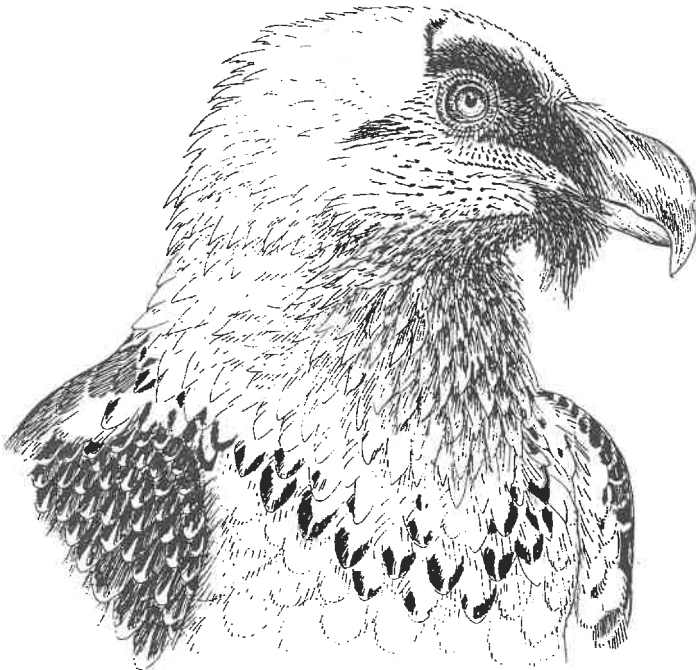


Part 6

Reintroduction of Eagles, Vultures and other Raptors



Ulrich, 94

Bearded Vulture *Gypaetus barbatus*

Conveners:

J. Love & M. Terrasse

Population and Range Restoration of Threatened Raptors in the United Kingdom

I.M. Evans, J.A. Love, C.A. Galbraith & M.W. Pienkowski

ABSTRACT

This paper outlines the experimental reintroduction programmes for the White-tailed Eagle and Red Kite in the UK. Both projects aim to evaluate how self-sustaining nucleus populations can be established which are capable of expanding and recolonising areas of the birds' former ranges which are at present vacant but still remain suitable. The methods of population establishment are outlined within the context of current international guide-lines. The progress made so far is reported and future plans discussed.

INTRODUCTION

The White-tailed Eagle (*Haliaeetus albicilla*) and Red Kite (*Milvus milvus*) are the only species of raptor in the United Kingdom that are threatened on a world scale. Consequently, both are priority species for conservation action in the UK as part of our commitment to maintain and enhance biodiversity through re-creation and protection of typical species assemblages.

An estimated population of 200 pairs of White-tailed Eagles inhabited the north and west coasts of Scotland and Ireland, with a possibly wider distribution earlier (Love 1988; Brown 1976). Red Kites were abundant breeders over most of England, Scotland and Wales. Intense persecution by humans eliminated White-tailed Eagles from their range in the United Kingdom and Republic of Ireland. The last recorded nesting attempt was on the Isle of Skye in 1916 (Baxter & Rintoul 1953). Red Kites also suffered from persecution in the seventeenth, eighteenth and nineteenth centuries. Their range was drastically reduced to a small area of central Wales where a small but expanding population of Red Kites survive today as a result of intensive conservation efforts (Lovegrove 1991).

The world populations of these species (1 000 pairs of White-tailed Eagle; 13 000 pairs of Red Kite) have also suffered from the effects of persecution, loss of habitat and pollution and are now very fragmented and restricted to relatively small areas of their former range. Within the Western Palearctic, about 80% of White-tailed Eagles breed in Norway, the Baltic coast and the Volga Delta, while 90% of all Red Kites breed in France, Germany and Spain (Gensbol 1989; Evans & Pienkowski 1991; Meyburg *et al.* 1991). Restoration of their former ranges within the UK will

make a significant international contribution to safeguarding their future in the most effective way: by widening their existing world ranges, which in turn reduces the vulnerability of their global populations to unforeseen environmental threats.

Natural recolonisation by the White-tailed Eagle and the Red Kite is unlikely to restore their former breeding ranges within the UK in the foreseeable future. Hence, human intervention is essential to initiate re-establishment of population centres which will expand and recolonise naturally large areas of their former ranges which still remain suitable. Pioneering efforts to reintroduce White-tailed Eagles and Red Kites have been undertaken on a small scale in the past without achieving success (Bannerman 1956; Dennis 1968, 1969; Lovegrove 1991; Sandeman 1965). However, the current reintroduction programmes for these species recognise the need for careful consideration and planning which includes a post-release monitoring programme. In addition, strict adherence to international criteria (Green 1979) is essential to maintain standards and to demonstrate that reintroduction is a useful and appropriate conservation technique.

The IUCN criteria have appeared in various forms with slightly different wording. They can, however, be summarised as follows:

1. There should be good historical evidence of former natural occurrence.
2. There should be a clear understanding of why the species was lost to the area. In general, only those species lost though human agency and unlikely to recolonise naturally within a reasonable time scale should be regarded as suitable candidates for reintroduction.
3. The factors causing extinction have been rectified.
4. There should be suitable habitats of sufficient extent to which the species can be reintroduced.
5. The individual organisms taken for reintroduction should be from a population as genetically close as possible to that of the native population.
6. Their loss should not prejudice the population from which they are taken.

The work on White-tailed Eagles was initiated by the Nature Conservancy Council (NCC) but is now operated jointly by its successor in Scotland, Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds. The project steering committee includes representatives from the Joint Nature Conservation Committee (JNCC), Institute of Terrestrial Ecology (ITE) and the Scottish Wildlife Trust (SWT). The experimental work on Red Kites is being undertaken by the Joint Nature Conservation Committee and Royal Society for the Protection of Birds. Both projects are long-term operations which are divided into a succession of phases, each of increasing temporal duration (Pienkowski & Love 1991; Pienkowski & Evans 1991). Monitoring each stage carefully provides the means of assessing progress and determining the level of future action required.

METHODS

Procuring release stock

Translocating individuals of a species from one part of their traditional geographic range to another is the basic principle underlying both reintroduction programmes currently underway. The translocated individuals provide the basis for population establishment, broadly emulating natural immigration. Captive breeding and the use of eggs which were unlikely to produce fledged young were also evaluated as alternatives to translocation.

The release stock of White-tailed Eagles was collected under special licence from nests in northern Norway as this is one of the nearest populations to the UK. In addition, the population in this area is relatively large (1200 pairs) and could accommodate the removal of a small number of individuals without any adverse affects. Even so, great efforts were taken to keep nests viable wherever possible by collecting single eaglets from broods of two. The collection of eaglets from the same nests in successive years was avoided in order to maximize genetic diversity in the founder population.

Procuring the entire release stock of Red Kites from within Great Britain was not possible. Even so, a very small number of chicks were obtained from Wales by removing eggs from nests that were likely to fail and these were reared artificially. However the majority of birds released (see Table

2) were donated by Swedish and Spanish conservationists from their much larger populations in Skania, southern Sweden, and Navarra and Aragon in northeast Spain. Recent evidence supports the view that there are unlikely to be any major natural genetic differences between British and Continental populations; which were a continuous population until recently (May *et al.* 1993).

The collection of young Red Kites from Continental nests was based on the experience gained from the White-tailed Eagle project and on information gleaned from work on the translocation of Ospreys in North America (Gillette & Englund 1985; Hammer & Beddow 1984; Rymon 1989; Schaadt & Rymon 1983). The same procedures were used to maintain genetic diversity in the founder population and to maintain viability of the donor nests.

Captive breeding was considered as an option to obtain birds, since it could supplement or even preclude the need for importing wild release stock. With this in mind, four (two males and two females) of the imported wild White-tailed Eagles were retained in 1976 with the view to establish a viable captive breeding stock, since captive breeding of White-tailed Eagles was possible (Fiedler 1970; Fentzloff 1977). However, the potentially lengthy and expensive commitment to captive breeding was abandoned when Norwegian conservationists agreed to guarantee further supplies of wild-bred stock for release in Scotland. The surviving captive eagles were released in 1979 after three and a half years in captivity.

Experimental captive breeding of Red Kites has been carried out in a limited way as part of the release programme. The breeding experiment was set-up in 1989, using rehabilitated birds which cannot be released back into the wild as potential breeding stock. No chicks have yet been reared in captivity but one pair laid eggs in 1992. It is apparent from the progress made so far that the captive-breeding option is unlikely to replace wild stock entirely because of the time scale involved and the relatively large number of rehabilitated birds that are required to establish a viable captive breeding stock. However, the potential of this supplementary technique is demonstrated by the careful deployment of even injured birds.

Pre-release care

White-tailed Eagles were released between 1975-85 from the island of Rum, a National Nature Reserve, situated in the heart of the White-tailed Eagles' former range in the Scottish Hebrides. In 1985, releases of young eagles were suspended to allow a period of assessment as to whether further releases were required. The Red Kite experimental reintroduction programme followed on from this work. However, as the former range of the Red Kite in the UK was much more extensive than the White-tailed Eagle, it was apparent that several population centres would need to be established over a much larger area and in different geographic regions to evaluate if and how population and range recovery could be achieved within a reasonable timescale. For this reason, two experimental release sites (one in the north of Great Britain and another in the south) were established in 1989.

Red Kites start breeding at 2-7 years old in Wales (Newton *et al.* 1989) whereas White-tailed Eagles do not start breeding until at least five years old (Love 1988). In addition, one of the lessons learnt from the White-tailed Eagle programme was that larger numbers of birds should be released over a shorter time period. Taking these aspects into account, it was decided to operate the experimental Red Kite release scheme for an initial period of five years (1989-1993), to evaluate methodology and assess future requirements. The total number of Red Kites released at each site was planned to be similar to the number of White-tailed Eagles released on Rum (see Table 1) but the release period would be much shorter.

The release methods developed were based on the falconry technique of 'hacking' but have been refined to suite the individual requirements of each project. In both schemes, specially constructed aviaries of quarantine standard were built to rear and house the birds through the mandatory 35 day quarantine period. The aviaries were situated in secluded areas offering suitable habitat; the only difference being the relative security afforded to the White-tailed Eagle release site on the Isle of Rum meant that it could be publicized widely. In contrast, the mainland localities of the two Red Kite release sites have been kept confidential to minimize unsanctioned disturbance.

At the White-tailed Eagle release site, a total of four release aviaries were constructed of wire mesh stretched over a timber framework and divided into two compartments, 4m square and 2m high; each containing an open-fronted shelter 1m square and a log perch (Love 1983, 1988). In

comparison, two release aviaries were built at each Red Kite release site approximately 1km apart in England and 12km apart in Scotland. Each aviary consisted of three compartments (6m x 2.5m x 2.5m in England; 3.5m x 3m x 2.5m in Scotland) which were provided with a sheltered artificial nest platform and both natural and artificial perches. The top and front were open, but were covered with an outer layer of metal wire and inner layer of plastic wire. The wooden panelled sides proved invaluable in affording shelter from adverse weather and by acting as a screen which reduced human contact considerably, although progress could be monitored through small peepholes in the sides (Evans, Pienkowski & Dennis 1990).

The eaglets and kite chicks were placed in their quarantine aviaries in June, aged 7-8 weeks and 4-6 weeks respectively. By this age they were well feathered and able to maintain body temperature without brooding. Chicks of this age require very little 'hands on' care which reduced the risk of imprinting and conditioning to humans considerably. This was reduced further by rearing the chicks in brood sized groups (up to 4 for Kites and 2 for Eagles), although in cases where eaglets were raised separately, visual contact was maintained with their neighbours through the wire mesh of the aviary walls.

During the rearing period, human contact was limited in both projects to brief visits to provide food and to fit monitoring marks. Experience gained in the White-tailed Eagle work recognised the need to reduce human contact even further for Red Kites. This was achieved by feeding the kite chicks through small feeding hatches. The aviaries were only entered to fit monitoring marks and to return any flightless chicks that had fallen off their nest platform. In addition, a small number of visits were undertaken for detailed veterinary examinations of the Red Kite nestlings and to take blood samples for haematology tests, genetic finger printing studies and sexing.

The diet of the young eagles was designed to be representative of the variety of natural foods available in the area. It comprised fish (mainly mackerel, whiting, dogfish, herring), sea-birds (greater black-backed gull, herring gull and their chicks), hooded crow, carrion (scraps of venison, goat meat and offal), and was provided in excess to permit an average daily food intake of 550-600g (Love & Ball 1979; Love 1979). Red Kites, were given a varied diet of mammals (rabbit, grey squirrel, hare, fox, venison scraps), birds (magpie, carrion crow, jay, rook) and fish (mainly trout). Depending on the age of the Kites, the food was either minced (4-7 weeks), skinned (7-9 weeks) or given whole (after 10 weeks) and supplied daily in excess amounts. Individual consumption rates could not be calculated as the Kites were reared in groups. The first week proved the most critical for both Eagles and Kites as the birds had to adjust after collection to life with no parents, and to new surroundings. During this period it was necessary to ensure that the chicks were feeding themselves and receiving adequate food. Hand-feeding was required in some cases for a short period during the initial few days, but once the birds had settled, this was discontinued (Evans 1991; Love 1983, 1988).

Prior to release, the young White-tailed Eagles were fitted with a British Trust for Ornithology metal leg ring. In addition, two Darvic colour rings were also fitted on young birds between 1975 and 1983 for individual recognition. However, this marking technique was not very satisfactory and individually inscribed, coloured patagial tags visible on the upper wing surface were fitted to the Eagles released in 1982-1985. The value of patagial tags as visual markers has already been established by Newton & Davis (1989), and based on this experience all the Red Kites released were fitted with BTO leg rings and wing tags. Radio telemetry was found to be unsuitable for White-tailed Eagles due to the remote mountainous and coastal habitat (Love 1988). In contrast, tail-mounted radio transmitters with a 50km range and 12 month life-span have proved highly successful in monitoring juvenile Red Kites.

Release into the wild

The release methods developed differed slightly as a result of the size difference between the two species. In the larger White-tailed Eagle, the aviaries proved less suitable after fledging (at 10-11 weeks old), as some nervous individuals risked injury from colliding with the aviary walls. For this reason a free-flying leash system was devised in 1976 (Love 1983, 1988) which permitted tethered flight between a wooden shelter and a perching block 5m apart. Immediately prior to release each eagle was fitted with a falconry hood in order to keep it calm for measurement and marking. The hood was then removed and the Eagle was able to fly free from a nearby rock.

The Red Kites were kept in their quarantine aviaries for up to a month after fledging (at 7-8

weeks old). Release simply involved opening a release door at the front of the aviary. During the period of captivity, damage to individual feathers was recorded in a small number of cases but occurred immediately after fledging when the flight feathers were not fully hard panned. Hence, during this stage of development it was most important to ensure that the birds were not disturbed unduly.

In the early years of the White-tailed Eagle release scheme, juvenile eagles were released singly or in pairs from the end of September to May. However, in later years the procedure was modified and releases took place much earlier in August/September and more eagles were released simultaneously (up to six). In the Red Kite project, birds were released at about 12 weeks old in batches of 3-10 individuals per day during July/early August.

Once liberated, both eagles and kites remained together in loose groups in the vicinity of the release area where several food dumps had been established for their use. On Rum, the food dumps were maintained for several months until the eagles had dispersed or proved able to fend for themselves. Some young eagles were seen to kill sea-birds within a month or so after release while many were able to locate natural carrion much earlier, demonstrating that independence could be achieved relatively quickly. The Red Kites returned to food dumps for a relatively shorter period of up to 14 days. During this period their visits became less frequent as their reliance on this food source decreased as they became independent. By the middle of August, food was no longer provided, since the birds had moved away from the release site and began to explore the surrounding countryside in their search for natural foods.

RESULTS

Number released

From 1975 to 1985, a total of 85 White-tailed Eagle chicks were imported from Norway and 82 of these were subsequently released (Table 1). The release programme was stopped in 1985 to assess the performance of the reintroduced population and to determine whether further releases were necessary. Only three died in captivity (representing 4% of the total) during the early stages of the project, one from complications arising from an injury and the others from illness or disease. Although such losses are to be expected through chance events, every effort was made to ensure that such losses were at an absolute minimum.

Table 1. Number of White-tailed Eagles released on Rum in 1975-1985.

Year	No. released
1975	3
1976	9
1977	4
1978	7
1979	6
1980	8
1981	5
1982	10
1983	10
1984	10
1985	10

The Red Kite experimental release programme has received 74 chicks from Sweden, 44 from Spain and 7 from Wales; 69 have been released in northern Britain and 53 in southern Britain between 1989-1992 (Table 2). Future plans include the release of 24 Red Kites in northern Britain and 20 in southern Britain in 1993. Only three imported Red Kites, representing 2.4% of the total, were not released into the wild. One from Sweden was rather weak when taken from its nest and later died in captivity after developing complications. The two other Red Kites originated from Spain; one died from an acute infection of *Trichomonas* (caught in Spain) and the other (the runt

of a brood of three) was severely handicapped and is now confined to an aviary. In addition to these three birds another Spanish bird was released but was rescued five months later following damage to its primary flight feathers rendering it incapable of flight. It is now in captivity and is being used in the Red Kite experimental captive breeding programme.

Table 2. The number and country of origin of Red Kites released annually in 1989-1991.

Release site	Origin	1989	1990	1991	1992	Total
N. Britain	Sweden	6	19	20	24	69
S. Britain	Sweden	4	-	-	-	53
	Spain	-	11	11	20	
	Wales	1	2	4	-	

The sex ratios of the total number of White-tailed Eagles and Red Kites released was approximately 50:50.

Dispersal patterns after release

Monitoring of the White-tailed Eagles after release was very difficult and relied on observations gathered by project staff and from reports solicited from the public. Sightings of newly-released birds were recorded mainly on Rum, its neighbouring islands and adjacent mainland during the autumn and winter months and several localities proved to be particularly attractive, often holding groups of six or more birds (Love 1983). However, some of the records received between September-January included sub-adult birds which had returned temporarily to the release area. Some of the sub-adults were even recorded associating with the captive and recently released eagles at the release site (Love 1983, 1988).

During spring and early summer, the most distant sightings were reported and this coincided with the dispersal of the young eagles from the release area. Consequently, reports from Rum became less frequent. During the initial few years after release, White-tailed Eagles were recorded over a wide area from Shetland in the north to the Antrim coast, Northern Ireland in the south; the Outer Hebrides in the west and central Highlands in the east. Analysis of re-sighting data of individually marked birds released in 1982 revealed that as the birds matured, sightings of them became progressively concentrated to within an area of 80km radius of Rum (Table 3). It is believed that this pattern is probably true for all eagles released, although suitable data are lacking.

Table 3. Number of reported sightings received between 1982-1988 of White-tailed Eagles released on Rum in 1982.

Year	Number of reports						
	1982	1983	1984	1985	1986	1987	1988
Area							
<80km from Rum	13	23	16	7	7	15	105
Western Isles	1	1	0	2	1	1	0
Highland Mainland	0	5	0	0	0	0	0
Orkney	0	3	1	0	0	0	0
Shetland	1	4	3	0	0	0	0
Islay	0	0	1	0	0	0	0
Northern Ireland	0	0	0	4	0	0	0
% < 80km from Rum	87	64	76	54	88	94	100

Monitoring Red Kites in northern and southern Britain has allowed a great deal of information to be collected by radio telemetry on the movements of juvenile birds and details will be published at a later date. The main pattern emerging is that during September and October juvenile birds disperse away from the release area and by November they have all settled on winter ranges. Some disperse over several hundreds of kilometres, often in small groups but also as individuals. A greater proportion of the released population of Swedish origin undertake long distance dispersal (up to 1000km), presumably because they are from a more northern population. Even so, some Spanish and Welsh birds also disperse over large distances (up to 250km) in the autumn, albeit in smaller numbers. Those juveniles which do not disperse, tend to move over much shorter distances (up to 100km) and remain within northern and southern Britain throughout the winter. At this time (November-February), populations become spatially stable and individuals associate in loose groups which roost communally and move around considerably in response to changing food supplies. Those which have dispersed out of northern and southern Britain often overwinter alone.

In spring, populations become spatially unstable as winter ranges break up and new summer ranges are established. Those juveniles which had dispersed from the release areas in the previous summer/autumn return to northern and southern Britain in the following spring. However, their visits can be very brief because by early summer some have already left their summer ranges for their wintering areas outside. This movement continues through to the autumn. In southern Britain a more complex pattern is emerging since, in addition to autumn emigration/spring immigration, there is also spring emigration of overwintering juveniles out of southern Britain. However, the number involved is relatively small.

Movements of adult Red Kites can be recorded only by observation of wing tags, since radio transmitters are lost during the bird's first moult. Even so, details have been obtained on the movements of several individuals. In northern Britain, many adults now have well-established summer and winter ranges often several hundreds of kilometres apart. In southern Britain, adults that have established home ranges move around over relatively shorter distances and as a result winter and summer ranges are closer together and often coincide.

Interchange between adjacent Red Kite populations within Britain has been recorded when one juvenile of Spanish origin overwintered within the Red Kite range in Wales. Further interactions should become more frequent if populations in England and Wales continue to increase. No similar interactions through immigration or emigration are believed to have occurred in White-tailed Eagles between Scotland and Europe.

Survival/Mortality

Population estimates in 1989 suggest that as many as 46-47 of the current stock of eagles had disappeared from Scotland, a figure that is quite feasible when compared to recorded recovery rates for other large raptors (Mead & Clark 1989). However, available data on 30 tagged eagles indicate that as many as 80% survive through their first year of life, a period when a high mortality is expected (Newton 1979). Unfortunately, the present survival rates for White-tailed Eagles cannot be estimated, since the identity of most individuals cannot be ascertained because of tag loss and as a result of difficulties in reading wing tag inscriptions. Population estimates are now limited to observed numbers of known territory holding immature and adult birds, which in 1991 was 22 individuals (Table 4).

All mortality recorded for the 82 released White-tailed Eagles occurred between 1975-1987 and involved eight individuals (10% of the total released). Four died in their first year while another, held captive for two and a half years, died six months after release. The cause of death was ascertained in only two cases and illegal poisoning was involved. Another factor influencing the ability to survive was the time of release, since only 8% of birds released in the autumn were later reported dead compared to 25% of spring releases (Love 1988). In addition to the above mortality, three White-tailed Eagles reared from nests in Scotland between 1985-1992 have also been reported dead; two in their first year of life and the third in its second year. The actual number of deaths is, of course, likely to be higher than recorded as some will not have been detected.

Table 5 summarizes the survival statistics of Red Kites released in Britain. It is estimated that 48 Red Kites released in northern Britain are still alive while in southern Britain 38 individuals survive. This is equivalent to survival rates of 70% and 72%, respectively. All recorded mortality (15 individuals found between 1989-1992) occurred within the first year of life and accounts for

about 11% of all birds released. Direct persecution accounts for 47% of all recorded mortality but this must be regarded as an absolute minimum as some suspected cases of persecution could not be evaluated fully because the corpses were too putrefied for analysis. No other mortality factors were identified positively, although circumstances suggest that for 13% of the recorded cases, collision with electricity wires and high speed vehicles were the probable cause of death. Only 13% of recorded mortality was considered to have resulted from natural causes. Comparative figures from Davis & Newton (1981) showed that during the period 1951-1980, 32 Red Kites were reported dead. Human persecution could be attributed to 31% of the recorded mortality, 9% to collision with electric wires/vehicles and 19% to natural causes. In their study, 41% of the corpses were too putrefied for analysis and hence the cause of death remains unknown.

Table 4. Numbers of territorial White-tailed Eagles located, number of territorial pairs and numbers of young fledged.

Year	individuals	pairs	fledged young
1981	1	0	0
1982	3	1	0
1983	6	2	0
1984	11	5	0
1985	14	6	1
1986	14	6	2
1987	19	9	3
1988	18	9	2
1989	22	9	5
1990	21	9	2
1991	22	10	7
1992	c. 20	8	7

Illegally laid poison baits targeted at foxes and crows still pose a serious threat, since White-tailed Eagles and Red Kites feed readily on carrion. Absolute mortality figures from illegal poisoning may be higher than recorded as some incidents will go undetected, although the problem tends to be more acute in dispersing birds. Illegal poisoning also affects the remaining Red Kite population in Wales: for example 19 birds were found poisoned in Wales between 1971-1991 (Cadbury 1991; Fletcher *et al.* 1991). Most of these were adults which had a high potential for survival. Efforts are now underway to alleviate this problem in the UK to reduce this mortality factor in future, although there is some concern over two juvenile Red Kites found poisoned outside the UK. Other mortality factors such as collision with wires and moving vehicles as well as natural causes are not cause for concern at the moment as they involve only a small number of birds.

Breeding of released birds

Released White-tailed Eagles first showed signs of courtship and nest building behaviour in 1982 (see Table 4). In 1983 and 1984, clutches were laid but failed in early May during periods of adverse weather. Successful breeding was achieved in 1985 when one pair reared a single chick. Since this time more eagles have acquired territory and by 1991, 15 territories had been occupied. In most years some territories were held by single unmated birds, three have supported a polygamous trio and at least 13 territories have supported a pair. In 1991, ten territories held pairs, of which successful breeding took place on four where a total of 7 young were reared. A fifth pair helped contribute to another 7 young (four broods) fledged in 1992 (Table 4).

In White-tailed Eagles, there was a wide span of age at which breeding was first attempted. This could be linked to the period spent in captivity, since three birds which spent one year or more in captivity were the oldest to attempt to breed at 8-9 years old and have not yet been successful. The

youngest eagles (which were in captivity for 2-4 months) attempted to breed at only 3-4 years old and successfully reared their first chick when 5-6 years old. There is a clear trend for reproductive performance to improve with age and current evidence suggests that most territories currently occupied have not reached their full potential.

In the Red Kite experimental reintroduction project, most of the birds that can be accounted for are still too young to breed, while those approaching breeding age were released in too small numbers for any serious breeding attempts to be undertaken. However, against these odds, the first signs of courtship behaviour by birds in their first year were observed in 1991 in both northern and southern Britain. Two pairs established territories in southern Britain in which nests were built and clutches of eggs laid. Both attempts failed and the adults deserted early in incubation, probably as a result of their inexperience. In 1992, more birds attempted to breed and four pairs successfully reared nine chicks in southern Britain, whilst a single pair raised a single chick in northern Britain.

Table 5. Red Kite release and survival statistics for the period 1989-1991 are summarized for Release Site 1 and Release Site 2 in northern and southern Britain, respectively.

Year of Release		1989	1990	1991	1992	Total
Total imported	Site 1	6	20	20	24	70
	Site 2	5	13	17	20	55
Total released	Site 1	6	19	20	24	69
	Site 2	5	13	15	20	53
Whereabouts Known	Site 1	2	8	15	23	48
	Site 2	-	6	14	18	38
Whereabouts Unknown	Site 1	3	7	3	-	13
	Site 2	4	4	-	-	8
Dead: Poisoned	Site 1	1	2	1	-	4
	Site 2	1	1	-	1	3
Dead: Unknown	Site 1	-	2	2	1	5
	Site 2	-	1	1	1	3
Captivity: Dead	Site 1	1	-	-	-	1
	Site 2	-	-	1	-	1
Captivity: Alive	Site 1	-	-	-	-	-
	Site 2	-	1	1	-	2

CONCLUSIONS

The current White-tailed Eagle and Red Kite reintroduction schemes have both reached the stage where the basis for population establishment has been evaluated in terms of translocation of release stock from suitable donor populations and their successful integration into the wild at their respective release sites. This was achieved without any input from captive breeding and very little input from nest manipulation. The use of wild stock nestlings from healthy donor populations was by far the easiest option to use in this case.

Variations in the release methods used allowed some comparison of the most appropriate techniques to use. The use of release aviaries does not appear to influence behaviour leading to reduced survival or future breeding performance. However, the period in captivity did appear to be significant. It is now recognised that it is important to rear the nestlings in groups of conspecifics (see Bird *et al.* 1985) and to release them soon after fledging. Collecting the nestlings at an age where they could feed themselves and maintain their own body temperature reduced the risk of imprinting/conditioning on their human keepers, although minimum contact was maintained as a

further precaution. Releasing White-tailed Eagles and Red Kites in large groups proved to be a satisfactory way of establishing nucleus populations where the majority were less likely to disperse widely, which small groups were prone to do. This could be related to the fact that both species forage and roost gregariously, especially when young, which could be significant in terms of enhancing their survival (Heredia *et al.* 1991; Hiraldo *et al.* 1993). In addition, individuals that disperse are more likely to relocate other conspecifics if large groups are released together.

The establishment of nucleus populations by these reintroduction programmes confirms that the countryside is still capable of supporting Red Kites and White-tailed Eagles. In both experimental projects, the breeding performance of successful pairs is at least as good as the donor populations from which they were taken, which lends further support to the suitability of the environment in which they were released. However, both projects have yet to reach the stage where breeding populations are self-sustaining and of sufficient size to allow extensive recolonisation of the former breeding range. For this reason, monitoring the established populations will continue. This is because the number released may not be sufficient and further releases may be necessary at either existing or additional release sites. Furthermore, conditions may change over time which could either adversely affect the outcome of the reintroduction programme or could act favourably and preclude the need for further releases.

There is now sufficient population data from the White-tailed Eagle programme to investigate the viability of the current breeding population and to predict future population levels based on present breeding performance parameters. The results indicate that the current breeding population is still very small and vulnerable to chance events which could result in extinction (Green & Pienkowski unpublished). Consequently, the rate of expansion is still very slow and the analysis recommends that further releases should be undertaken in an effort to raise the current breeding population to a more reliably self-sustainable level. In the Red Kite reintroduction programme, the initial five-year period of experimental releases is scheduled to finish in 1993/4 and a further 44 juvenile birds are planned to be released in northern and southern Britain in 1993. At this stage, the future needs to be assessed and evaluated. Hence, decisions on whether to continue the release programme, the scale and duration on which it should be undertaken and the possibility of establishing other population centres in other parts of Great Britain will rely entirely on the results of this work.

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J. A. Love
 Scottish Natural Heritage
 Western Isles South Sub-area Office
 Tallowqulairn, Stilgarry
 South Uist PA81 5rs, Scotland

I. M. Evans/C. A. Galbraith
 Vertebrate Ecology & Conservation Branch
 Joint Nature Conservation Committee
 Monkstone House, City Road
 Peterborough PE1 1JY, England

M. W. Pienkowski
 Director, Life Sciences
 Joint Nature Conservation Committee
 Monkstone House, City Road
 Peterborough PE1 1JY, England

