

SCOTTISH RAPTOR MONITORING SCHEME
REPORT 2008



Brian Etheridge, Helen Riley, Chris Wernham, Mark Holling and Des Thompson

SCOTTISH RAPTOR MONITORING SCHEME – REPORT 2008

CONTENTS

1	Introduction.....	3
1.1	Scottish Raptor Monitoring Scheme (SRMS)	3
1.2	Scottish Raptor Study Groups (SRSGs)	3
1.3	Scottish Raptor Monitoring Group (SRMG)	3
2	Breeding report for 2008.....	5
2.1	Introduction	5
2.2	Observer coverage.....	6
2.3	Occupation of home ranges	6
2.4	Terminology	7
2.5	Estimating breeding success: a note of warning	7
2.6	Persecution	8
3	Species accounts	9
3.1	European Honey-buzzard <i>Pernis apivorus</i>	9
3.2	Red Kite <i>Milvus milvus</i> (Tables 1 and 2).....	9
3.3	White-tailed Eagle <i>Haliaeetus albicilla</i> (Tables 3 and 4).....	9
3.4	Marsh Harrier <i>Circus aeruginosus</i> (Table 5).....	10
3.5	Hen Harrier <i>Circus cyaneus</i> (Tables 6 and 7).....	10
3.6	Northern Goshawk <i>Accipiter gentilis</i> (Tables 8 and 9)	10
3.7	Eurasian Sparrowhawk <i>Accipiter nisus</i> (Table 10).....	10
3.8	Common Buzzard <i>Buteo buteo</i> (Table 11)	11
3.9	Golden Eagle <i>Aquila chrysaetos</i> (Table 12).....	11
3.10	Osprey <i>Pandion haliaetus</i> (Table 13).....	11
3.11	Common Kestrel <i>Falco tinnunculus</i> (Tables 14 and 15).....	11
3.12	Merlin <i>Falco columbarius</i> (Table 16)	12
3.13	Eurasian Hobby <i>Falco subbuteo</i>	12
3.14	Peregrine Falcon <i>Falco peregrinus</i> (Tables 17, 18 and 19).....	12
3.15	Barn Owl <i>Tyto alba</i> (Table 20).....	13
3.16	Little Owl <i>Athene noctua</i>	13
3.17	Tawny Owl <i>Strix aluco</i> (Table 21)	13
3.18	Long-eared Owl <i>Asio otus</i> (Table 22)	13
3.19	Short-eared Owl <i>Asio flammeus</i> (Table 23).....	13
3.20	Common Raven <i>Corvus corax</i> (Table 24).....	14
4	Acknowledgements.....	14
5	References.....	15
6	Tables.....	17
	Annex 1: Raptor, owl and Common Raven nest site and home ranges data submitted under the Scottish Raptor Monitoring Scheme in 2008.	31
	Annex 2: Raptor, owl and Common Raven breeding attempts monitored under the Scottish Raptor Monitoring Scheme in 2008.	32

1 Introduction

This is the sixth report of the Scottish Raptor Monitoring Scheme, and covers the year 2008. The aim of the report remains unchanged from those of previous years (Etheridge, 2005; Etheridge *et al.*, 2006, 2007, 2008, 2010); it provides clear and factual information on breeding birds of prey in Scotland. This report is initially being published electronically, as the Scheme ‘catches up’ on its reporting schedule. The Scottish Raptor Monitoring Group intends to publish a paper copy of this report, and will also publish paper copies of the reports for 2007 and 2009. The Group is completing a review of data submitted to the Scheme thus far, and will publish an overview of trends.

We are now moving towards making much more effective use of Scheme data to underpin raptor conservation efforts. We are particularly looking forward to catching up with the annual reports, and to developing trends reporting for raptors in Scotland.

1.1 Scottish Raptor Monitoring Scheme (SRMS)

The SRMS was established on 24 June 2002 with the signing of an Agreement by the following parties: Scottish Natural Heritage (SNH), Joint Nature Conservation Committee (JNCC), Scottish Raptor Study Groups (SRSGs), British Trust for Ornithology, Scotland (BTO), Rare Breeding Birds Panel (RBBP), Royal Society for the Protection of Birds, Scotland (RSPB), and Scottish Ornithologists’ Club (SOC) (Anon. 2002). The SRMS currently focuses primarily on the annual monitoring of the abundance, distribution and breeding success of diurnal birds of prey (Accipitriformes and Falconiformes) and owls (Strigiformes) native to Scotland. Because of its ecological similarity to raptors, the Common Raven is given honorary status as a bird of prey and is included in the Scheme.

1.2 Scottish Raptor Study Groups (SRSGs)

The SRSGs form a consortium of eleven regional raptor study groups (Figure 1) active during 2008 with a combined membership of over 260 amateur and professional ornithologists. Members have extensive expertise in the field study of breeding birds of prey and conduct these studies largely in their own time. They have provided the bulk of the data collected in this report on raptor numbers, distribution and productivity. In 2008, we welcomed the formation of the Lewis & Harris Raptor Study Group, completing the coverage of the Outer Hebrides. Now that the majority of data submitted to the SRMS come in electronically on the MS Excel recording spreadsheet, much of the routine data checking and processing can be done automatically, and the standard tables for the annual report can be generated quickly and efficiently. We are very grateful to all those SRSG Members who now submit their data in this way, and encourage those that do not to please attempt this (with assistance from the RMO if required) in future. This will mean that information can be processed and reported more quickly and made available for important raptor conservation purposes.

1.3 Scottish Raptor Monitoring Group (SRMG)

The SRMG consists of representatives of the seven organisations who were signatories to the SRMS agreement. They meet up to four times a year and oversee the work of the scheme. A part-time Raptor Monitoring Officer (RMO), funded by SNH and employed by BTO Scotland during the year under review, reports to the group and is primarily responsible for collecting and collating annual breeding records on all raptor and owl species from individuals, SRSGs and other organisations.



Figure 1. Scottish Raptor Study Groups in 2008.

2 Breeding report for 2008

Raptor home range¹ coverage and the monitoring of breeding pairs increased again in 2008 (see 2.1) helped in part by an expanding raptor study group membership and growing awareness by individual members of the importance of long-term data sets. Furthermore, a national merlin survey in 2008 increased the coverage of this species and benign weather during late spring and early summer improved hatching and fledging success for many species.

In Scotland, the annual and seasonal abundance of Field Vole *Microtus agrestis* can have a profound effect on the breeding success on a number of raptor and owl species, particularly Common Kestrel, Barn Owl and Short-eared Owl. If vole populations reach a peak during the spring and summer months, these predators can respond with an increase in the number of pairs settling to breed and a corresponding increase in brood size, nesting success and productivity. Conversely, when vole numbers are low, the reverse can occur. In late 2007 and in the early months of 2008, vole numbers reached a peak, particularly in southwest Scotland. This initially had a positive impact in the number of raptor and owl pairs breeding, but as the spring progressed through to summer, vole numbers rapidly crashed affecting the productivity of both Kestrel, Barn Owl and possibly Short-eared Owl.

2.1 Introduction

Members of the eleven regionally based raptor study groups in Scotland (Figure 1), all of which are part of the Scottish Raptor Study Groups, were the main contributors to this breeding report. Important data were also supplied by species officers employed by RSPB Scotland, primarily to monitor the reintroduced populations of Red Kite and White-tailed Eagle. Other organisations supplying data were Howarth Conservation Ltd, Natural Research Ltd and RPS Group. Rare Breeding Birds Panel data were also extracted from the annual returns to SNH and BTO by the small number of Schedule 1 licence holders who are not members of the SRSGs. Annex 1 provides a regional breakdown, based on Scottish Raptor Study Group boundaries (Figure 1), of the raptor home ranges that received at least one visit in the spring of 2008 to check on occupancy. The 4606 home ranges visited continues the upward trend in reporting and matches the 7% increase reported in the 2007 report (Etheridge *et al.*, 2010). Not all these home ranges will hold pairs: some have only single birds and others are apparently vacant. This occupancy rate expressed as a percentage of home ranges visited is an important statistic and if the monitoring effort is carried out rigorously each year, can be used to reflect changes in population levels. Equally important are follow up visits to confirm the findings of the first visit and to monitor the nesting success of pairs present. This nesting success, normally expressed as the percentage of monitored pairs producing fledged young, together with the mean brood size, can also provide a window on the health of the population. A regional summary of monitored pairs is provided in Annex 2. This shows that 2800 potential breeding pairs received further visits enabling their nesting success to be determined. This total is a 7% increase on the 2614 pairs monitored in 2007.

¹ For a definition of terms used in this report, see section 2.4

2.2 Observer coverage

For some of the scarcer species, such as Red Kite, Marsh Harrier, White-tailed Eagle and perhaps Osprey, a high proportion of the breeding population, reaching 90-100% for some species, is monitored each year, mainly by RSPB personnel and specialist groups. Amongst amateur fieldworkers, the appeal of carrying out fieldwork on open moorland and mountain habitats is strong, and four widely but thinly spread upland species, Hen Harrier, Golden Eagle, Merlin and Peregrine Falcon, with national breeding populations in the range of 400–1200 pairs, receive excellent coverage, with up to 50% of the breeding population monitored annually. Also receiving good coverage are two lowland owl species, Barn and Tawny Owl, both because they readily adapt to nest boxes, thus allowing easier study. Common Buzzard and Common Raven attract support from a number of specialist enthusiasts, though there are several substantial regional gaps in coverage for the former offering monitoring opportunities for new fieldworkers. A few species in Scotland, either because of their extreme scarcity (Honey-buzzard and Hobby), sporadic occurrence and /or secretive behaviour (Short-eared and Long-eared Owl), present challenges as far as monitoring is concerned. Two widespread species attract little attention from the majority of field workers. Coverage of breeding Eurasian Sparrowhawks and Kestrels needs to increase if we are to achieve effective monitoring to determine estimates of population size, annual productivity and long-term trends. This requirement is becoming ever more urgent as the declining status of these two species, in particular the kestrel (Risely *et al.*, 2010), is now causing concern.

2.3 Occupation of home ranges

In many species of raptors and owls, breeding pairs are faithful to a home range. In some resident species such as Red Kite, Common Buzzard, Golden Eagle and Common Raven, the pair can remain together throughout the year and for at least part of the day will be on their home range. In migratory species such as Honey-buzzard, Marsh Harrier and Osprey, the pair bond breaks up at the end of the breeding season. If they survive the rigours of migration, the majority of adults will return to the same location the following year and pair up again. In long-lived species, the same pair of birds will typically occupy the same home range, and use the same nesting locations, over many years. For relatively short-lived species such as Hen Harrier, Sparrowhawk and Merlin, providing the habitat remains unchanged, such home ranges may be occupied by a succession of breeding pairs.

Not all home ranges will be occupied by a breeding pair and there are a variety of reasons why a pair of raptors may not breed in a given year e.g. one or both birds may be immature (not yet of breeding age) or food may be in short supply. In some years, only a single bird may be present, caused by the death of a mate or even ‘divorce’, or recruitment to a new territory if the population is undergoing expansion. Some home ranges may be occupied only when the population reaches a certain level and others may have the appearance of being vacant for long periods, sometimes because of human interference. Others may suffer irreversible habitat changes, e.g. through afforestation, or be subjected to increased human disturbance and may never become regularly occupied again. For these reasons, it is important in the long-term monitoring of Scotland’s bird of prey populations, that the presence of unoccupied ranges within a study area is recorded accurately, as well as the occurrences of breeding attempts and any production of young.

2.4 Terminology

The terminologies used in this report have the following definitions and are taken from Hardey *et al.* (2009):

Breeding range - the geographical area within which the species occurs and breeds.

Home range - constitutes the immediate area around the nest site and the area over which a raptor or a pair of raptors forage. Some raptor species, such as Golden Eagle and Tawny Owl, defend more-or-less the entire home range, whereas others, including Goshawks and Kestrels, defend only a core area of the home range around the nest site and have extensive home ranges for hunting which overlap with those of neighbouring pairs.

Nesting range - the locality within a home range that includes all the alternative nests used in successive years by a pair of birds.

Nesting territory - an area around an active nest that is defended by the resident pair of birds against intrusions by other raptors of the same species or against potential predators.

Occupancy - a nesting range is **occupied** if a single bird or pair of birds is recorded during the breeding season, usually on more than one occasion, or if there is strong evidence that birds are present (moulted feathers, pellets, plucks, faecal splash).

Territorial bird or pair - a single bird or pair that defends a territory against intrusions by other raptors of the same species or against potential predators. For some species, notably Common Buzzard, this territorial behaviour can occur throughout the year and not just during the breeding season.

Breeding pair - a pair that (a) defends a nesting territory in the spring; (b) repairs or builds a nest, or prepares a nest scrape; and (c) lays at least one egg.

Nest site - the nest and its immediate surrounds (e.g. the tree or ledge on which the nest is placed).

Nesting or breeding success - the proportion or percentage of breeding pairs that successfully rear at least one chick to fledging.

Breeding failure - once occupancy by a breeding pair is established, failure occurs if no young fledge successfully. A broader definition will also include those territorial pairs, which appear capable of breeding but fail to lay eggs (this can be difficult to prove without careful and very regular observations).

Productivity - the number of young produced annually, can be expressed in one of three ways: (i) as the mean or average number of young fledged per occupied home range; (ii) the mean number of young fledged per breeding pair, territorial pair or female laying eggs; or (iii) the mean number of young fledged per successful pair or female.

Monitored home range - a home range occupied by a pair that receives sufficient repeat visits to establish the outcome of a breeding attempt.

2.5 Estimating breeding success: a note of warning

Ideally, all breeding attempts should be monitored from the start of pair formation to either breeding failure or the successful fledging of young. In a national report of this size using data from a wide range of field workers, this ideal is not always achievable. The timing of survey visits may bias estimates of raptor breeding success. First visits to an area that occur later in the season will miss breeding attempts that failed early and overestimate nesting success. Non-breeding territorial pairs are a common component in raptor populations and these can be easily overlooked, exacerbating the problem. Therefore, there is a bias in favour of detection of nesting attempts that have a longer period of survival. In particular, nests are most likely to be found and examined at the chick stage; this places a strong positive slant on estimations of breeding success, as failure is more likely to occur at the pre-lay stage or during incubation. Moreover, it was not always possible to determine from data submitted at what stage in the breeding cycle individual nests were found, nor in many cases of nest failure, what caused this to happen. It is hoped that a new nest recording spreadsheet introduced at the start of 2005 (updated in 2009) and

now widely adopted by raptor workers will help address these problems, and in particular that raptor observers will submit information on the dates that they carry out monitoring visits.

2.6 Persecution

Many factors influence the numbers, distribution and productivity of birds of prey in Scotland. A large proportion of the uplands, particularly in the south and east of Scotland, are given over to driven grouse shooting, managed by a full-time gamekeeper often with the assistance of one or more under-keepers. The keepers' primary aim is to manage the heather through regular burning and cutting to maximise the number of Red Grouse available for shooting and to control common and widespread predators such as crows, stoats, weasels and foxes. However, recent research has shown that illegal activities directed at birds of prey such as nest destruction and the killing of sub-adults and adults, is adversely affecting the conservation and status of several species. On many driven grouse-moors some raptor species are scarce or absent and many attempts to breed are promptly stopped (Etheridge *et al.*, 1997; Fielding *et al.*, 2011; Hardey *et al.*, 2003; Redpath *et al.*; 2010, Whitfield *et al.*, 2004, 2008). This can have a severe effect on species at a local level by reducing the number of breeding pairs present and their breeding success. It will also impact on surrounding populations, if birds are drawn into areas of apparently suitable habitat which is unoccupied because previous inhabitants have been removed – the so-called “black hole” or “ecological trap” effect (Whitfield *et al.*, 2004).

Such interference can also diminish the enthusiasm of a volunteer raptor worker for monitoring raptors in what they perceive to be a hostile environment. The consequential impact of this shift of effort away from some grouse-moors, particularly where this form of land management is dominant at the regional scale, is that:

- (i) data collected on some raptor breeding populations may not be an accurate reflection of the species status and breeding success in the region. Some upland breeding species such as Hen Harrier, Golden Eagle or Peregrine may appear to have considerably higher occupancy of home ranges, breeding success and productivity than is actually the case nationally across all habitats. This is because in areas not being surveyed occupancy may be low and mortality high compared with other habitat; and
- (ii) persecution of birds of prey may be under-recorded.

Ongoing SRMS work to more thoroughly assess annual changes in monitoring coverage, and to collect related habitat data to characterise nesting attempts, will help to address whether these issues do indeed lead to any biases in the data collected.

3 Species accounts

3.1 European Honey-buzzard *Pernis apivorus*

A small population of Honey-buzzards is now naturally established in Britain and the species has bred annually in Scotland since the mid 1970s (Etheridge, 2007). Honey-buzzards are known to nest in at least three regions of Scotland but their secretive behaviour makes them elusive and difficult to monitor. Only one active nest was reported in 2008, from Highland. This succeeded in fledging two chicks; the largest was fitted with a satellite transmitter. Limited information from previous Scottish satellite tracked Honey-buzzards suggests a migration route through southwest Europe and North Africa, across the Sahara desert to wintering grounds near the Equator between Nigeria and Gabon (see www.roydennis.org/honey-buzzard).

3.2 Red Kite *Milvus milvus* (Tables 1 and 2)

The Scottish Red Kite breeding population is monitored annually by RSPB field staff in the four regions where the species has been successfully reintroduced; Highland, Central & Tayside, Dumfries & Galloway and Aberdeen.

The huge success of the Red Kite reintroduction scheme in England and the spectacular growth of the population over the past 20 years have not been matched in Scotland despite an almost identical release programme. A recent analysis (Smart *et al.*, 2010) has shown that the cause of the poor population growth was consistent with the high level of raptor persecution that occurs on some sporting estates and emphasised the role that the widespread use of illegal poisoned baits on these estates has on the poor survival of Scottish kites (particularly those in Highland and to a lesser extent Central & Tayside).

Nevertheless, in 2008, the number of breeding pairs known to lay eggs showed a 30% increase over the previous year, the largest annual increase in 10 years. Most of this growth came from Dumfries & Galloway (48%) and Central & Tayside (36%), rather than Highland (18%) where the risk of persecution is known to be highest. In Aberdeen and just nine months after the release of the first batch of 30 juvenile kites, a pair built a nest and laid eggs, the first to do so in Northeast Scotland since the species was exterminated nearly 150 years ago. Unfortunately, the nest failed during incubation, but this attempt coming so soon after the start of this reintroduction bodes well for the future.

3.3 White-tailed Eagle *Haliaeetus albicilla* (Tables 3 and 4)

This impressive bird was reintroduced to the Western Highlands in two phases in 1975–85 and 1993–98. Like Red Kites, the breeding population is wholly monitored by RSPB, however demographically the two species vary considerably. The age of first breeding in White-tailed eagles is twice that in kites and breeding success and the number of young produced by the eagles is much lower, so population growth is slower. In 2008, an additional two territorial pairs were found but the total number of pairs found breeding was unchanged from the previous year. Unfortunately, poor weather both before and during incubation contributed to the reduced breeding success experienced in 2008. This weather effect was particularly marked in the Outer isles.

3.4 Marsh Harrier *Circus aeruginosus* (Table 5)

Despite their success in England & Wales where an estimated 360 pairs occur (Eaton *et al.*, 2006), the Marsh Harrier's breeding population in Scotland has always been small and in the last two years their status has become less secure. From a high in 2006 of four sites, seven nesting pairs and 20 young fledged, they were reported nesting at only one site in 2008 – the extensive reed beds on the River Tay estuary. Here, four pairs were located but only two were successful, fledging a total of just three young.

3.5 Hen Harrier *Circus cyaneus* (Tables 6 and 7)

In the spring and summer months, Hen Harriers are largely confined to the uplands. They are particularly attracted to heather moorland. When this habitat is managed for grouse shooting, harriers come into conflict with game-keepers and suffer a high level of persecution (Etheridge *et al.*, 1997; Natural England, 2008; Anderson *et al.*, 2009, Redpath *et al.*, 2010, Fielding *et al.*, 2011). Because much of this persecution involves the destruction of both breeding adults as well as nests (Etheridge *et al.*, 1997), in those regions where most of the uplands are given over to intensive grouse management (east Inverness and Nairn, Aberdeenshire, Angus and Lothian & Borders), Hen Harriers have become noticeably absent in the assemblage of moorland breeding birds. Harriers are now so rare in these regions that in 2008 only two successful breeding pairs and three fledged young were reported to the SRMS. Across all habitats, 273 pairs were monitored of which 48 (18%) failed early or didn't breed and 225 were known to lay eggs. Of these, 179 (80%) hatched young and 144 (64%) fledged at least one young. A minimum of 415 young were recorded, giving a mean brood size of 1.5 young per monitored occupied home range.

3.6 Northern Goshawk *Accipiter gentilis* (Tables 8 and 9)

Since the late 1970s, this powerful accipiter has become firmly established in three regions and occurs in smaller numbers in several other mainland areas. The strongholds lie within Border region and neighbouring Dumfries & Galloway and there is an important population in Aberdeenshire. Though it is known to breed in other parts of Scotland, coverage of breeding Goshawk elsewhere is poor, perhaps reflecting their relative abundance. Part of the species success is due to their preference for nesting in commercial forest plantations, many of which are remote and undisturbed. Nesting success and productivity in this habitat can be high and the species has the ability to breed when one year old, countering the impact of the illegal persecution they suffer in some areas (Mearns, 2007). The 2008 breeding season was particularly favourable for Goshawks, with nesting pairs maintaining a high success rate of 87% and producing an average brood of 2.3 young per nesting pair, the highest yet recorded by the SRMS.

3.7 Eurasian Sparrowhawk *Accipiter nisus* (Table 10)

Still relatively common throughout much of the country, Sparrowhawks have been showing signs of a slow decline over the past two decades (Risely *et al.*, 2010), possibly in response to the declining fortunes of farmland and woodland bird prey. Over much of Scotland these small predators are poorly monitored, receiving less coverage than their scarcer cousin, the Northern Goshawk. A long-term breeding study based in Ayrshire provided almost 60% of the breeding records in 2008. For effective monitoring of this species to take place, coverage elsewhere in Scotland needs to greatly increase. Their abundance and accessibility make Sparrowhawks a suitable "starter species" for fieldworkers engaging in raptor studies for the first time. Breeding success during 2008 at 83% and productivity of 2.3 young per monitored occupied home range was similar to 2007.

3.8 Common Buzzard *Buteo buteo* (Table 11)

Following a remarkable increase over the last 20 years, the Common Buzzard is now considered the most widespread and abundant raptor throughout much of Scotland. However, it remains a scarce breeder on Orkney and has yet to colonise Shetland (Holling, 2007). The SRMS is now monitoring over 400 breeding attempts annually but there is still scope for further survey work in under-recorded parts of the Scottish breeding range, and this is another ideal “starter species” for those who would like to get involved in raptor monitoring work. Over the past 6 years, nesting success and productivity (expressed as pairs known to fledge young and young per monitored occupied home range) has shown great stability, varying from 77% and 1.6 in 2003, 75% and 1.4 in both 2006 & 2007 and 76% and 1.3 in 2008. The Common Buzzard’s prominent social and vocal behaviour will ensure that amongst birds of prey, it remains the most visible and familiar to a wide spectrum of the Scottish public.

3.9 Golden Eagle *Aquila chrysaetos* (Table 12)

Coverage of Golden Eagle nesting territories by Raptor Study Groups has always been very good, in some regions 100% of the known territories are monitored. In 2008, increased monitoring effort on Lewis & Harris, much of it by a single fieldworker, provided the SRMS with comprehensive breeding data on this important eagle population for the first time. Across Scotland, 78% of home ranges checked were occupied by pairs (a figure identical to 2007), of which 222 were monitored during the breeding season. One hundred and sixty pairs (72%) laid eggs and 111 (69%) succeeded in rearing 123 young, figures slightly higher than 2007. Nesting success was exactly 50% with an average brood size of 0.6 young per monitored pair, a further small improvement on both 2006 and 2007.

3.10 Osprey *Pandion haliaetus* (Table 13)

Despite its relative scarcity over much of Britain, the Osprey is widely known to the public through the publicity it attracts at various nest viewing facilities. This popularity through greater nest protection has in part contributed to the steady increase in the number of breeding pairs over the past 50 years (Dennis 2008). In Highland and Tayside, where two-thirds of the breeding population occurs, it has become increasingly difficult for field workers to keep track of this increase, as more and more new nest sites are added to the list to be monitored each year. Elsewhere, the increasing number of pairs appearing in Dumfries & Galloway and Lothian & Borders is largely due to the provision of nesting platforms by a few enthusiasts. The 208–211 pairs recorded in Scotland in 2008, must be considered a minimum. Incorporating all the pairs monitored, breeding success averaged 73% in 2008 and a minimum 303 young fledged from successful nests – the highest totals ever.

3.11 Common Kestrel *Falco tinnunculus* (Tables 14 and 15)

Although long considered a common and widely distributed resident in Scotland, the annual Breeding Bird Survey (BBS) and its predecessor, the Common Bird Census (CBC), have shown a long-term trend of decline in kestrel numbers in the UK, measuring -36% between 1970 and 2008 (Eaton *et al.*, 2010). In Scotland, BBS data show a decline of 64% between 2008 and 2009, and 54% between 1995 and 2008 (Risely *et al.*, 2010). The extent of the decline appears to be greater in some regions of Scotland than in others (Riddle, 2007), and in many areas the kestrel is no longer the most frequently seen bird of prey, that distinction having passed to the Common Buzzard some time ago (Clements, 2002). The scarcity of Kestrels over much of the countryside is partially reflected in the number of breeding attempts reported, though in 2008 there was a 74% increase in the number of breeding pairs monitored. Part of this increase

will have been due to a vole peak that occurred earlier in the year. In the long running study in Ayrshire, territory occupancy rose from 56% in 2007 to 67% and the number of breeding pairs laying eggs were up from 12 to 25. Despite these increases, as the season progressed, productivity, expressed as the mean brood size per monitored home range, declined as vole numbers collapsed from their earlier abundance. There is now a greater need than ever for the SRMS to increase their monitoring of this attractive falcon, and once again this would make a very suitable “starter species” for those who would like to get involved in raptor monitoring.

3.12 Merlin *Falco columbarius* (Table 16)

Merlins show a clear association with heather moorland managed for grouse-shooting, particularly those in the east and south of Scotland. However, the species is not thought to be subjected to the level of persecution that other raptors can suffer when they attempt to settle in this habitat. This does not mean that Merlins are unaffected by some of the activities associated with this type of land management. Inappropriate burning of steep heather slopes and a quicker rotation in patch burning could negatively affect Merlins through nest site loss and habitat degradation. Merlins receive excellent monitoring coverage on many of these eastern and southern grouse-moors, and though this link between the intensity of burning and a decline in some moorland species has not been proven, several studies are beginning to show signs of a population decline in Merlins. Monitoring coverage was high in 2008, the year of the third Merlin national survey (previous surveys being organised in 1983–84 and 1993–94). Home range checks in 2008 were carried out at 513 nest sites, 314 (61%) bore signs of Merlin presence and 266 pairs were recorded. Of these, 209 pairs received follow up visits, resulting in 187 pairs (89%) confirmed as laying clutches of eggs and 142 pairs (70%) breeding successfully. A minimum of 433 young successfully fledged, giving a mean brood size per monitored pair of 2.1 young.

3.13 Eurasian Hobby *Falco subbuteo*

Hobbies maintain a toe-hold in Scotland based solely on the one or two pairs reported annually in Badenoch & Strathspey, Highland. Nesting was not confirmed in 2008 but a number casual sightings of hunting adults in the core area suggest this probably occurred. The presence of this species in inland areas during the late spring and summer months should always be considered as a potential nesting pair to be followed up and reported through SRMS.

3.14 Peregrine Falcon *Falco peregrinus* (Tables 17, 18 and 19)

The UK and Isle of Man holds about 12-14% of the European population of Peregrine Falcons, estimated to be 1530 pairs or single birds at the last breeding survey in 2002 (Banks *et al.*, 2010). This result places Peregrines behind both Common Kestrel (36,800 pairs) and, surprisingly, the Hobby (2,200 pairs) in order of abundance amongst UK falcons and only slightly more abundant than Merlin (1,330 pairs). Scotland’s share is 49% (Banks *et al.*, 2010), around 750 pairs and single birds (49%) and over 40% of this population is monitored annually by those contributing to the SRMS. In 2008, visits were made to 597 home ranges, 317 (53.1%) held pairs and 27 (4.5%) single birds (Table 17). Of the 305 pairs monitored in 2008, 62 pairs (20%) failed early or did not breed. Two hundred and forty-three pairs (80%) were confirmed as laying eggs, 203 pairs (67%) reached the hatching stage and 185 (61%) reared a minimum of 416 young. Mean brood size per pair was 1.4 young per monitored occupied home range. These figures are all slightly down on 2007 and the long-term average. An analysis of home range occupancy by habitat type in 2008 shows that the occupancy of known home ranges on grouse-moors was

lower than any other habitat (Table 18), although there was no indication of lower breeding success (Table 19). Constraints on the Scottish peregrine population are being investigated by the SRMS under the Conservation Framework for this species, due to report later in 2011.

3.15 Barn Owl *Tyto alba* (Table 20)

Barn Owls are probably at their greatest densities in the milder southwest of Scotland, particularly Galloway. Monitoring effort for this charismatic species has doubled since the SRMS began in 2003, matching both an increasing owl population following a run of mild winters and the increasing popularity of the species amongst some specialist raptor workers. Barn Owls feed primarily on Field Voles *Microtus agrestis* and their breeding success is largely determined by the abundance of this widespread species. A peak in vole numbers occurred in the southwest during the latter part of 2007, which allowed many Barn Owl pairs to get off to a flying start in 2008. However, as vole numbers began to collapse, so it impacted on the owl's breeding success and as the season progressed, broods got smaller and more and more pairs failed completely. Overall, just 276 (75%) of 369 pairs monitored succeeded in rearing any young. The mean brood size was a low 1.9 young per monitored pair. For comparison, the figures for 2007 were 86% and 2.8 young.

3.16 Little Owl *Athene noctua*

No records received.

3.17 Tawny Owl *Strix aluco* (Table 21)

All regions showed a decline in the monitoring of this species in 2008. A 29% reduction in the number nest sites (nest boxes) checked for occupation, resulted in a corresponding 25% decline in the number of pairs monitored. Of the 77 pairs that were checked, 62 (81%) bred successfully, rearing an average of 1.4 young per monitored pair and very similar to previous years.

3.18 Long-eared Owl *Asio otus* (Table 22)

Long-eared Owls are possibly the most overlooked and under recorded of breeding owl species in Scotland. Monitored laying pairs over the past six years have varied between just seven in 2003 and 20 the following year, with an average of 13 per annum. At this low level, it is very difficult to look at long-term breeding trends. In 2008, 16 nesting pairs were monitored of which 14 (88%) nested successfully, rearing a minimum of 28 young.

3.19 Short-eared Owl *Asio flammeus* (Table 23)

It seems likely that the peak in field vole numbers that occurred late in 2007 led to an increased number of Short-eared Owls breeding in 2008. Eighty-five pairs were found at the 113 sites regularly checked. In addition there were sightings during the breeding season of an additional 73 single birds and it is likely that many of these would have referred to breeding pairs. Nests can be difficult to find and the young owls disperse rapidly away from the nest long before they can fly, making it equally difficult to assess the number of fledged young. Thus, the number of young recorded is always an absolute minimum. In 2008, the 28 successful nests monitored produced at least 53 young.

3.20 Common Raven *Corvus corax* (Table 24)

Ravens have become increasingly common in Scotland over the past two decades and are no longer confined to mountainous regions of the west and far north (Mearns, 2007). The increasing use of tree nests in southern and central regions of Scotland has meant they can now be found breeding in many lowland agricultural areas from which they were exterminated during the 19th century. However, Ravens remain stubbornly absent as a breeding species from the whole of Northeast Scotland, even from favoured hill ground. In 2008, home range checks were made at 404 known breeding sites and 353 pairs were in found, giving an occupation rate of 87%. Further checks were carried out on 317 pairs. Full clutches were laid by 296 pairs (93%) with 21 pairs (7%) either failing at an early stage or non-breeding. A total of 219 monitored pairs (69%) succeeded in rearing at least 632 young, giving a mean brood size per monitored pair of 2.0 young. Nesting success was down on the 2007 figure of 79% as was the mean brood size.

4 Acknowledgements

The Scottish Raptor Monitoring Scheme is supported by a grant from Scottish Natural Heritage for which we are extremely grateful. Special thanks go to members of the Scottish Raptor Study Groups who supplied much of the information on which this report is based. Further data came from the Rare Breeding Birds Panel, commissioned surveys by Scottish Natural Heritage, general survey work by Natural Research Ltd and RPS Group, and long term species monitoring programmes by Forestry Commission Scotland, the Galloway Nature & Heritage Trust and RSPB Scotland, all of which we gratefully acknowledge. For this 2008 report, we are grateful to Anne Carrington-Cotton and Staffan Roos at BTO Scotland for assistance with data checking and processing. We also thank Howard Loates for the cover photograph of a short-eared owl.

The Scottish Raptor Monitoring Officer welcomes all raptor, owl and Common Raven breeding records and can be contacted at the following address: Brian Etheridge, c/o RSPB, North Scotland Office, Etive House, Beechwood Park, Inverness, IV2 3BW, email brian.etheridge@rspb.org.uk

This publication should be cited as follows:

Etheridge, B., Riley, H.T., Wernham, C.V., Holling, M., & Thompson, D.B.A. (2011). *Scottish Raptor Monitoring Scheme Report 2008*. www.scottishraptorgroups.org/srmscheme.php

5 References

Anderson, B.J., Arroyo, B.E., Collingham, Y.C., Etheridge, B., Fernandez-De-Simon, J., Gillings, S., Gregory, R.D., Leckie, F.M., Sim, I.M.W., Thomas, C.D., Travis, J., & Redpath, S.M. (2009). Using distribution models to test alternative hypotheses about a species' environmental limits and recovery prospects. *Biological Conservation* 142: 488–499.

Anon. (2002). *Scottish Raptor Monitoring Scheme Agreement*. Scottish Natural Heritage, Perth.

Banks, A.N., Crick, H.Q.P., Coombs, R., Benn, S., Ratcliffe, D.A., & Humphreys, E.M. (2010). The breeding status of Peregrine Falcons *Falco peregrinus* in the UK and Isle of Man in 2002. *Bird Study* 57: 421–436.

Clements, R. (2002). The common buzzard in Britain: a new population estimate. *British Birds* 95: 377–383.

Crawford, A., Reid, R., Sexton, D., Smith, C. & MacLennan, A. (2008). *Sea eagle project Newsletter 2007*. RSPB Scotland, Inverness.

Dennis, R. (2008). *A Life of Ospreys*. Whittles Publishing, Caithness.

Eaton, M.A., Ausden, M., Burton, N., Grice, P.V., Hearn, R.D., Hewson, C.M., Hilton, G.M., Noble, D.G., Ratcliffe, N. and Rehfisch, M.M. (2006). *The state of the UK's birds 2005*. RSPB, BTO, WWT, CCW, EN, EHS, and SNH, Sandy, Bedfordshire.

Eaton, M. A., Appleton, G. F., Austen, M. A., Balmer, D. E., Grantham, M. J., Grice, P. V., Hearn, R. D., Holt, C. A., Musgrove, A. J., Noble, D. G., Parsons, M., Risely, K., Stroud, D. A., Wotton, S. (2010). *The State of the UK's birds 2010*. RSPB, BTO, WWT, CCW, JNCC, NE, NIEA and SNH, Sandy, Bedfordshire.

Etheridge, B, Summers, R.W. & Green, R.E. (1997). The effects of illegal killing and destruction of nests by humans on the population dynamics of the hen harrier *Circus cyaneus* in Scotland. *Journal of Applied Ecology* 34: 1081–1105.

Etheridge, B. (2005). *Scottish Raptor Monitoring Report 2003*. Scottish Ornithologists' Club, Aberlady.

Etheridge, B., Holling, M., Thompson, D.B.A., & Riley, H.T. (eds.) (2006). *Scottish Raptor Monitoring Scheme Report 2004*. Scottish Ornithologists' Club, Aberlady.

Etheridge, B. (2007). European Honey-buzzard. In: *The Birds of Scotland*, Forrester, R.W, Andrews, I.J., McInerney, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C., & Grundy, D.S. (eds). The Scottish Ornithologists' Club, Aberlady. pp 442–445.

Etheridge, B., Holling, M., Riley, H.T., Wernham, C.V. & Thompson, D.B.A. (2007). *Scottish Raptor Monitoring Scheme Report 2005*. Scottish Ornithologists' Club, Aberlady.

Etheridge, B., Holling, M., Riley, H.T., Wernham, C.V. & Thompson, D.B.A. (2008). *Scottish Raptor Monitoring Scheme Report 2006*. Scottish Ornithologists' Club, Aberlady.

Etheridge, B., Holling, M., Riley, H.T., Wernham, C.V. & Thompson, D.B.A. (2010). *Scottish Raptor Monitoring Scheme Report 2007*. Scottish Raptor Study Groups, Dunblane.

Fielding, A., Haworth, P., Whitfield P., McLeod, D. & Riley, H. (2011). *A conservation framework for hen harriers in the United Kingdom*. JNCC Report, 441.

Hardey, J., Crick, H., Wernham, C., Riley, H., Etheridge, B. & Thompson, D. (2009). *Raptors: a field guide to survey and monitoring (2nd Edition)*. The Stationery Office, Edinburgh.

Hardey, J., Rollie, C.J., & Stirling-Aird, P.K. (2003). Variation in breeding success of inland peregrine falcon (*Falco peregrinus*) in three regions of Scotland 1991-2000. In: *Birds of Prey in a Changing Environment*, Thompson, D.B.A., Redpath, S.M., Fielding, A.H., Marquiss, M. and Galbraith, C.A. (eds). The Stationery Office, Edinburgh.

Holling, M. (2007). Common Buzzard. In: *The Birds of Scotland*, Forrester, R.W, Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C., and Grundy, D.S. (eds). The Scottish Ornithologists' Club, Aberlady. pp 476–479.

Mearns, R. (2007). Common Raven. In: *The Birds of Scotland*, Forrester, R.W, Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C., and Grundy, D.S. (eds). The Scottish Ornithologists' Club, Aberlady. pp 1364–1366.

Natural England 2008. *A future for the hen harrier in England?* Natural England, Sheffield.
http://www.naturalengland.org.uk/Images/hen_harrier_report221208_tcm6-9451.pdf.

Redpath, S., Amar, A., Smith, A., Thompson, D. B. A. & Thirgood, S. (2010). People and nature in conflict: can we reconcile hen harrier conservation and game management. In: *Species Management: Challenges and Solutions for the 21st Century*, Baxter, J. M. & Galbraith, C. A. (eds). TSO, Edinburgh.

Riddle, G. 2007. Common Kestrel. In: *The Birds of Scotland*, Forrester, R.W, Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C., and Grundy, D.S. (eds). The Scottish Ornithologists' Club, Aberlady. pp 493–496.

Risely, K., Baillie, S. R., Eaton, M. A., Joys, A. C., Musgrove, A. J., Noble, D. G., Renwick, A. R. & Wright, L. J. (2010). *The breeding bird survey 2009*. BTO Research report 559. BTO, Thetford.

Smart, J., Amar, A., Sim, I.M.W., Etheridge, B., Cameron, D., Christie, G. & Wilson, J.D. (2010). Illegal killing slows population recovery of a reintroduced raptor of high conservation concern - The red kite *Milvus milvus*. *Biological Conservation* 143: 1278–1286.

Whitfield, D.P., Fielding, A.H., McLeod, D.R.A. & Howarth, P.F. (2004). The effects of persecution on age of breeding and territory occupation in Golden Eagles in Scotland. *Biological Conservation* 118: 249–259.

Whitfield, D.P., Fielding, A.H., McLeod, D.R.A. & Howarth, P.F. (2008). *A conservation framework for the golden eagle: implications for the conservation and management of golden eagles in Scotland*. Scottish Natural Heritage Commissioned Report No. 193, Perth.

6 Tables

Table 1. Population growth and breeding success of Red Kites in Scotland, 1992–2008. The mean values given for the final columns are the unweighted means, i.e. the sample sizes for each year has not been taken into consideration.

Year ¹	Pairs laying eggs	Pairs fledging young	Total young fledged	% of pairs that fledged young	Productivity: young laying pair
1992	1	1	1	100	1
1993	5	3	7	60	1.4
1994	8	7	13	87.5	1.63
1995	15	11	26	73.33	1.73
1996	17	16	39	94.12	2.29
1997	23	19	39	82.61	1.7
1998	25	22	49	88	1.96
1999	34	27	59	79.41	1.74
2000	39	35	86	89.74	2.21
2001	43	38	95	88.37	2.21
2002	50	43	112	86	2.24
2003	54	48	106	88.89	1.96
2004	60	49	115	81.67	1.92
2005	76	61	131	80.26	1.72
2006	84	69	151	82.14	1.8
2007	93	73	162	78.49	1.74
2008	122	97	210	80	1.74
Total	749	619	1401	83.6	1.8

¹ Breeding in North Scotland started in 1992, in Central Scotland in 1998, in Dumfries & Galloway in 2003 and in Aberdeen in 2008.

² Some totals published in earlier reports have been corrected in this table.

Table 2. Breeding success of Red Kites in Scotland in 2008.

Region	Home ranges checked	Pairs located	Pairs monitored	Pairs failing early	Pairs laying eggs	Pairs hatching young	Pairs fledging young	Minimum number of young fledged
Highland	85	46	46	0	46	44	39	81
Aberdeen	1	1	1	0	1	0	0	0
Tayside	42	32	26	1	25	21	20	44
Central Scotland	46	23	21	1	20	18	13	31
Dumfries & Galloway	31	31	31	1	30	27	25	54
Grand total	205	133	125	3	122	110	97	210

Table 3. Breeding success of White-tailed Eagles in Scotland in 2008.

Study area	Pairs monitored	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young
Isle of Skye	11	8	4	4	6
Argyll islands	11	9	8	7	8
Western Isles	11	8	2	2	4
NW Mainland & Small Isles	11	10	7	7	10
Grand total	44	35	21	20	28

Table 4. White-tailed Eagle breeding success and productivity in Scotland, 1996-2008 (from Crawford *et al.*, 2008).

Year	Territorial pairs	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Total young fledged	Young fledged per pair laying	Young fledged per territorial pair
1996	12	12	8	7	9	0.75	0.75
1997	14	11	6	5	9	0.64	0.64
1998	19	16	9	9	13	0.81	0.68
1999	20	16	9	6	11	0.69	0.55
2000	22	19	12	8	12	0.63	0.55
2001	23	17	10	7	11	0.65	0.48
2002	25	22	14	8	12	0.55	0.48
2003	31	25	20	16	26	1.04	0.84
2004	32	28	19	15	19	0.68	0.59
2005	33	28	21	17	24	0.86	0.73
2006	36	31	25	21	29	0.94	0.81
2007	42	35	31	24	34	0.97	0.81
2008	44	35	21	20	28	0.8	0.64

Table 5. Marsh Harrier breeding success in Scotland, 2003- 08.

Year	Pairs located	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
2003	6	6	5	17
2004	8	5	5	15
2005	9	6	5	17
2006	9	7	7	20
2007	8	5	2	3
2008	4	4	2	3

Table 6. Home range occupancy and breeding success of Hen Harriers in Scotland, 2003-2008.

Year	Home ranges checked	Home ranges occupied by pairs	%	Occupied home ranges monitored	Pairs known to lay eggs	%	Pairs known to fledge young	%	Minimum number of young fledged	Mean brood size	Mean brood size per laying pair	Mean brood size per monitored occupied home range
2003	379	335	88	303	271	89	171	63	529	3.1	2	1.7
2004	457	417	91	359	236	91	219	67	630	2.9	1.9	1.8
2005	395	342	87	310	268	86	175	65	466	2.7	1.7	1.5
2006	428	355	83	278	223	80	144	65	381	2.6	1.5	1.4
2007	415	298	72	253	213	84	147	69	432	2.9	2	1.7
2008	422	311	74	311	232	75	128	41	370	2.9	1.6	1.2

Table 7. Breeding success of Hen Harriers in Scotland in 2008.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	64	64	64	21	43	26	20	55
Hebrides								
North Uist	21	21	16	0	16	9	8	24
Benbecula	11	10	10	0	10	8	8	21
South Uist	13	10	6	0	6	6	6	17
Skye & Eigg	22	14	14	1	13	12	6	20
Sub-total	67	55	46	1	45	35	28	82
North Highlands								
Sutherland	19	18	14	2	12	12	9	26
Ross-shire & Inverness	6	5	5	1	4	3	2	9
Sub-total	25	23	19	3	16	15	11	35
East Highlands								
Moray & Nairn	20	12	12	1	11	11	8	16
Aberdeenshire	12	9	7	5	2	1	1	1
Angus	27	2	2	2	0	0	0	0
Perthshire	56	40	31	2	29	23	18	56
Sub-total	115	63	52	10	42	35	27	73
West Highlands and Islands								
Central	9	4	2	0	2	2	2	7
Argyll mainland	6	3	2	1	1	0	0	0
Mull & Coll	50	37	34	4	30	27	24	72
Cowal & Bute	11	9	9	4	5	3	3	10
Islay & Colonsay	10	5	5	0	5	5	3	9
Arran	20	20	16	0	16	16	16	30
Sub-total	106	78	68	9	59	53	48	128
Southwest and Southern Uplands								
South Strathclyde	24	12	12	2	10	8	5	19
Lothian & Borders	7	2	1	0	1	1	1	2
Dumfries & Galloway	13	13	11	2	9	6	4	21
Sub-total	44	27	24	4	20	15	10	42
Grand total	421	310	273	48	225	179	144	415

Table 8. Breeding success of Northern Goshawks in Scotland in 2008.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Highland	2	1	1	0	0	0	0	0
North-east Scotland	45	31	27	0	27	[25]	25	65
Lothian & Borders	59	36	25	0	25	21	20	49
Dumfries & Galloway	33	21	19	1	18	16	16	49
Grand total	139	89	72	1	70	62	61	163

Table 9. Breeding success of Northern Goshawks in Scotland, 2003-08.

Year	Home ranges checked	Home ranges occupied	Pairs known to lay eggs	Pairs known to fledge young (%)	Minimum number of young fledged
2003	117	84	62	52 (84%)	121
2004	132	86	67	60 (90%)	126
2005	116	81	58	47 (81%)	117
2006	116	78	60	48 (80%)	108
2007	136	87	70	60 (86%)	127
2008	139	89	70	61 (87%)	163

Table 10. Breeding success of Sparrowhawks in Scotland in 2008.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	12	12	10	0	10	8	8	10
Uist	1	1	0	0	0	0	0	0
Highland	4	3	3	0	3	3	2	6
Tayside	5	5	5	0	5	5	5	16
Argyll	4	4	1	0	1	1	1	1
South Strathclyde	65	33	32	2	30	27	27	87
Lothian & Borders	1	1	1	0	1	1	1	1
Dumfries & Galloway	6	5	2	0	2	1	1	2
Grand total	98	64	54	2	52	46	45	123

Table 11. Breeding success of Common Buzzards in Scotland in 2008.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	1	0	0	0	0	0	0	0
Lewis & Harris	3	3	2	0	2	2	2	4
Uist	24	24	22	4	18	17	15	27
Highlands								
Eigg	6	6	6	0	6	6	6	9
Caithness & Sutherland	21	16	14	0	14	14	14	26
Lochaber	3	3	3	0	3	3	3	6
Ross-shire	59	59	55	11	44	34	34	69
Inverness-shire	6	6	3	0	3	3	2	4
Badenoch & Strathspey	16	16	16	0	16	15	15	40
Sub-total	111	106	97	11	86	75	74	154
North-east Scotland	106	79	21	0	21	20	20	30
Tayside & Fife	75	75	57	1	56	56	56	76
Central Scotland	191	171	108	33	75	68	67	110
Argyll								
Coll	3	3	0	0	0	0	0	0
Colonsay	58	24	12	9	3	1	1	2
Islay	4	4	4	1	3	2	1	1
Bute	53	28	19	2	17	17	17	26
Cowal peninsula	19	19	4	0	4	4	4	6
Sub-total	137	78	39	12	27	24	23	35
South Strathclyde	11	11	5	0	5	5	5	5
Dumfries & Galloway	33	32	14	1	13	12	10	21
Lothian & Borders								
Lothian	34	32	28	1	27	25	23	48
Borders	16	16	16	0	16	16	16	36
Sub-total	50	48	44	1	43	41	39	84
Grand total	742	627	409	63	346	320	311	546

Table 12. Breeding success of Golden Eagles in Scotland in 2008.

Region	Home ranges checked	Home ranges occupied by pairs	Of which imm. pairs¹	Further home ranges in use²	Pairs monitored	Failed early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Min. number of young fledged
Lewis & Harris	26	25	2	0	24	3	21	12	11	11
Uist	28	25	1	1	22	1	21	15	11	11
Highland										
Sutherland	10	6	1	4	5	2	3	3	3	3
Ross-shire	12	7	0	1	5	0	5	4	4	5
Skye	34	29	0	0	29	14	15	15	15	17
Rum, Canna & Eigg	6	6	0	0	6	2	4	4	4	6
West Inverness-shire	21	9	2	7	8	2	6	3	3	4
Ardnamurchan, Morvern & Sunart	22	18	1	3	18	6	12	7	6	6
East Inverness-shire	7	1	1	5	1	1	0	0	0	0
Badenoch	13	11	1	1	10	4	6	5	5	5
Sub-total	125	87	6	21	82	31	51	41	40	46
North-east Scotland	19	15	0	1	15	6	9	5	5	6
Tayside										
Perthshire west of the A9 road	16	10	3	1	9	3	6	6	5	6
Perthshire east of the A9 road	4	4	0	0	4	1	3	1	1	1
Angus Glens	8	5	0	0	4	0	4	2	2	3
Sub-total	28	19	3	1	17	4	13	9	8	10
Central Scotland	9	9	0	0	9	3	6	4	4	4
Argyll										
Islay & Colonsay	9	9	0	0	7	2	5	5	4	5
Mull & Jura	37	29	0	2	24	8	16	15	13	14
Mainland incl. Bute	25	21	0	1	21	4	17	15	14	15
Sub-total	71	59	0	3	52	14	38	35	31	34
Dumfries & Galloway	2	2	0	0	2	1	1	0	0	0
Lothian & Borders	2	1	0	1	1	0	1	1	1	1
Grand total	310	242	12	28	224	63	161	122	111	123

¹ These immature pairs are included in the column 'Home ranges occupied by pairs'. For the purpose of this report, we regard pairs consisting of either one or two birds with immature plumage as immature pairs.

² Additional home ranges occupied by single birds or showing signs of occupation but no pair seen.

Table 13. Breeding success of Ospreys in Scotland in 2008.

Region	Pairs present	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Highland	80–83	77	7	70	57–58	118+
North-east Scotland	21	21	6	15	15	28
Tayside	56	56	7	49	40	79
Central Scotland	21	21	4	17	16	34
Argyll	15	14	1	13	11	22
Lothian & Borders	8	8	0	8	8	19
Dumfries & Galloway	7	7	6	1	1	3
Grand total	208–211	204	31	173	148–149	303+

Table 14. Breeding success of Common Kestrels in Scotland in 2008.

Region	Nest sites checked	Pairs present	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Orkney	3	3	3	0	3	2	2	8
Uist	3	2	1	0	1	1	1	2
Highland	4	3	3	0	3	3	3	13
Tayside	27	25	15	3	12	11	11	26
Central Scotland	5	4	4	0	4	4	4	13
Argyll	8	6	4	0	4	4	4	7
South Strathclyde	49	34	29	2	27	26	25	101
Lothian & Borders	9	7	7	0	7	7	7	32
Dumfries & Galloway	7	6	2	0	2	2	2	4
Grand total	115	90	68	5	63	60	59	206

Table 15. Home range occupancy and breeding success of Common Kestrels in Ayrshire, 2003-2008.

Year	Home ranges checked	Home ranges occupied by pairs	%	Occupied home ranges monitored	Pairs laying eggs	%	Pairs hatching eggs	%	Pairs fledging young	%	Minimum number of young fledged	Mean brood size per monitored home range
2003	30	20	67	20	17	85	16	80	16	80	62	3.1
2004	33	28	85	26	24	92	23	88	23	88	109	4.2
2005	38	20	53	17	14	82	11	65	11	65	45	2.6
2006	36	24	67	24	21	88	20	83	20	83	77	3.2
2007	36	20	56	13	12	92	12	92	12	92	59	4.5
2008	43	29	67	27	25	86	24	83	23	83	99	3.7
Total	216	141	66	127	113	88	106	82	105	82	451	3.6

Table 16. Breeding success of Merlins in Scotland in 2008.

Region	Home ranges checked	Home ranges with signs of occupation¹	Home ranges occupied by pairs	Pairs monitored	Failed early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Min. number of young fledged
Shetland	58	19	19	19	1	18	14	14	51
Orkney									
West mainland	7	7	7	6	0	6	2	2	5
East mainland	1	1	1	1	0	1	1	1	1
Rousay	2	2	2	2	0	2	0	0	0
Hoy	8	8	8	7	0	7	4	4	13
Sub-total	18	18	18	16	0	16	7	7	19
Lewis & Harris	7	7	7	4	0	4	4	4	8
Uist									
North Uist	9	9	9	1	0	1	1	1	5
Benbecula	4	4	4	3	1	2	2	2	7
South Uist	17	17	14	7	0	7	5	5	18
Barra	3	3	3	2	0	2	2	2	4
Sub-total	33	33	30	13	1	12	10	10	34
Highland									
Skye & Rum	12	9	5	5	0	5	4	4	14
Ross-shire/ Sutherland	48	33	0	16	2	14	12	11	22
Inverness/ Strathspey	1	0	0	0	0	0	0	0	0
West Moray/Nairn	27	8	6	6	2	4	3	2	8
Sub-total	88	50	11	27	4	23	19	17	44
Northeast Scotland									
- East Moray	25	12	11	11	-	11	8	7	21
- Lower Deeside	21	10	10	10	1	9	6	6	21
- Mid/Upper Deeside	44	21	21	21	1	20	18	18	62
- Donside	24	11	11	11	-	11	9	9	31
sub-total	114	54	53	53	2	51	41	40	135
Tayside									
Perthshire	60	43	33	25	8	17	13	12	25
Angus	26	17	10	10	1	9	8	8	30
Sub-total	86	60	43	35	9	26	21	20	55
Central Scotland	9	9	6	1	0	1	1	1	1
Argyll	5	3	1	1	0	1	1	1	4
South Strathclyde	16	14	13	9	2	7	5	4	13
Lothian & Borders									
Moorfoot Hills	10	9	7	5	0	5	5	5	9
Lammermuir Hills	30	11	8	8	0	8	7	7	27
Pentland Hills	18	6	3	3	1	2	1	1	2
south of Peebles	10	10	9	7	0	7	7	6	16
Sub-total	68	36	27	23	1	22	20	19	54
Dumfries & Galloway	11	11	11	8	2	6	5	5	15
Grand total	513	314	266	209	22	187	148	142	433

¹ The number of home ranges that was occupied by pairs and single birds plus the number of home ranges where fresh signs of Merlins were observed

Table 17. Breeding success of Peregrines in Scotland in 2008.

Region	Home ranges checked	Home ranges occupied by single birds	Home ranges occupied by pairs	Pairs monitored	Failed early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young ¹	Min. number of young fledged ¹
Orkney	4	0	4	4	0	4	4	3	4
Lewis & Harris	2	0	2	0	0	0	0	0	0
Uist	7	0	7	7	1	6	6	6	13
Highland									
Sutherland	5	0	2	2	0	2	2	2	4
Easter Ross	4	0	4	3	0	3	3	3	7
Inverness	5	0	3	3	0	3	3	3	8
Strathspey & Nairn	4	0	4	4	0	4	4	1	1
Sub-total	18	0	13	12	0	12	12	9	20
North-east Scotland	90	2	41	38	13	25	22	22	46
Tayside & Fife									
west of A9 and M90	30	0	24	23	5	18	15	15	27
east of A9 and M90	30	2	17	15	2	13	11	11	26
Angus upland	36	1	13	13	4	9	7	7	13
Angus coastal plain	9	1	7	7	2	5	4	4	11
Sub-total	105	4	61	58	13	45	37	37	77
Central Scotland	37	2	23	21	5	16	15	15	32
Argyll									
Mainland	19	1	14	14	4	10	7	7	14
Coll, Colonsay, Islay & Tiree	12	0	8	8	1	7	6	4	9
Mull	1	0	1	1	0	1	1	1	3
Sub-total	32	1	23	23	5	18	14	12	26
South Strathclyde									
Inland	40	3	20	20	4	16	10	9	22
Coastal	11	1	8	8	1	7	6	4	8
Sub-total	51	4	28	28	5	23	16	13	30
Lothian & Borders									
Grouse moor	25	0	6	6	1	5	5	5	14
Other upland	31	3	15	15	6	9	4	4	9
Woodland	6	0	4	4	0	4	4	2	6
Lowland farmland	18	1	14	14	2	12	10	9	25
Urban/Industrial	9	1	6	6	2	4	4	4	10
Sea-cliff/coast	53	0	15	15	2	13	13	13	37
Sub-total	142	5	60	60	13	47	40	37	101
Dumfries & Galloway									
Kirkcudbright & Wigtown coast	28	2	22	21	1	20	15	10	22
Moffat & Eskdale	20	0	10	10	0	10	9	8	20
Nithsdale	27	2	8	8	3	5	4	4	9
Galloway inland	34	5	15	15	3	12	9	9	16
Sub-total	109	9	55	54	7	47	37	31	67
Total	597	27	317	305	62	243	203	185	416

¹ No records from North-east Scotland in 2008 contained information regarding the number of fledged young. Therefore, the figures presented here regarding the number of pairs that fledged young and the minimum number of young fledged in North-east Scotland is based on the number of large young in the nest. It should therefore be noted that some late failures may have occurred and the figures for North-east Scotland may over-estimate the fledging success in that region

Table 18. Variation in home range occupancy of Peregrines between different habitat types within 1km² of the nest site in Scotland in 2008.

Habitat type	Home ranges checked	Home ranges occupied by pairs	%	Home ranges occupied by single birds	%	Vacant home ranges	%
Grouse moor	92	32	35	2	2	58	63
Other upland	116	62	53	6	5	48	41
Woodland	31	12	39	1	3	18	58
Lowland farmland	41	28	68	3	7	10	24
Urban/Industrial	33	20	61	5	15	8	24
Coastal	107	60	56	3	3	44	41
Unknown	177	103	58	7	4	67	38
Grand total	597	317	53	27	6	253	41

¹ The category 'Unknown' consists of records with no information of the habitat type within 1km².

Table 19. Variation in breeding success of Peregrines between different habitat types within 1km² of the nest site in Scotland in 2008.

Habitat type ¹	Pairs monitored	Pairs failing early or non-breeding	%	Pairs laying eggs	%	Pairs hatching eggs	%	Pairs fledging young	%	Min. no. of young fledged	Mean no. of young fledged per monitored pair
Grouse moor	32	6	19	26	81	22	81	22	81	46	1.4
Other upland	61	15	25	46	75	32	75	29	75	68	1.1
Woodland	12	0	0	12	100	10	100	7	100	16	1.3
Lowland farmland	26	3	12	23	88	20	88	18	88	43	1.7
Urban/Industrial	20	5	25	15	75	12	75	12	75	30	1.5
Coastal	57	5	9	52	91	46	91	37	91	88	1.5
Unknown	97	28	29	69	71	61	71	60	71	125	1.3
Grand total	305	62	17	243	83	203	83	185	83	416	1.4

¹ The category 'Unknown' consists of records with no information of the habitat type within 1km².

Table 20. Breeding success of Barn Owls in Scotland in 2008.

Region	Nesting sites checked	Occupied by pairs	Occupied by single birds ¹	Pairs monitored	Failed early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Min. number of young fledged
Highland									
Sutherland & Caithness	9	8	1	7	1	6	6	5	16
Ross-shire	15	7	4	7	0	7	7	6	20
Inverness & Badenoch	16	13	2	13	0	13	11	11	27
Sub-total	40	28	7	27	1	26	24	22	63
North-east Scotland	40	30	8	15	0	15	13	13	34
Tayside									
Perthshire	9	7	1	6	0	6	5	5	13
Fife	6	5	1	5	2	3	1	0	0
Angus	2	2	0	2	0	2	2	1	1
Sub-total	17	14	2	13	2	11	8	6	14
Central Scotland									
Clackmannan	7	6	1	5	0	5	4	4	6
Stirling	65	64	1	63	6	57	50	44	72
Falkirk Council	4	0	0	0	0	0	0	0	0
Sub-total	76	70	2	68	6	62	54	48	78
Argyll									
Cowal & Bute	46	31	12	31	3	28	27	24	54
Islay	7	6	1	5	0	5	4	3	5
Mull	4	4	0	4	0	4	4	4	12
Sub-total	57	41	13	40	3	37	35	31	71
South Strathclyde									
Mainland	42	30	10	25	3	22	18	11	30
Isle of Arran	1	1	0	1	0	1	1	0	0
Sub-total	43	31	10	26	3	23	19	11	30
Lothian & Borders	69	61	7	53	1	52	49	42	102
Dumfries & Galloway									
Wigtown & Galloway forest	33	23	1	18	1	17	16	15	45
Stranraer, The Rhins & West Wigtown	96	75	2	74	8	66	63	60	164
Kirkcudbright-shire & Dumfries	53	36	2	35	4	31	30	28	87
Sub-total	182	134	15	127	13	114	109	103	296
Grand total	524	409	52	369	29	340	311	276	688

¹ The number of nesting sites occupied by single birds includes nesting locations where fresh signs of occupation (pellets, splashes) were seen, but no birds were observed.

Table 21. Breeding success of Tawny Owls in Scotland in 2008.

Region	Nest sites checked	Pairs present	Pairs monitored	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Min. no. of young fledged
Highland							
Sutherland	15	10	10	10	10	10	18
Black Isle	22	5	1	1	1	1	1
Easter Ross	20	18	17	17	15	15	26
Badenoch & Strathspey	3	3	2	2	2	1	1
Other areas	9	6	5	5	2	1	2
Sub-total	69	42	35	35	30	28	48
Argyll	14	14	14	14	8	8	11
Central Scotland	7	7	7	7	7	7	14
Lothian & Borders	13	13	13	13	13	13	28
Dumfries & Galloway	8	8	8	8	6	6	10
Grand total	111	84	77	77	64	62	111

Table 22. Breeding success of Long-eared Owls in Scotland in 2008.

Region	Known territories checked for occupation	Territories with signs of occupation	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Uist		4	3	0	0
Highland		8	8	8	7
North-east Scotland		22	3	2	2
Argyll		3	2	1	1
Lothian & Borders		10	10	5	4
Grand total		47	26	16	14

Table 23. Breeding success of Short-eared Owls in Scotland in 2008.

Region	Sites checked	Pairs found	Additional single birds recorded	Nests monitored ¹	Pairs fledging young ¹	Minimum number of young fledged
Orkney	>35	35	-	>6	>6	6
Uist	16	16	16	8	7	13
Highland	5	4	1	3	3	4
Tayside	38	19	22	7	6	11
Central Scotland	7	4	26	1	1	3
Argyll	4	3	4	1	1	1
South Strathclyde	5	2	2	2	2	8
Lothian & Borders	3	2	2	2	2	7
Grand total	113	85	73	30	28	53

¹ No nests were located on Orkney, but on 6 different places newly fledged Short-eared Owls were observed. Thus, this table presents a very conservative measure of the breeding success of this species on Orkney.

Table 24. Breeding success of Ravens in Scotland in 2008. [Figures in square brackets were not supplied – the one given is a minimum figure].

Region	Home ranges checked	Home ranges occupied by pairs	Pairs monitored	Failed early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Min. number of young fledged
Orkney	[50]	[50]	50	0	[50]	[33]	33	97
Uist	18	17	16	1	15	15	14	45
Highland								
Sutherland	9	7	7	0	7	6	6	22
Ross-shire	2	2	2	0	2	2	2	6
Inverness & Badenoch	3	3	2	0	2	1	1	5
Eigg & Skye	6	6	6	0	6	5	5	14
Sub-total	20	18	17	0	17	14	14	47
Tayside								
Angus & Fife	23	19	17	1	16	13	10	34
Perth & Kinross	44	44	41	6	35	33	31	78
Sub-total	67	63	58	7	51	46	41	112
Central Scotland	32	28	23	3	20	18	18	45
Argyll								
Mainland	2	2	2	0	2	2	2	5
Colonsay, Islay & Tiree	40	35	31	1	30	18	17	60
Cowal & Isle of Bute	25	15	13	4	9	8	8	22
Sub-total	67	52	46	5	41	28	27	87
South Strathclyde								
Inland	42	37	30	1	29	27	21	52
Coastal	11	9	9	1	8	8	3	8
Sub-total	53	46	39	2	37	35	24	60
Lothian & Borders	38	29	27	1	26	25	25	79
Dumfries & Galloway	59	50	41	2	39	28	23	60
Total	404	353	317	21	296	242	219	632

Annex 1: Raptor, owl and Common Raven nest site and home ranges data submitted under the Scottish Raptor Monitoring Scheme in 2008.

Species	Argyll	Central Scotland	Dumfries & Galloway	Highland	Lewis & Harris	Lothian & Borders	Northeast Scotland	Orkney	South Strathclyde	Tayside & Fife	Uist	Shetland	TOTAL
European Honey-buzzard				1									1
Red Kite		46	31	85			1			42			205
White-tailed Eagle	11			22							11 ²		44
Eurasian Marsh Harrier										4			4
Hen Harrier	77	9	13	47		7	32	64	44	83	45		421
Northern Goshawk			33	2		59	45						139
Eurasian Sparrowhawk	4		6	4		1		12	65	5	1		98
Common Buzzard ¹	137	191	33	111	3	50	106	1	11	75	24		742
Golden Eagle	71	9	2	125	26	2	19			28	28		310
Osprey	15	21	7	90		8	21			56			218
Common Kestrel	8	5	7	4		9		3	49	27	3		115
Merlin	5	9	11	88	7	68	114	18	16	86	33	58	513
Eurasian Hobby													0
Peregrine Falcon	32	37	109	18	2	142	90	4	51	105	7		597
Barn Owl	57	76	182	40		69	40		43	17			524
Tawny Owl	14	7	8	69		13							111
Long-eared Owl	3			8		10	22				4		47
Short-eared Owl	4	7		5		3		35	5	38	16		113
Common Raven	67	32	59	20		38		50	53	67	18		404
TOTAL	505	449	501	739	38	479	490	187	337	633	190	58	4606

¹ Common Buzzard totals for a study area covering parts of both Central and Tayside regions are included under Central Scotland.

² Includes some pairs monitored on Lewis & Harris.

Annex 1 shows the total number of all breeding sites and home ranges (by area) checked in 2008 and reported under the SRMS. This includes traditional nesting sites and home ranges that were found unoccupied during the visit, and also sites and home ranges which were found occupied but received no follow-up visits, so their breeding success is unknown.

Annex 2: Raptor, owl and Common Raven breeding attempts monitored under the Scottish Raptor Monitoring Scheme in 2008.

Species	Argyll	Central Scotland	Dumfries & Galloway	Highland	Lewis & Harris	Lothian & Borders	Northeast Scotland	Orkney	South Strathclyde	Tayside & Fife	Uist	Shetland	TOTAL
European Honey-buzzard													0
Red Kite		21	31	46			1			26			125
White-tailed Eagle	11			22							11 ¹		44
Eurasian Marsh Harrier										4			4
Hen Harrier	50	2	11	33		1	19	64	28	33	32		273
Northern Goshawk			19	1		25	27						72
Eurasian Sparrowhawk	1		2	3		1		10	32	5			54
Common Buzzard	39	108 ²	14	97	2	44	21		5	57	22		409
Golden Eagle	52	9	2	82	24	1	15			17	22		224
Osprey	14	21	7	77		8	21			56			204
Common Kestrel	4	4	2	3		7		3	29	15	1		68
Merlin	1	1	8	27	4	23	53	16	9	35	13	19	209
Eurasian Hobby													0
Peregrine Falcon	23	21	54	12		60	38	4	28	58	7		305
Barn Owl	40	68	127	27		53	15		26	13			369
Tawny Owl	14	7	8	35		13							77
Long-eared Owl	1			8		5	2						16
Short-eared Owl	1	1		3		2		6	2	7	8		30
Common Raven	46	23	41	17		27		50	39	58	16		317
TOTAL	297	286	326	493	30	270	212	153	198	384	132	19	2800

¹ Includes some White-tailed Eagle pairs monitored on Lewis & Harris.

² Common Buzzard totals for a study area covering parts of both Central and Tayside regions, are included under Central Scotland RSG.

Annex 2 shows the total number of all breeding sites and home ranges (by area) that were found to be occupied and which received follow-up visits in 2008, i.e. they were effectively monitored to enable a level of breeding success and productivity to be estimated.