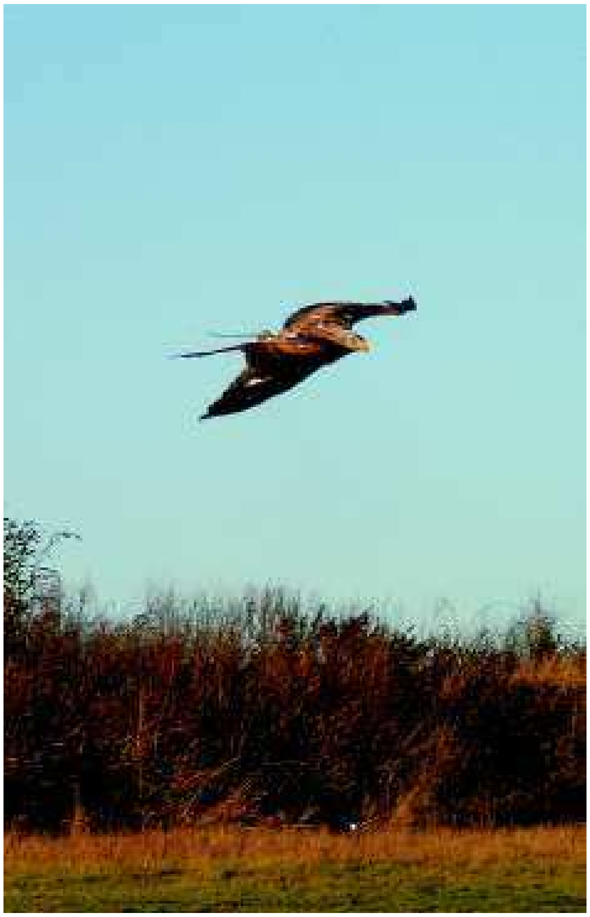

Figure 1 An adult red kite.

provision to the hack site gradually decreased to zero over a period of three weeks as successful foraging was observed and the kites began to make use of a nearby (~200 m) feeding station. The feeding station has been operating since 1995 and supplements the diet of local raptors, herons and corvids. It is provisioned by The Hawk Conservancy Trust and a viewing hide overlooking the feeding station is the venue of an educational talk each afternoon.

During the second release, eight mature kites (five females and three males) were released including one wild rehabilitated kite. The rehabilitated kite had suffered from a blood disorder, and upon recovery exhibited leucism (partial loss of pigment in plumage and pigmented eyes). Pre-release preparations were the same as for the young kites, except radio tags were tail-mounted.

For three weeks before release, the mature kites lived in an aviary approximately 21-m long, 8-m wide and 9-m high. The aviary had a favourable aspect, with an extended view from the southeast to the southwest, and permitted the kites to assess their location and observe the feeding station. At release, a section of the aviary

Figure 2 Young red kites.

was removed. After all the kites had left the aviary they were tracked daily for five months, during which food was available at the feeding station near the release aviary in the mornings and afternoons. The morning feed was gradually reduced and ceased completely after five months. The afternoon feed continued as part of the pre-existing educational programme.

3. RESULTS

The first young kite left the hack site after only four days, possibly due to a storm with strong winds. The kite was returned to the hack site after being found, grounded and wet, 20 m away. The three other young kites left the hack site after eight days. None of the young kites moved very far (~50 m) from the hack site during their initial excursions. The hack site trees were part of large hedgerows, which enabled the birds to make short gliding flights and land a short distance away. Roosting positions were in or within 10 m of the hack site.

As the fledging period progressed, the young kites took time to develop their flight skills. They undertook frequent short flights and their inexperience often forced them to land on the nearest available structure. It was during this period of flight skill development that, after 18 and 17 days post-fledging, two of the young kites died from electrocution on a nearby (~180 m) powerline.

After 141 days a third young kite was found lying on the ground at the edge of a field near the release site. A veterinary examination revealed severe head trauma, widespread infection and abscess development, and the bird was euthanased. The head injuries were consistent with those possibly inflicted by another raptor, or a group of corvids, and there were numerous observations made of buzzards and/or corvids harassing and attacking the kites. The third kite was often observed to encounter difficulties in such situations,

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often needing to land and defend itself from the nearest perch.

The final young kite encountered no obvious difficulties and quickly became proficient at avoiding both buzzards and corvids. Subsequent to excursions of up to 27 km during the first year of release, the final young kite remained local to the release area in 2008.

Within a week of release, all the mature kites were accomplished fliers and they possessed superior skill and coordination. During five months of observation, there was only one sighting of a mature kite using a pylon, and there were no known fatalities resulting from the use of pylons by mature kites. Two had left the release area after two days and the remaining mature kites had dispersed by day 56, and gradually increased the distances they moved away from the release site. These distances were not large, and between 39 and 94 days post release ranged from 6.5 km and 12.5 km from the release site.

Despite careful post-release monitoring and supplementary feeding, the rehabilitated leucistic kite died 10 days post-release. This may have been due to leucistic birds being rare and possibly at a disadvantage to conspecifics resulting from their conspicuous plumage and presumed optic deficiencies. There were no other observed fatalities during the period of post-release monitoring, indicating a confirmed mortality rate during the observation period of 12.5% for the group of mature kites, 75% for the young kites and 33% for the combined release.

Preferred habitats after release for all kites were areas with large hedgerows surrounding arable or grassland fields. The kites avoided the centre of woodlands and utilised woodland edges or large hedgerows.

4. DISCUSSION

Mortality rates in excess of 50% are not unusual for first year and/or pre-breeding age raptors. Broad mortality estimates across the family Accipitridae range between 60 and 90% (Thiollay, 1994), whilst radio tag studies on large falcons have shown first year mortality rates of between 28% (McFadzen and Marzluff, 1996) and 77% (Kenward *et al.*, 2007) for prairie falcons (*Falco mexicanus*) and saker falcons (*Falco cherrug*) respectively. Studies on common buzzards (*Buteo buteo*) indicate first year mortality rates of between 25% and 40% (Kenward *et al.*, 2000), and mortality rates for juvenile red kites in Britain rarely exceed 50% (Wotton *et al.*, 2002). The 75% mortality of our released captive-bred kites therefore appears high.

It is tempting to reflect upon the low mortality rate of the mature kites and draw the conclusion that releasing young kites *via* hacking is an inferior release method. Although we consider there are insufficient grounds to support this conclusion completely, it is possible that holding young kites in captivity until they are fully flight-fit may be a superior release technique. This may compensate for any potential susceptibility to electrocution and/or inter-specific aggression.

Other releases involving scavenging raptors have successfully employed hacking (Frey and Bijleveld van Lexmond, 1994) or a combination of hacking and the release of adults from aviaries (Terrasse *et al.*, 2004). It has been suggested also that for some taxa, a period of time in captivity prior to release can increase the chances of post-release survival (Molony *et al.*, 2006). Release of Eurasian griffons (*Gyps fulvus*) to France was more successful when older birds were released from aviaries, rather than juveniles (Sarrazin *et al.*, 2000). This is comparable with the release of our mature kites, which had lower mortality and demonstrated innate foraging behaviour despite having been captive birds all their lives.

However, the release of older, captive animals can be complicated by the potentially negative effects of captivity in the form of stress (Tiexeira *et al.*, 2007) or adaptation to captivity (McPhee and Silverman, 2004). Compared to their wild-bred counterparts, captive-bred animals released to the wild can show reduced faculties, such as predator avoidance (McPhee, 2003) or locating food resources (Mathews *et al.*, 2005), and rates of survival in reintroduction programmes tend to be higher for wild-bred animals (Fischer and Lindenmayer, 2000; Brown *et al.*, 2006). Despite this, some raptor reintroductions have shown that mortality rates between captive-bred and wild-bred individuals do not necessarily differ (Nicoll *et al.*, 2004). Clearly post-release survival varies between and within species and the variation shown in our project suggests that behavioural variations within a species may be a factor in reintroduction success.

The different fates of the four young kites highlight how individuals can respond differently to the same situation, despite having had identical rearing or life experiences. The behavioural variation between individuals has traditionally been given little attention in reintroduction programmes (Watters and Meehan, 2007), but is particularly relevant where small numbers of animals are due for release, and should be a consideration during the pre-release planning of such programmes (Armstrong and Seddon, 2007).

The single electricity pylon that killed the two young kites was unsafe due to a small phase gap and earthed metal cross arm. Before their deaths, the behaviour of these kites appeared to follow a similar pattern to the surviving fourth young kite. The fact that they were electrocuted would indicate otherwise. Red kites are susceptible to electrocution (Carter and Newbury, 2004) and it is possible that during the important time of post-fledging flight skill development, the release method of hacking exposed the behavioural variation between the four young kites and put two of them at risk of death.

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Despite avoiding electrocution, field staff considered the third young kite that died after 141 days to be the weakest of all the release birds. Our suspicion that it was attacked by buzzards and/or corvids is consistent with the type of injuries sustained and the inter-specific conflicts we witnessed. The difference in behaviour and skill development between the third and fourth kites over 20 weeks of observations was pronounced, with the latter showing rapid skills development in all areas. It is possible that the third young kite may never have become an accomplished flier, regardless of whether it was born in captivity or the wild.

With regard to behavioural variations, Carter *et al.* (2008) suggest that captive-bred raptors, compared with wild-bred raptors, may have an increased familiarity with human structures, thereby increasing their risk of electrocution. We do not agree with this suggestion for two reasons. Firstly, the habitats frequented by all the kites were not consistent with human settlements and structures, but rather the noted habitat requirement for the species, which is a mixture of forest patches to breed and open areas to forage (Seoane *et al.*, 2002; Hardey *et al.*, 2006). Secondly, the young kites we released were of pre-fledging age and had had no opportunity to become familiar with human structures, other than in a nest within an aviary for 40–45 days. In fact, the mature kites had more opportunity to become familiar with human structures, having lived in captivity for their entire lives. Furthermore, although the release project in England used wild-bred red kites, they were fledged in captivity and kept in aviaries for 56 days prior to release (Carter and Newbery, 2004). Red kite reintroductions in Scotland used a similar release method (McGrady *et al.*, 1994).

We conclude that the proximity of a dangerous powerline combined with behavioural differences of the young kites during the fledging period was the reason for their observed high mortality, rather than because of any familiarity with human structures. The method of release by hacking described here possibly exposed the behavioural variations between individuals that existed at the skills development stage. Our suggestion of not releasing captive-bred kites until they are fully flight-fit (*i.e.* releasing mature kites) may provide a means by which the consequences of behavioural variation can be alleviated, thus lowering the risks of electrocution, inter-specific aggression or other mortality factors.

Although understanding the biology of a species is central to reintroduction success, our experience suggests that such an understanding should extend to include an appreciation of the behavioural variation between the individuals of a release population. Adapting release methods to incorporate the behavioural ecology of skills development during the release of juveniles can mitigate exposure to hazards, improve survival and thus reduce the need to release more animals to compensate for higher mortality (McPhee and Silverman, 2004).

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