Scottish Raptor Monitoring Scheme

Report 2006

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Figure 1: Scottish Raptor Study Group areas in 2006

Figure 2: Location of the regions used to summarise Hen Harrier breeding data in this report and in the 1988/89, 1998 & 2004 national surveys (from Sim *et al.* 2007).

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1 Preface

I spend a great deal of time talking with people about raptors and the habitats that these birds depend on. Whether I am speaking to a tourist, a gamekeeper or a raptor surveyor, all of them are united in a keenly felt enjoyment of nature. The richness and diversity of our raptor populations is one of the things that makes Scotland a very special place for everyone.

Most Scottish raptor populations are now recovering, and many are at a higher level than at any time in the past 200 years. Yet despite full legal protection since 1954, problems associated with illegal killings continue to restrict the distribution and abundance of several species. There can be no excuse for breaking the law, and we must tackle this head on.

But we also need good data on what the raptors are feeding on and the impacts that they may or may not be having on other species, including gamebirds and domestic animals. Without this information we cannot make progress in managing the conflicts of interest that must be addressed. And unless we do so the sense of frustration, exasperation and alienation will continue to exist for some, to the detriment of all.

So I am very pleased to see the publication of the annual reports from the Scottish Raptor Monitoring Scheme. I believe that in Scotland we are leading the way in collecting, collating and reporting on what is happening to raptor populations. That we have so much data is a great tribute to the skill, experience and energy of the Scottish Raptor Study Groups, and to the land managers who work with them. All involved deserve our thanks.

Andrew Thin
Chairman, Scottish Natural Heritage, June 2008

2 Introduction

This is the fourth annual report by the Scottish Raptor Monitoring Group (SRMG) on the Scottish Raptor Monitoring Scheme (SRMS). The aim of the report is to provide clear and factual information on breeding birds of prey in Scotland during 2006. The format follows closely that used in the previous reports (Etheridge 2005, Etheridge *et al.* 2006, Etheridge *et al.* 2007).

2.1 The Scottish Raptor Monitoring Scheme (SRMS)

The SRMS was established on 24 June 2002 with the signing of an Agreement by the following parties: SNH (Scottish Natural Heritage), JNCC (the Joint Nature Conservation Committee), SRSGs (the Scottish Raptor Study Groups), BTO (the British Trust for Ornithology) Scotland, RBBP (the Rare Breeding Birds Panel), RSPB (the Royal Society for the Protection of Birds) Scotland, and SOC (the Scottish Ornithologists' Club) (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 certain raptors, the Common Raven is given honorary status as a bird of prey and is included in the Scheme.

2.2 Scottish Raptor Study Groups (SRSGs)

The SRSGs are a consortium of ten regional raptor study groups (Figure 1, inside front cover) with a combined membership of over 240 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 majority of the data collected in this report on raptor numbers, distribution and productivity.

2.3 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 RSPB 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.

3 Raptor breeding report for 2006

3.1 Introduction to breeding report

Data on breeding raptors, owls and Ravens were again supplied by the ten Scottish Raptor Study Groups, supplemented by records from RSPB Scotland, Scottish Natural Heritage, the Rare Breeding Birds Panel and Natural Research Ltd. Figure 1 shows the study areas generally used in this report; note that these do not necessarily coincide with Scottish local authority areas. Annex 1 provides a regional breakdown of the home ranges[1] which received at least one visit in the spring of 2006 to check on occupancy. The 4006 home ranges visited represent an 11% increase in the 3618 checked in 2005. The proportion of home ranges that are occupied by a pair of birds varies by year, species, area and land management. It can approach 100% under the most favourable conditions but is more usually in the region of 50-80%. Most home ranges will require at least two visits to confirm the findings of the first. When signs of occupation are present, a minimum of three visits is normally required to assess the outcome of the breeding attempt (Hardey *et al.,* 2006). Annex 2 provides a regional breakdown of home ranges holding a potential breeding pair that received further monitoring visits. This reveals that 2525 breeding attempts were effectively monitored, a 10% increase over 2005 (2289). These comprise 63% of those home ranges that received an initial visit, listed in Annex 1.

With few exceptions, the scarcer raptors, particularly those associated with remote mountains and moorland, have the strongest appeal to raptor workers and therefore attract the greatest monitoring effort. Likewise, those species that have been the focus of recent reintroduction schemes, White-tailed Eagle and Red Kite, are also closely monitored. Barn and Tawny Owl nest box studies are popular and these two species receive good coverage. A few species in Scotland, either because of their extreme scarcity (Honey-buzzard and Hobby) or secretive behaviour (Long-eared Owl), present challenges as far as monitoring is concerned. However, there are some widespread species, which despite their alleged abundance, attract little attention from the majority of field workers. Coverage of breeding Sparrowhawks and Kestrels in particular needs to increase in order to achieve effective monitoring to determine estimates of population size, annual productivity and long-term trends. This requirement is becoming ever more urgent as some available evidence suggest that the status of these two species is no longer as secure in Scotland as it was in former times.

[1]For a definition of terms used in this report see section 3.4.

3.2 Observer coverage

Survey effort varies across Scotland and some raptor species and regions receive more comprehensive coverage than others. In the report, the scale of coverage achieved is indicated on the maps associated with each species. Note however, that the maps are not designed to accurately represent the breeding distribution or abundance of individual species.

3.3 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 the Osprey, the pair bond breaks up at the end of the breeding season. If they survive the rigours of migration, 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 short. 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 home ranges within a study area are recorded accurately, as well as the occurrences of breeding attempts and any production of young.

3.4 Terminology

The terms used in this report have the following definitions and are taken from Hardey *et al.*(2006):

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

Home range - the area that contains the nesting range plus 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.

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 bird(s) 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, 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 area immediately around and including a nest.

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 pair is established and eggs are laid, failure occurs if no young fledge successfully. A broader definition will also include those territorial pairs that 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 three ways: as the number of young fledged per occupied home range; as the number of young fledged per breeding pair; or as the number of young fledged per successful pair or female. In this report the first definition is mostly used. Unless otherwise stated, brood sizes refer to the number of young fledged.

Monitored home range - a home range occupied by a pair that receives sufficient repeat visits (see species accounts in Hardey *et al.* 2006) to establish the outcome of a breeding attempt.

3.5 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 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 may underestimate the size of the breeding population in a given area and overestimate nesting success per pair. Non-breeding territorial pairs are a common component in raptor populations and these can be easily overlooked, exasperating 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 is not always possible to determine from the submitted summary recording forms at what stage in the breeding cycle individual nests were found. It is hoped that a new nest recording spreadsheet introduced at the start of 2005 and now widely adopted by raptor workers will help address this problem.

On some driven grouse-moors of Scotland, recent studies have shown that certain species of raptor that attempt to settle or breed there suffer from human interference (Etheridge *et al.* 1997, Hardey *et al.* 2003, Whitfield *et al.* 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 may 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* effect (Whitfield *et al.* 2008). 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 impact of this shift of effort away from some grouse-moors, particularly in regions where this form of land management is a dominant feature, would be that:

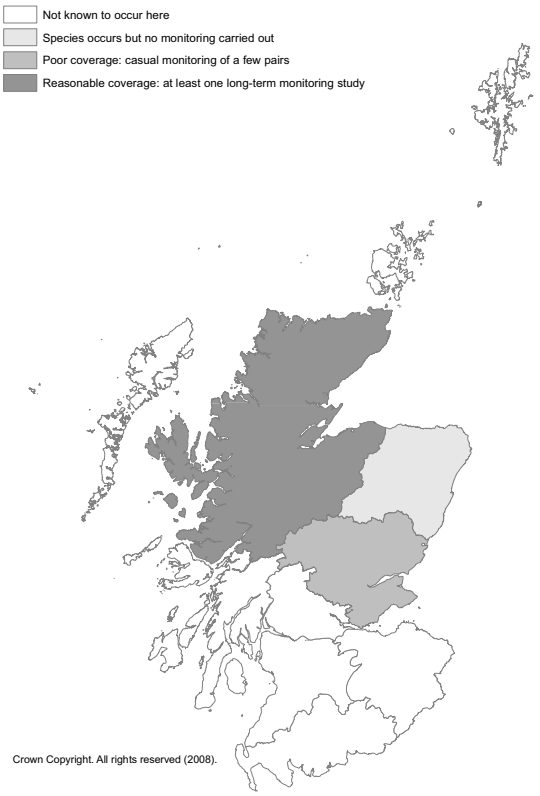
1. data collected on raptor breeding populations may not be an accurate reflection of the species status and breeding success in the region. Some upland breeding species such as Hen Harrier, Golden Eagle or Peregrine may appear to have considerably higher occupancy of home ranges, breeding success and productivity than is actually the case nationally across all habitats, and
2. persecution of birds of prey may be under-recorded.

Further 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.

4 Species accounts

4.1 European Honey-buzzard *Pernis apivorus*

In Highland, five woods where breeding has occurred in the past were checked during the summer. Honey-buzzard activity was recorded at four locations and breeding confirmed at one. A brood of two young successfully fledged. Both chicks were fitted with satellite tags, allowing their southward migration in the autumn to be tracked (see http://www.roydennis.org/Migration maps 2006.htm).



Level of coverage of European Honey-buzzard

4.2 Red Kite *Milvus milvus*

The Red Kite, once a widespread native species in Great Britain, was rapidly exterminated throughout Scotland during the 19^{th} century. There have been three phases of Red Kite re-introduction: 1989–93 on the Black Isle, Highland; 1996–2001 near Doune, west Perthshire and 2000–05 at Loch Ken, Galloway. These schemes have resulted in a slowly increasing and expanding population (Table 1). The Scottish population reached 97 pairs in 2006, 86 of which were known to lay eggs (Table 2). This constitutes a 17% increase over the number of pairs located in 2005 with a similar percentage increase in the 151 young produced. However, these total figures conceal the continuing lack of population growth in North Scotland with only the smaller Perthshire and Galloway populations showing an increase over the previous year. Two landmarks were reached in 2006 - the total number of breeding attempts since 1992 exceeded 500 and the number of young reared exceeded 1000 (Table 1).

Level of coverage of Red Kite

Highland

Seventy-one home ranges were checked for occupation in the early spring and 39 breeding pairs were found. This is the same number as in 2005. Thirty-five pairs (90%) were successful in rearing 79 young, a mean brood size per occupied home range of 2.0. There were four failures, three during incubation and one during the chick rearing stage. Two of these failures were caused by the death of breeding males: victims of poison abuse on a local sheep farm in April.

Central Scotland & Tayside

These two populations share a common origin - the Doune reintroduction scheme in west Perthshire. The combined number of pairs located increased by 22% from 32 pairs in 2005 to 39 in 2006. A minimum of 30 pairs laid eggs but only 20 (67%) were successful with 45 young reared.

Central Scotland

Thirty-seven home ranges were monitored resulting in the location of 24 pairs. Of these, at least 19 pairs reached the laying stage but only 12 (63%) bred successfully. Twenty-seven young were reared.

Tayside

Twenty home ranges were checked in west Perthshire and 15 pairs were found. Eleven monitored pairs bred and eight succeeded in rearing 18 young. This is a major improvement over 2004 when only four pairs were successful, rearing just six young.

Table 1: Population growth & breeding success of Red Kites in Scotland, 1992-2006.

Year	Pairs laying eggs	Pairs fledging young	Percentage of pairs laying that fledged young	Total young fledged	Productivity: young/laying pair
1992[1]	1	1	100	1	1.0
1993	5	3	60	7	1.4
1994	8	7	87	13	1.6
1995	15	11	73	26	1.7
1996	17	16	94	39	2.3
1997	23	19	83	39	1.7
1998[2]	25	22	88	49	2.0
1999	34	27	79	59	1.7
2000	39	35	90	86	2.2
2001	43	38	88	95	2.2
2002	50	43	86	112	2.2
2003[3]	57	48	84	106	1.9
2004	55	45	82	115	2.1
2005	76	61	80	131	1.7
2006	86	69	82	151	1.8
TOTAL	534	445	83	1029	1.9

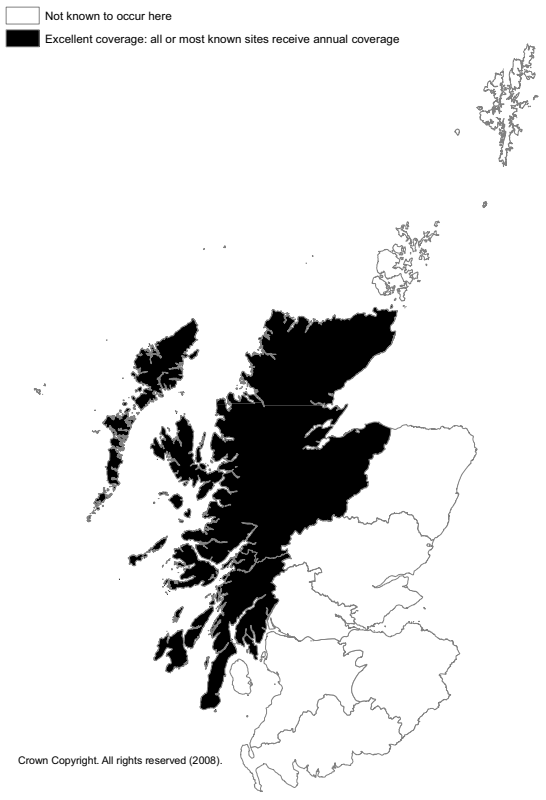
[1] Breeding in North Scotland commenced
[2] Breeding in Central Scotland commenced
[3] Breeding in Dumfries & Galloway commenced

Table 2: Breeding success of Red Kites in Scotland, 2006.

Region	Home ranges checked	Pairs located	Single birds holding territory	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Highland	71	39	3	39	36	35	79
Tayside	20	15	1	11	9	8	18
Central Scotland	37	24	2	19	16	12	27
Dumfries & Galloway	19	19	-	17	14	14	27
TOTAL	147	97	6	86	75	69	151

Dumfries & Galloway

This population of Red Kites is the result of the third and most recent reintroduction scheme in Scotland, which was completed in 2005. The population continued to grow in 2006: seventeen laying pairs were located, an increase of five pairs from 2005. Fourteen pairs were successful, rearing 27 young.



Level of coverage of White-tailed Eagle

4.3 Black Kite *Milvus migrans*

A 40^{th} breeding pair of kites was recorded in Highland in 2006. A six-year old wing-tagged female Red Kite was found apparently breeding with an adult male Black Kite within the core Red Kite breeding area in late June. They were defending a nest high in a Douglas fir. The very late nest contained two well-feathered young and was situated 3m out from the trunk, near the end of a horizontal limb. The Black Kite, which was probably the same bird that had been present the previous year when it was temporarily paired with a different female Red Kite (Etheridge *et al.* 2007), was seen presenting food to his mate and feeding the chicks at the nest. The fledged young both had the appearance of Red Kites. They were last seen during August and the Black Kite in early September. Neither parents nor either of the young was seen over winter or during 2007. This constitutes the first confirmed breeding of Black Kite in the wild in Scotland and the UK.

Table 3: White-tailed Eagle breeding success and productivity in Scotland, 1997-2006 (from Reid & Sexton 2006).

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

Table 4: Breeding success of Eurasian Marsh Harriers in Scotland, 2006.

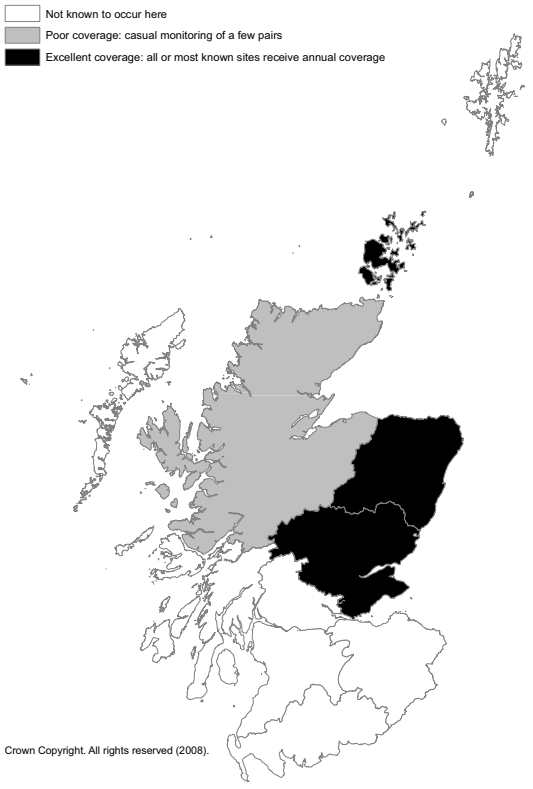
Region	Pairs located	Single summering birds	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Orkney	-	1	-	-	-
Highland	1	1	-	-	-
Northeast Scotland	1	-	1	1	2
Tayside	7	-	6	6	18
TOTAL	9	2	7	7	20

4.4 White-tailed Eagle *Haliaeetus albicilla*

Sea-eagles in 2006 had their most successful nesting season since the start of the re-introduction in the late 1970s. The number of territorial pairs located increased from 33 in 2005 to 36, with the number of pairs laying eggs increasing from 28 to 31 pairs (Table 3). Hatching (81%) and fledging success (68%) were also up on 2005 and the 21 successful pairs and 29 fledged young are new highs for this re-introduced population. Monitoring of this species is co-ordinated by the RSPB Sea Eagle Project Team

4.5 Eurasian Marsh Harrier *Circus aeruginosus*

At nine pairs, there was no change over the previous year in the number of Marsh Harriers located in suitable breeding habitat during the spring in Scotland. An increase from two to six in the number of laying pairs at the key Tay reed beds site was compensated by declines at all the other known breeding locations. All six pairs on the Tay, which included a polygamous male, were successful, rearing an impressive 18 young (Table 4). Elsewhere, in Northeast Scotland, a single breeding pair was located, fledging two young. In Highland, a single male spent April and May at the 2005 breeding site but no female was seen. Nearby, a pair appeared at a new location, built a nest but abandoned it before eggs were laid. The fragile Orkney population, with only a single summering bird recorded in 2006, appears to be on the verge of extinction.



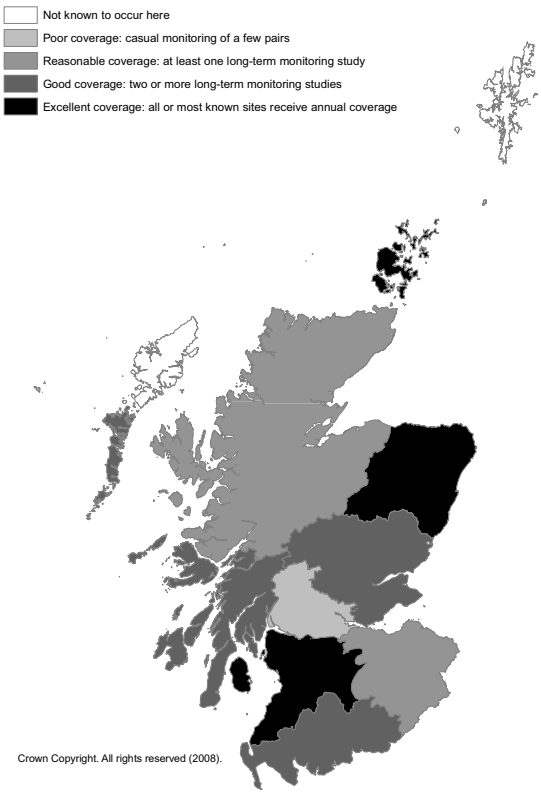
Level of coverage of Eurasian Marsh Harrier

4.6 Hen Harrier *Circus cyaneus*

The Scottish breeding population was estimated at 633 pairs in 2004 (Sim *et al.*, 2007), with a repeat survey scheduled for 2010. It remains a popular study species in most regions amongst Scottish raptor workers. During 2006, the number of home ranges checked rose to 428, an 8% increase on 2005 (Table 5). However, the proportion of ranges found to be occupied by pairs was 4% less than in 2005. Monitoring at 278 home ranges revealed that nest building and egg laying occurred at 223, 80% of those monitored. Of these, 144 (65%) succeeded in rearing young. This matches the 3-year average of 65% of nests successful during the 2003–05 period (Table 5). The minimum of 381 young fledged gave a mean brood size per monitored occupied home range of 1.4, the lowest for 4 years. Regional reporting below and in Table 6 is based on the Scottish Regions defined in the published reports of the three national surveys of 1988/89, 1998 and 2004 (Bibby & Etheridge 1993, Sim *et al.* 2001, 2007), rather than by SRSG area (see Figure 2, inside back cover).

Orkney

There was little if any change in the number of occupied home ranges found and monitored, the species again receiving 100% coverage in the island group. The number of occupied home ranges where egg laying was recorded was down from 60 in 2005 to 46, an apparent decline of 23%. However, it is thought that in 2006 a number of nests had already failed at the egg stage prior to the start of fieldwork and egg laying pairs were thus underestimated. Thirty-five pairs reached the hatching stage in the breeding cycle of which 28 succeeded in rearing at least one young to fledging. With 72 fledged young recorded (Table 6), the mean brood size per occupied home range was 1.0, slightly below the 2005 figure of 1.1.



Level of coverage of Hen Harrier

Hebrides

During the year, SNH funded surveys ensured comprehensive coverage was again achieved in the Outer Hebrides on the Uists and Benbecula. Forty-three known home ranges were checked and 35 pairs were found in occupation. The nesting attempts of 31 pairs were monitored and at least 30 laid eggs. Hatching and fledging success were good, with 23 pairs rearing 58 young. In the Inner Hebrides, a pair bred on Rum rearing two young and a bigamous male on Eigg succeeded with two females, rearing broods of one and three young. On Skye, eight pairs were located but due to gales and heavy rainfall followed by predation during the chick stage, they had a disastrous breeding season. Only a single brood of two survived to fledging. Across the region, a mean fledged brood size of 1.6 per occupied home range was recorded.

North Highlands

There was reduced monitoring of the important Sutherland Hen Harrier population during 2006. Only six breeding pairs received coverage, of which three successfully reared 12 young. Elsewhere in the region, in Ross-shire and Inverness, three breeding pairs were monitored. All were successful, raising 11 young. For the region, the mean fledged brood size per occupied home range was 2.3.

East Highlands

The ten breeding pairs monitored in Moray & Nairn occur mainly on unmanaged moorland. There were two failures and 26 young fledged from the eight successful nests. Further east in Aberdeenshire, 10 occupied home ranges were also monitored but only six pairs laid eggs from which five reared 12 young. In Angus, the species' status as a breeding bird remains critical. Although five pairs were located in the spring, only two were known to lay eggs and just one reared any young. On the moors of Aberdeenshire and Angus, driven grouse shooting is the primary land use. The view of local raptor study groups is that under the current land management regime, this once important Hen Harrier population is now greatly reduced. The Perthshire harrier population is more substantial with 33 of 41 home ranges found occupied in the spring. Egg laying was confirmed at 29 home ranges and 21 pairs produced a minimum of 57 young. Overall, in this region, the mean fledged brood size per monitored occupied home range was 1.8 young.

West Highlands & islands

In 2004, this region was the stronghold for breeding Hen Harriers in the UK (Sim *et al.*, 2007) and monitoring in the spring and summer of 2006 suggested this importance was maintained with 117 pairs occupying home ranges. SNH funded surveys produced estimates for the larger islands as follows: Islay, 51 pairs; Mull, 18 pairs and Arran, 22 pairs. The smaller islands, Coll, Colonsay and Bute, each held one or two pairs. Throughout the region, a sample of 67 occupied home ranges was monitored. Nests with eggs were found at 58 (87%) of which 44 hatched and 38 fledged a minimum of 92 young. The mean fledged brood size per monitored home range was 1.4.

Southwest & Southern Uplands

Hen Harriers throughout this region experienced poor breeding success in 2006. In South Strathclyde, 13 breeding pairs were monitored but only three (23%) succeeded in fledging any young. In Dumfries & Galloway, the situation was no better. Nineteen pairs were monitored but nine pairs (47%) failed at a very early

Table 5: Home range occupancy and breeding success of Hen Harriers in Scotland, 2003-06.

	2003	2004	2005	2006
Home ranges checked	379	457	395	428
Home ranges occupied (%)	335(88%)	417(91%)	342(87%)	355(83%)
Occupied home ranges monitored	303	359	310	278
Nests found with eggs (%)	271(89%)	326(91%)	268(86%)	223(80%)
Nests fledging young (%)	171(63%)	219(67%)	175(65%)	144(65%)
Minimum number of young fledged	529	630	466	381
Mean brood size	3.1	2.9	2.7	2.6
Mean brood size per laying pair	2.0	1.9	1.7	1.5
Mean brood size per monitored occupied home range	1.7	1.8	1.5	1.4

Table 6: Breeding success of Hen Harriers in Scotland, 2006.

Area	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	71	71	71	46	35	28	72
Hebrides							
- North Uist	24	20	18	17	16	12	26
- Benbecula	9	8	8	8	7	7	18
- South Uist	10	7	5	5	4	4	14
- Skye, Rum & Eigg	13	11	10	8	8	4	8
sub-total	56	46	41	38	35	27	66
North Highlands							
- Sutherland	9	8	6	6	4	3	12
- Ross-shire & Inverness	5	4	4	3	3	3	11
sub-total	14	12	10	9	7	6	23
East Highlands							
- Moray & Nairn	10	10	10	10	9	8	26
- Aberdeenshire	17	14	10	6	5	5	12
- Angus	5	5	4	2	1	1	3
- Perthshire	41	33	29	29	26	21	57
sub-total	73	62	53	47	41	35	98
West Highlands & islands							
- Central Scotland	5	2	2	1	1	1	3
- Argyll mainland	26	19	15	12	7	5	14
- Mull	39	18	16	12	10	6	14
- Coll, Colonsay & Bute	5	5	5	4	3	3	9
- Islay	51	51	15	15	11	11	29
- Arran	22	22	14	14	12	12	23
sub-total	148	117	67	58	44	38	92
Southwest & Southern Uplands							
- South Strathclyde	40	24	13	13	7	3	10
- Lothian & Borders	4	4	4	2	2	2	6
- Dumfries & Galloway	22	19	19	10	9	5	14
sub-total	66	47	36	25	18	10	30
TOTAL	428	355	278	223	180	144	381

stage or had simply disappeared on a subsequent visit. Of the 10 pairs known to lay eggs, just five reached the fledging stage; the failed nests had evidence of human interference. To the east, in Lothian & Borders, four occupied home ranges were located but eggs were found at only two nests, both being successful; a small improvement on the single nesting pair found in 2005.

Combining the three areas, 66 known home ranges were checked of which 47 (71%) were occupied by pairs. Of these, 36 were monitored and at least 25 pairs reached the egg laying stage. However, only 10 produced any young - a minimum of 30 young. The mean brood size per monitored home range was a low 0.8 young.

Table 7: Breeding success of Northern Goshawk in Scotland, 2006.

Region	Home ranges checked	Home ranges occupied	Home ranges monitored	Pairs laying eggs	Pairs hatching young	Pairs fledging young	Minimum number of young fledged
Highland	5	2	2	2	2	2	4
Northeast Scotland	30	21	21	18	13	13	30
Lothian & Borders	57	38	25	25	23	23	49
Dumfries & Galloway	24	17	17	15	10	10	25
TOTAL	116	78	65	60	48	48	108

4.7 Northern Goshawk *Accipiter gentilis*

Only a handful of dedicated field workers are actively monitoring the breeding biology of this powerful raptor in Scotland. The results of their monitoring effort in 2006 were remarkably similar to the previous year. One hundred and fifteen known home ranges were checked, of which 77 (67%) were occupied (Table 7). As in 2005, 65 home ranges received follow up visits. Sixty pairs were confirmed to lay eggs and 48 (80%) hatched and produced young. All of the breeding failures occurred during the incubation stage, as they did in 2005. The 108 young that fledged give a mean brood size of 1.7 per monitored occupied home range.

Highland

The species has never become as well established in this region as in the adjacent Northeast, despite breeding pairs being present since the start of re-colonisation in the 1970s and the abundance of seemingly suitable habitat. Only two occupied home ranges were located but both succeeded in producing young.

Northeast Scotland

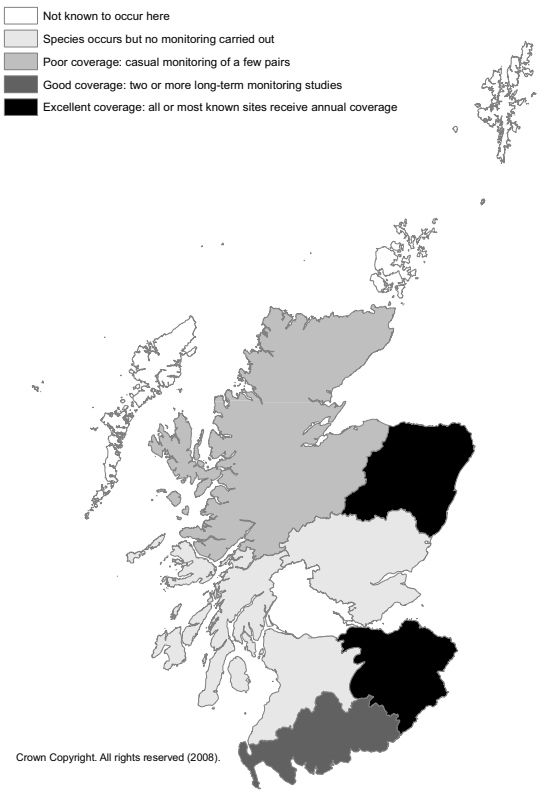
Goshawks are firmly established in the northeast but the population has been apparently stable at around 25 pairs for a number of years, despite good breeding success and productivity. Poor survival of dispersing young could be a cause. The species will readily enter crow-cage and Larsen traps after decoy or trapped crows and they become trapped. It is unlikely that few, if any, are released alive. Thirty known home ranges were again checked for their presence and 21 pairs were located and monitored. At least 18 pairs laid eggs and 13 (72%) bred successfully producing 30 fledged young. Productivity was 1.4 fledged young per monitored occupied home range.

Lothian & Borders

The Borders is home to Scotland's largest breeding population of Goshawks. In 2006, 57 home ranges were checked and 38 (67%) were found occupied. However, this is only a sample of the number of pairs believed to be present in the region and the species is considered more numerous than suggested. Twenty-five pairs were monitored and laid eggs. Nesting success at 92% was high; there were only two failures and a minimum of 49 young fledged. Of 48 young ringed, 28 were sexed as males and 20 as females. Mean brood size per monitored occupied home range was 2.0 young, the same as the previous year.

Dumfries & Galloway

Twenty-four home ranges were checked and 17 (71%) were found occupied and were monitored. Clutches were laid at 15 home ranges but five nests failed during incubation. The 10 (67%) successful nests produced 25 fledged young, a mean brood size of 1.5 young per monitored occupied home range.



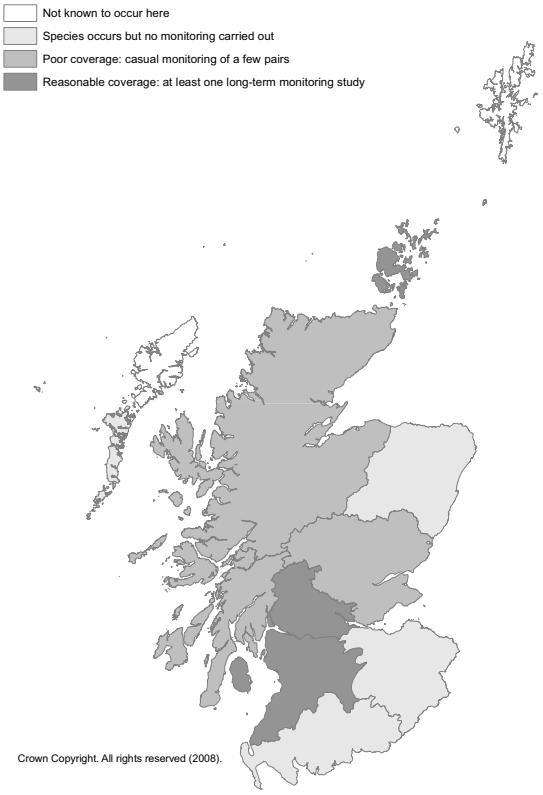
Level of coverage of Northern Goshawk

Table 8: Breeding success of Eurasian Sparrowhawks in Scotland, 2006.

Region	Home ranges checked	Home ranges occupied	Home ranges monitored	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Orkney	10	8	8	-	-	-
Highland	4	4	4	4	1	3
Tayside	1	1	1	1	1	1+
Argyll	5	5	2	2	2	6
South Strathclyde	64	33	32	29	27	102
TOTAL	84	51	47	36	31	112

4.8 Eurasian Sparrowhawk *Accipiter nisus*

There is some evidence that the population of this small hawk is in decline in some parts of Scotland (Park *et al.*, 2005). However, there is currently only one intensive long-term study evaluating Sparrowhawk site occupation and breeding success in Scotland. Further studies are urgently required and in the meantime, raptor enthusiasts are requested to monitor as many Sparrowhawk attempts as possible. Overall, 84 home ranges were checked for occupation and 51 had signs of use (Table 8). Follow up visits were made to 47 and pairs that laid eggs was confirmed at 36. There were 31 successful broods totalling 112 young.



Level of coverage of Eurasian Sparrowhawk

Orkney

Eight of the ten home ranges checked on Orkney had signs of occupation. Despite further monitoring, evidence that breeding may have occurred was found at only one site, although no nest was located to confirm breeding.

Highland

Four active nests were monitored, but only one (on the island of Rum) succeeded in producing young.

Tayside

A single nest was reported, fledging an unknown number of young.

Argyll

Records were submitted for five home ranges showing signs of occupation but just two received follow up visits. Successful breeding occurred at both with six young fledged.

South Strathclyde

In a long-term study, 64 home ranges were checked for occupation in the spring. Thirty-three home ranges (52%) showed signs of occupation and 32 were closely monitored. At these, egg-laying occurred at 29 sites and they enjoyed excellent breeding success with 27 pairs (93%) fledging 102 young. Mean clutch size was 4.7 (n=25) and mean fledged brood size per occupied home range was 3.2 young.

4.9 Common Buzzard *Buteo buteo*

There was improved monitoring of this species in several regions in 2006. Across Scotland, 499 known home ranges were checked and at 416 (83%), pairs were present (Table 9). Of these 337 received further checks and at least 300 (89%) reached the egg laying stage. There were 251 successful nests producing 475 young. Productivity of monitored pairs was identical to that in 2005, with 84% of laying pairs nesting successfully and a mean brood size per monitored occupied home range of 1.4.

Orkney

A poor year for Common Buzzards, with just a single pair on Hoy recorded breeding and rearing a single chick. A second pair on Mainland was present in the spring but did not breed.

Uists

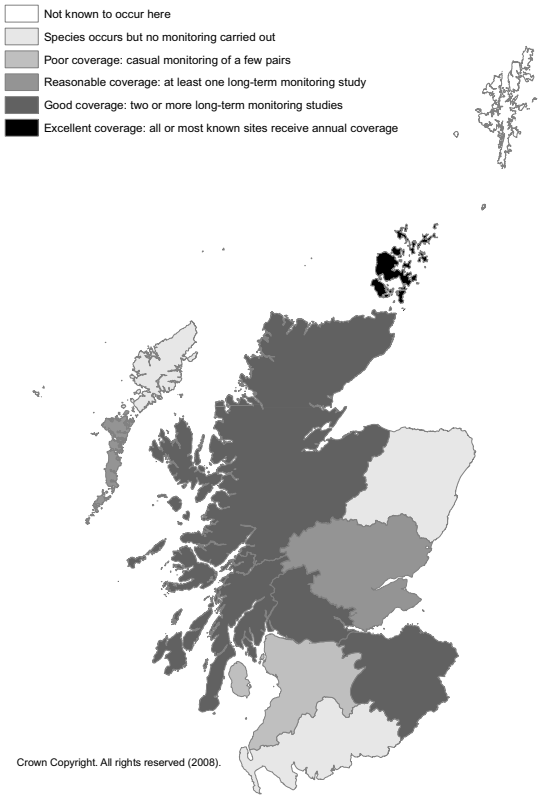
Twenty-three home ranges held pairs in the spring and seven laying pairs were monitored during later visits. Five were successful rearing nine young.

Highland

In the long-running Easter Ross study, 71 home ranges were visited. Pairs were present at 56 (79%) and 55 received follow-up checks. At least 44 pairs (80%) reached the egg laying stage and 34 (77%) succeeded in rearing 68 young. Mean clutch size for a sample of 20 nests was 3.0 eggs. Mean brood size per monitored occupied home range was 1.2. These figures are very similar to 2005. Elsewhere in Highland, 37 pairs were monitored of which 35 laid eggs. Of these, 28 (80%) were successful. Mean brood size was 1.5 young per monitored occupied home range.

Table 9: Breeding success of Common Buzzards in Scotland, 2006

Region	Home ranges checked	Home ranges occupied by pairs	Home ranges monitored	Pairs reported laying eggs	Pairs hatching young	Pairs reported fledging young	Minimum number of young fledged
Orkney	7	2	2	1	1	1	1
Uists	23	23	7	7	5	5	9
Highland							
- Eigg	2	2	2	2	1	1	1
- Caithness & Sutherland	19	19	19	17	11	11	18
- Ross-shire	71	56	55	44	34	34	68
- Inverness-shire	5	5	5	5	5	5	9
- Badenoch & Strathspey	11	11	11	11	11	11	28
sub-total	108	93	92	79	62	62	124
Tayside & Fife	14	14	14	11	11	11	20
Central Scotland	136	119	95	81	70	61	102
Argyll							
- Tiree	11	11	1	1	1	1	2
- Colonsay/Oronsay	54	20	13	11	11	11	23
- Islay	10	10	6	6	5	5	10
- Bute	41	30	26	25	22	22	40
- Mainland	7	7	7	7	7	7	17
sub-total	123	78	53	50	46	46	92
South Strathclyde	12	12	8	8	8	8	8
Lothian & Borders							
- Lothian	38	37	37	34	30	29	60
- Borders	38	38	29	29	29	28	59
sub-total	76	75	66	63	59	57	119
TOTAL	499	416	337	300	262	251	475



Level of coverage of Common Buzzard

Tayside & Fife

Of 14 pairs occupying known home ranges, 11 reached the egg laying stage. All 11 were successful, rearing a minimum of 20 young.

Argyll

Most of the data received came from the islands. On Bute, 41 home ranges were checked and 30 (73%) held territorial pairs. Twenty-six received monitoring visits, 25 pairs laid eggs and 22 (88%) nested successfully raising 40 young. On Colonsay & Oronsay, 54 home ranges received visits but pairs of buzzards were found at just 20 (37%). Of these, 13 were monitored, 11 laid eggs and all bred successfully with 23 young fledged. On Islay and Tiree, amongst seven breeding pairs monitored, there was only one failure and 12 young were reared. On the mainland, including the Cowal Peninsula, a further seven pairs located all bred successfully rearing 17 young. For the region, the mean brood size per monitored occupied home range was 1.7 young.

Central Scotland

A major study based on a population of buzzards in west Perthshire continued to expand. An impressive 136 home ranges were visited and pairs were present at 119 (88%). Follow-up checks were carried out on 95 pairs and 81 (85%) were confirmed to lay eggs. Of these, 61 pairs (75%) bred successfully, rearing 102 young. Mean brood size per monitored occupied home range was a low 1.1.

South Strathclyde

Eight successful breeding pairs were monitored, but no brood counts were possible and the eight young recorded is an absolute minimum figure.

Lothian & Borders

Common Buzzards have undergone a dramatic increase in this region over the past 15 years (Holling, 2003) as the species continues to re-colonise areas from which it was exterminated during the 19^{th} century. This expansion is reflected in the increasing number of breeding records submitted for the region. Seventy-six known home ranges were checked in the spring and pairs occupied all but one. Sixty-six received follow-up visits and 63 were known to lay eggs. Of these, 57 pairs (90%) bred successfully rearing at least 119 young. Mean fledged brood size per monitored occupied home range was 1.8.

4.10 Golden Eagle *Aquila chrysaetos*

The most recent full survey of Scottish Golden Eagles in 2003 gave a population of 441 pairs (Eaton *et al.*, 2007). This equates to just over 5% of the estimated European population of 8,400–11,000 pairs (BirdLife International, 2004). A relatively high proportion of Golden Eagles do not lay eggs in a given year (Hardey *et al.,* 2006) although nests may be 'greened-up' through the addition of new material. Therefore, faced with an apparently 'greened-up' but empty nest, an observer may find it impossible to decide whether this is a case of early breeding failure or simply a record of a non-breeding pair. Thirty-two percent of the monitored pairs in 2006 fell into this category of either failing early after egg laying occurred or being non-breeders (Table 10).

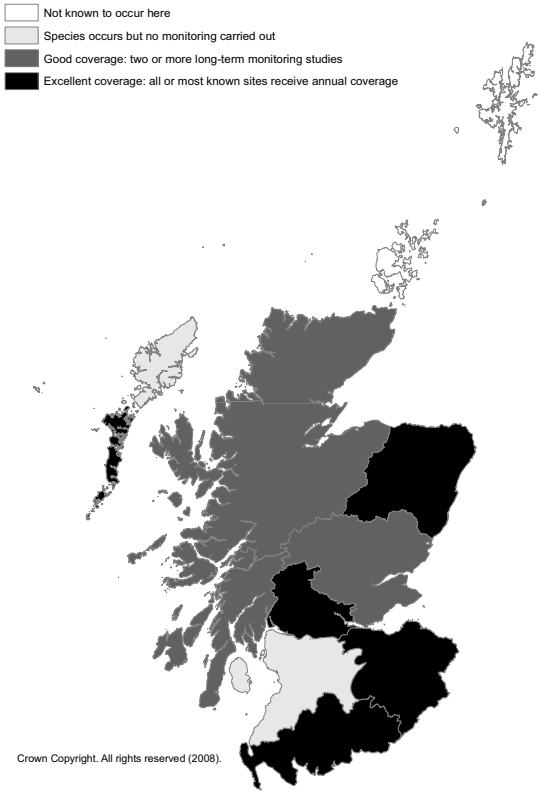
Scottish Raptor Study Group members checked 290 known home ranges in 2006. Two hundred and thirty-three (80%) held pairs of eagles and an additional 27 home ranges (9%) held single birds or had signs suggesting an eagle had been using them. One or both members of 15 pairs were in immature plumage. This is a minimum figure as in many cases the ages of the pair present could not be determined. Follow-up visits to the home ranges of 218 pairs were carried out. One hundred and forty-nine pairs (68%) were confirmed to lay eggs whilst the remaining 69 (32%) were placed in the 'early failure/ non-breeder' category. Of the breeding pairs, 39% failed during incubation and a further 9% failed at the chick stage. Thus, only 78 pairs (52% of those confirmed to lay eggs) managed to rear any young, and the majority (93%) reared only a single chick. Moreover, as in previous years, a proportion of the 'early failure/non-breeder' pairs will have laid eggs, so that breeding success will be even lower than the records suggest. Of the 218 monitored pairs, only 36% bred successfully and reared a mean of less than 0.4 young per occupied home range.

Uists

A comprehensive survey of known eyries in the Uist chain of islands was carried out in 2006 and of 28 home ranges checked, 24 held pairs of Golden Eagles. Twenty-two pairs were monitored and 13 were confirmed to lay eggs. Only six pairs (27% of those monitored) bred successfully, rearing a single chick each. Mean brood size per monitored occupied home range was 0.3 young per pair. Golden Eagles also breed throughout the larger Hebridean islands of Lewis and Harris but at present no annual monitoring of this important population occurs.

Highland

Visits were made to 122 known home ranges and eagle pairs occupied 101 (83%). The poor breeding success of some Scottish Golden Eagles is particularly marked amongst 69 pairs monitored in three west coast study areas. On Skye, in west Sutherland & Wester Ross and in Ardnamurchan, Lochaber, Morvern & Sunart, only 16 pairs (23%) bred successfully. It was particularly poor in the latter study area where from 28 monitored pairs, just two (7%) produced young. In contrast, four of six pairs on the 'Small Isles' of Rum, Canna and Eigg reared five young, the pair on Eigg apparently being a new colonist. Further east in west Inverness and in Badenoch & Strathspey, ten out of 20 monitored pairs bred successfully whilst on adjacent grouse moors of east Inverness, four home ranges held just three single birds. For the region, the overall mean brood size per monitored occupied home range was 0.3 young per pair.



Level of coverage of Golden Eagle

Northeast Scotland

Twenty home ranges were again checked in this region and 19 were occupied, 17 (85%) holding pairs. Sixteen pairs were monitored but just six (38%) bred successfully. There was only one nest with twins, a very low proportion compared with recent years. Mean brood size per monitored occupied home range was 0.4 young per pair.

Tayside

Checks made at 31 home ranges in Tayside revealed the presence of 16 Golden Eagle pairs (52%). Single birds or signs of occupation were reported from a further 11 (35%) home ranges. The 14 pairs monitored enjoyed high breeding success (85%) with just two pairs failing to rear any young. The 12 successful pairs fledged 15 young. Mean brood size per monitored occupied home range was 1.1 young per pair.

Table 10: Breeding success of Golden Eagles in Scotland, 2006.

Region	Home ranges checked	Home ranges occupied by pairs[1]	Additional home ranges occupied[2]	Pairs monitored	Pairs failing early/ non-breeding	Pairs laying eggs	Pairs hatching young	Pairs fledging young	Minimum number of young fledged
Uist									
- North Uist	11	9	1	9	2	7	5	4	4
- Benbecula	2	2	-	2	1	1	1	1	1
- South Uist	10	9	1	9	5	4	2	1	1
- Barra & small islands	5	4	-	2	1	1	-	-	-
sub-total	28	24 (2)	2	22	9	13	8	6	6
Highland									
- Skye	34	31	-	31	13	18	10	10	11
- West Sutherland & Wester Ross	14	10	3	10	3	7	5	4	4
- Ardnamurchan, Lochaber, Morvern & Sunart	30	28	-	28	11	17	4	2	2
- Rum, Canna & Eigg	6	6	-	6	1	5	5	4	5
- Easter Ross & East Sutherland	1	1	-	1	1	-	-	-	-
- West Inverness	18	11	1	9	3	6	5	4	4
- East Inverness	4	-	3	-	-	-	-	-	-
- Badenoch & Strathspey	15	14	1	11	4	7	6	6	6
sub-total	122	101 (5)	8	96	36	60	35	30	32
NE Scotland	20	17 (3)	2	16	4	12	6	6	7
Tayside									
- Perthshire West of A9	17	7	7	6	1	5	5	5	5
- Perthshire East of A9	5	4	1	4	-	4	4	4	6
- Angus glens	9	5	3	4	-	4	3	3	4
sub-total	31	16 (1)	11	14	1	13	12	12	15
Central Scotland	8	8 (0)	-	8	2	6	2	2	2
Argyll									
- Islay, Jura, Colonsay & Scaba	9	8	1	7	-	7	5	4	4
- Mull	36	31	-	28	11	17	10	6	6
- Mainland	29	23	3	22	2	20	12	11	11
sub-total	74	62 (3)	4	57	13	44	27	21	21
Lothian & Borders	3	3 (0)	-	3	2	1	1	1	1
Dumfries & Galloway	4	2 (1)	-	2	2	0	0	0	0
TOTAL	290	233 (15)	27	218	69	149	91	78	84

[1]including immature pairs in parenthesis

[2]by single birds or showing signs of occupation but no pair seen

Central Scotland

Pairs occupied all eight of the home ranges checked in the region. Six pairs were known to lay eggs, but their success was poor with just two (33%) rearing a single chick each. Mean brood size per monitored occupied home range was 0.3 young per pair.

Argyll

The population of Golden Eagles monitored on the island of Mull had another poor breeding season. Of the 36 home ranges visited, pairs were present at 31 (86%) and there were no single birds present. Twenty-eight were subsequently re-visited but just six pairs (21%) bred successfully rearing the minimum six young. Mean brood size on Mull per monitored occupied home range was a low 0.2 young per pair. Seven pairs were monitored on the other islands and fared better, with four pairs (57%) rearing four young. Whilst on the mainland, of 29 home ranges checked, 23 (79%) held pairs, 22 were monitored but only 11 (50%) were successful, rearing 11 young. Mean brood size per monitored occupied home range was 0.5 young per pair. Overall, for the region, 37% of pairs on monitored home ranges bred successfully with a mean brood size of 0.4 young per pair.

Lothian & Borders

The three home ranges checked all held potential breeding pairs but only one bred successfully, rearing a single chick.

Table 11. Population and nesting success of Ospreys in Scotland, 1995-2006.

Year	Pairs present at nests	Pairs laying eggs	Pairs fledging young	Total young
1995	99	92	73	146
1996	104	93	74	155
1997	111	102	77	159
1998	130	116	92	193
1999	136	125	87	183
2000	147	121	-	195
2001	153	135	104	219
2002	158	128	104	213
2003	162	140	109	229
2004	182	155	114	233
2005	180	158	124	241
2006	155	143	111	225

Table 12: Breeding success of Ospreys in Scotland, 2006.

Region	Nest sites checked	Pairs present	Single birds present	Pairs known to have laid eggs	Pairs known to have fledged young	Minimum number of young fledged
Highland	106	74	2	70	48	97
Northeast Scotland	19	19	-	19	16	34
Tayside	34	25	-	20	15	31
Central Scotland	21	18	1	16	16	34
Argyll	11	10	-	10	9	17
Lothian & Borders	12	6	5	6	5	10
Dumfries & Galloway	3	3	1	2	2	2
TOTAL	206	155	9	143	111	225

Dumfries & Galloway

Of the four home ranges checked, just two held eagle pairs and one of the males was in immature plumage. Both pairs either failed early or did not breed.

4.11 Osprey *Pandion haliaetus*

For over 50 years, the growth and spread of Ospreys in Scotland has been closely monitored by a small group of individuals and organisations and coverage approaching 100% has been achieved annually. With the population in Scotland now approaching 200 pairs (Dennis, 2007), this level of monitoring has been less easy to maintain in recent years. In 2006, in one key region for breeding Ospreys in Scotland, Tayside, monitoring effort was reduced and in some other regions it was confined to checking established pairs and relying on landowners, bird-watchers and others to report new pairs. Thus, the totals for 2006 in Table 11 reflect a reduction in coverage rather than any recent decline in the Scottish Osprey population. Table 12 shows that 206 nest sites[2] were checked during the year and 155 (75%) pairs and nine single birds were present. A minimum of 143 pairs laid eggs and 111 (78%) succeeded in rearing young. The 225 young counted give a mean brood size per pair occupied nest site of 1.5.

[2]Ospreys differ from other hawks and falcons that are covered in this report in that the nest site rather than the home range is treated as the monitoring unit. This is because Ospreys build large conspicuous nests that are reused annually and are the focus of their territorial behaviour.

Highland

Recent monitoring work suggests that over half the British Osprey population currently breeds in Highland region. One hundred & six known nest sites were checked in 2006 and 74 pairs and two single birds were present. Seventy pairs were known to lay eggs but only 48 (69%) succeeded in fledging young. There were 97 young counted; a mean brood size of 1.3 young per pair occupied nest site.

Northeast Scotland

Results from the northeast were encouraging in 2006. There were 19 egg laying pairs located, an increase of two pairs (12%) over the previous year. Sixteen pairs (84%) succeeded in rearing 34 young; a mean brood size of 1.8 young per pair present.

Tayside

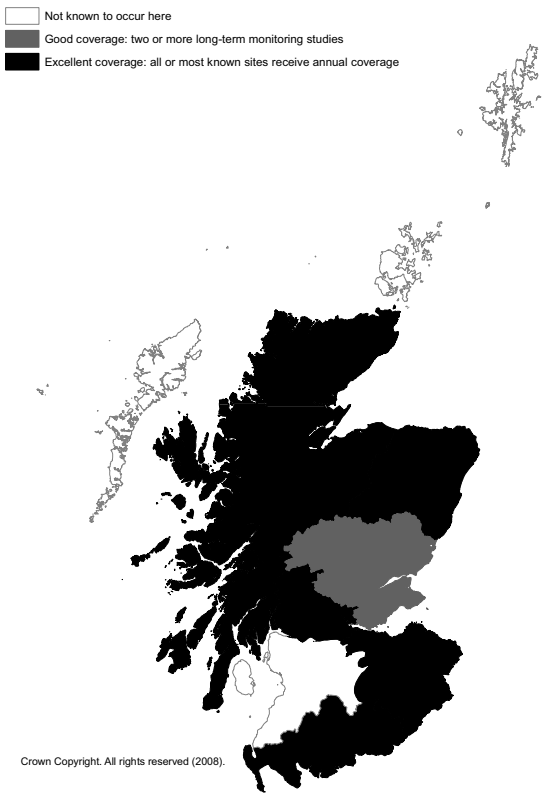
In 2006, only half the known nest sites in Tayside were monitored. A shortage of experienced manpower for fieldwork has been cited and it is hoped this can soon be rectified. Thirty-four nesting sites were checked and 25 (74%) were found occupied by pairs. A minimum of 20 pairs laid eggs and 15 (75%) were successful in rearing 31 young (Table 12). The mean brood size per occupied nest site was 1.2 young.

Central Scotland

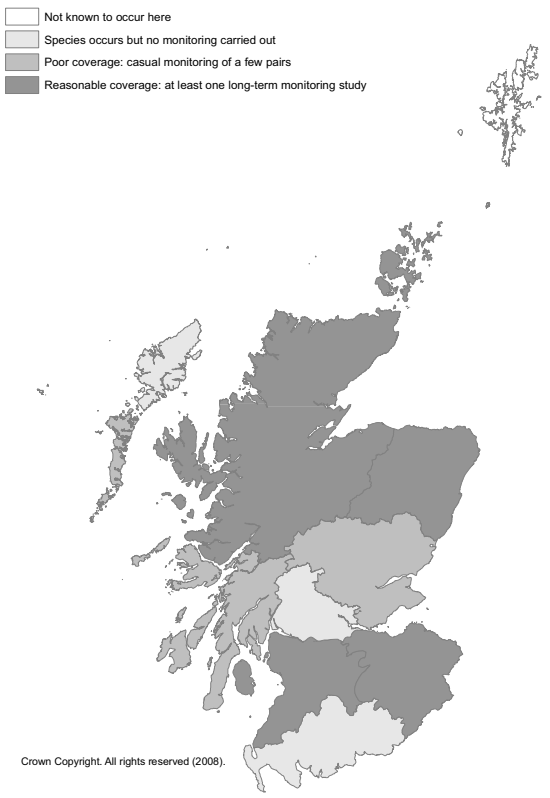
Twenty-one nesting sites were checked in this region and 18 pairs (86%) were again present. At least 16 pairs laid eggs and all were successful. There were 34 young giving a mean brood size of 1.9 per occupied nest site.

Argyll

Ten pairs were again present in the 11 nesting sites checked. All ten pairs laid eggs and nine (90%) bred successfully, rearing 17 young; a greatly improved result over the previous year. Mean brood size per nest site occupied by a pair was 1.7.



Level of coverage of Osprey



Level of coverage of Kestrel

Lothian & Borders

Twelve nest sites were checked in the spring and six pairs (50%) plus five single birds were present. All six pairs laid eggs and five succeeded in fledging ten young; a small improvement on 2005. Mean brood size per nest site occupied by was 1.7.

Dumfries & Galloway

This fledgling population was consolidated in 2006 with two of the three pairs present laying eggs. Both pairs were successful, but reared only single chicks each.

4.12 Common Kestrel *Falco tinnunculus*

There was a disappointing fall of 42% in the number of nest records received in 2006, despite the existence of two intensive breeding studies in Ayrshire and Lothian. Many of the nest histories submitted were for nests found in the latter stages of the breeding cycle. These are, therefore, biased in favour of a successful breeding attempt and their results should be used with caution. However, the results in 2006 from the two intensive studies show high nesting success amongst those pairs that laid eggs. Across the country, 113 home ranges were checked and 94 (83%) found occupied (Table 13). Of these, 74 were re-visited and 66 pairs had laid eggs. There were only three breeding failures and a minimum of 211 young fledged from the 63 successful nests.

Orkney

Just four pairs were found breeding on Orkney in 2006, two of them ground nesting in heather. The three pairs monitored all bred successfully rearing 11 young.

Uists

A single record of a pair fledging an unknown number of young was received.

Highland

Ten pairs were located and nine received follow up visits. All nine were successful and reared at least 31 young.

Northeast Scotland

Eight occupied home ranges were monitored, and at seven, clutches of eggs were laid. These seven succeeded in rearing 28 young.

Argyll

All ten known home ranges checked were found occupied. Just two were monitored and they succeeded in fledging broods of three and four.

Tayside

Three breeding pairs were reported. All were successful but no accurate brood counts were made.

South Strathclyde

The long running Ayrshire study entered its 34th year in 2006. After the poor occupancy and productivity figures recorded in 2005 following a 'low' in the vole cycle, a substantial improvement occurred in 2006. Thirty-six known home ranges were checked for occupation and 24 (67%) held potential breeding pairs. Three pairs failed to lay eggs, but of the 21 that did, 20 (95%) succeeded in hatching and rearing young. The 77 young fledged give a mean brood size per monitored occupied home

Table 13: Breeding success of Common Kestrels in Scotland, 2006.

Region	Home ranges checked	Home ranges occupied	Home ranges monitored	Pairs laying eggs	Pairs hatching young	Pairs fledging young	Minimum number of young fledged
Orkney	4	4	3	3	3	3	11
Uists	1	1	1	1	1	1	1+
Highland	10	10	9	9	9	9	31+
Northeast Scotland	8	8	8	7	7	7	28
Tayside	3	3	3	3	3	3	5+
Argyll	10	10	2	2	2	2	7
South Strathclyde							
- Ayrshire study	36	24	24	21	20	20	77
- elsewhere	6	6	4	4	4	4	4+
Lothian & Borders							
- Pentland Hills study	26	19	15	11	11	9	39
- elsewhere	9	9	5	5	5	5	8+
TOTAL	113	94	74	66	65	63	211

range of 3.2 young. This compares with figures of 4.2 in 2004 and 2.6 in 2005. Elsewhere in the region, a further four breeding pairs reared an unknown number of young.

Lothian & Borders

In the Pentland Hills study, 26 known home ranges were checked for occupancy. Nineteen ranges held Kestrel pairs and 15 received follow up checks. Of this 15, 11 pairs laid full clutches and 9 bred successfully, rearing 39 young. Mean brood size per monitored occupied home range was 2.6 young; a small improvement on the 2.3 young recorded the previous year. Five successful breeding attempts were recorded elsewhere in the region but there were no complete brood counts.

4.13 Merlin *Falco columbarius*

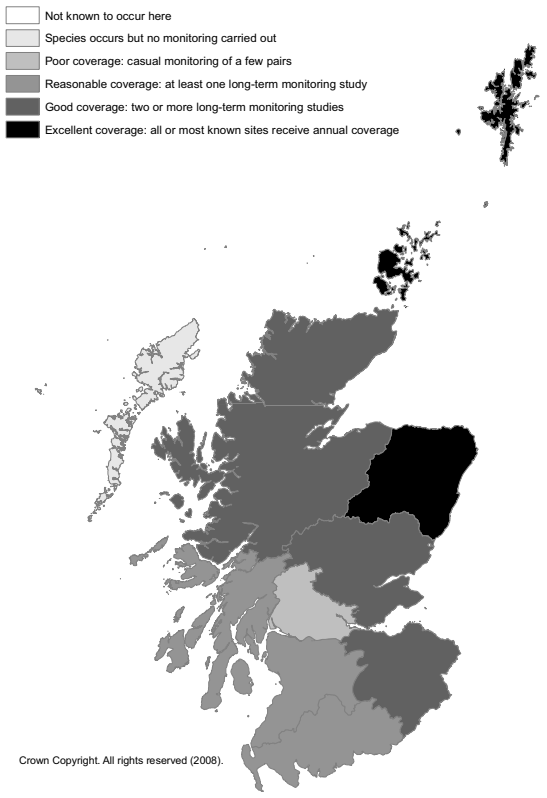
Monitoring effort in 2006 was maintained or increased slightly in all the main regions where breeding occurs. There was an increase in the extent of monitoring on Shetland but no records were received from the Isle of Lewis, unlike in 2005. Overall, the popularity of this species amongst raptor field ornithologists remains high. This is important with a national survey of the species due in 2008. In total, 462 home ranges were checked and 285 (62%) had signs of Merlin occupation (Table 14). Of those home ranges where pairs were present, the breeding attempts of 189 were monitored. At least 171 pairs laid eggs, and 140 (82%) reached the hatching stage. There were few failures during chick rearing and 133 (78%) pairs reared at least one young. The minimum count of 402 fledged young gives a mean brood size per monitored pair of 2.1.

Shetland

As part of a wider diver survey by the RSPB in Shetland in 2006, the opportunity was taken to check 75 known Merlin home ranges. The following minimum figures were obtained. Twenty-two home ranges had signs of occupation and at 17, there were nesting pairs with eggs. Thirteen reached the hatching stage but one failed with chicks. The 12 successful pairs reared 42 young. Mean brood size per monitored pair was 2.5.

Orkney

Three islands were visited and 21 pairs were located and monitored. Of these, at least 18 (86%) pairs laid eggs, 14 (78%) hatched eggs and 12 (67%) fledged 41 young. Mean brood size per monitored pair was 2.0 young.



Level of coverage of Merlin

Table 14: Breeding success of Merlins in Scotland, 2006.

Region	Home ranges checked	Home ranges with signs of occupation	Monitored pairs	Pairs laying eggs	Pairs hatching young	Pairs fledging young	Minimum number of young fledged
Shetland	75	22	17	17	13	12	42
Orkney							
- Mainland	12	12	12	10	7	7	24
- Hoy	7	7	7	6	6	4	14
- Rousay	2	2	2	2	1	1	3
sub-total	21	21	21	18	14	12	41
Uists							
- North Uist	11	11	1	1	0	0	0
- Benbecula	3	3	1	1	1	1	3
- South Uist	8	8	3	3	1	1	2
- Barra	2	2	2	2	2	2	7
sub-total	24	24	7	7	4	4	12
Highland							
- Skye & Rum	11	6	5	4	3	3	8
- Sutherland/Caithness	35	23	10	9	9	7	19
- Ross-shire	4	4	4	3	2	2	8
- Inverness/Strathspey	10	8	6	6	5	6	15
- Nairn	4	1	1	1	1	1	4
- West Moray	16	6	6	5	3	3	10
sub-total	80	48	32	28	23	22	64
Northeast Scotland							
- East Moray	20	10	6	5	5	5	14
- Lower Deeside	21	9	7	6	6	6	21
- Mid/Upper Deeside	36	20	18	17	14	13	40
- Donside	19	13	11	10	10	9	31
sub-total	96	52	42	38	35	33	106
Tayside							
- Perthshire	57	50	27	23	17	17	42
- Angus	25	17	9	8	7	7	22
sub-total	82	67	36	31	24	24	64
Argyll	9	5	4	4	4	4	10
South Strathclyde	15	10	5	4	2	2	6
Lothian & Borders							
- Pentland Hills	6	2	1	1	1	1	4
- south of Peebles	9	6	4	4	4	4	10
- Moorfoot Hills	4	4	3	3	3	3	7
- Lammermuir Hills	33	16	9	8	7	7	24
sub-total	52	28	17	16	15	15	45
Dumfries & Galloway	8	8	8	8	6	5	12
TOTAL	462	285	189	171	140	133	402

Western Isles

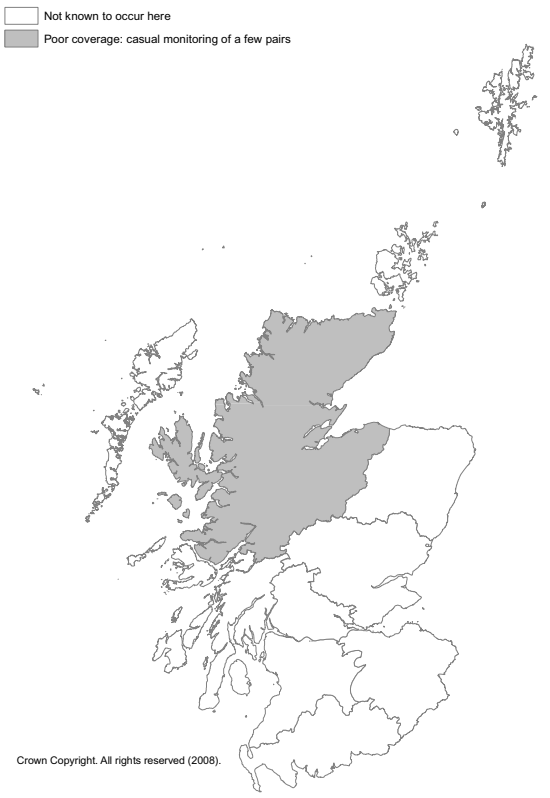
There was no monitoring this year of the important Merlin population on Lewis. On the four southern islands between Barra and North Uist, there were signs of occupation at 24 home ranges. Seven breeding attempts were fully monitored; however, an additional eight pairs were known to lay eggs but received no further checks. Four (57%) of the monitored pairs hatched eggs and fledged young, with 12 young being reared. Mean brood size per monitored pair was 1.7.

Highland

Breeding Merlins occur throughout the region, but are scarcer and have a much more localised distribution along the north-west mainland. They are most widespread and commoner on the drier more eastern heather moors. There were visits to 80 known home ranges in the spring and 48 (60%) showed signs of occupation. Thirty-two ranges containing pairs received further visits and at 28 (88%), egg laying occurred. Of these, 23 pairs (82%) hatched young and 22 fledged a minimum of 64 young. Mean brood size per monitored pair was 2.0 young.

Northeast Scotland

The region is divided into four study areas for the purpose of Merlin monitoring and covered by a small team of enthusiasts. Overall, 96 home ranges were checked for occupation in the spring. Fifty-two showed signs of Merlin attendance. Further monitoring checks were carried out 42 home ranges where pairs were present and at 38 ranges (90%), a full clutch of eggs was laid. Hatching success at 92% was high as was fledging success (87%) and 106 young fledged from 33 successful nests. Mean brood size per monitored pair was 2.5.



Level of coverage of Eurasian Hobby

Tayside

Eighty-two home ranges were checked for occupation and there was evidence of Merlin presence at 68 (82%). However, some of this occupancy was only temporary or came from single transient birds. Thirty-six home ranges that held pairs were closely monitored and 31 nests with eggs were found (86%). Twenty-four nests (77%) hatched and fledged young. Nine broods could not be accurately counted so the 64 young that fledged is a minimum figure. The mean brood size per monitored pair of 1.8 is therefore likely to be higher.

Argyll

Checks were carried out at nine home ranges and five had signs of occupation. Four pairs received further visits and all four bred successfully producing 10 young. Mean brood size per monitored pair for this small sample was 2.5 young.

South Strathclyde

The year was a disappointing one for Merlin enthusiasts in this region compared to 2005. Fifteen home ranges were checked and ten (67%) had signs of occupation. Five pairs were monitored but just four pairs laid eggs. Only two succeeded in hatching and fledging young. The six young recorded give a mean brood size per monitored pair of 1.2 young.

Lothian & Borders

Fifty-two home ranges received spring visits and 28 (54%) showed signs of occupation. Seventeen pairs were finally located, monitored and 16 nests with eggs confirmed. There was just one breeding failure, with 15 pairs (94%) producing 45 young. Mean brood size per monitored pair was 2.6 young.

Dumfries & Galloway

Reports were received of eight breeding pairs in the region. Six of them (75%) reached the chick stage and five (63%) fledged a minimum of 12 young. Mean brood size per monitored pair was 1.5 young; a low figure but two broods could not be accurately counted and a minimum of one young was assumed to have fledged from each.

4.14 Eurasian Hobby *Falco subbuteo*

In Highland, a pair of Hobbies nested successfully and fledged at least two young. This was the first confirmed breeding attempt recorded in Scotland since 2002. In 2003 three pairs were located in Highland (Etheridge, 2005), but no young were reared, and in both 2004 and 2005 the records indicated only possible breeding (Etheridge *et al.* 2006, 2007).

4.15 Peregrine Falcon *Falco peregrinus*

There are an estimated 600 pairs of Peregrine Falcon in Scotland (Banks *et al.* 2003). Monitoring coverage is extensive in eastern regions, through the central belt and across southern districts, but poorer in the north and west. Nevertheless, the number of home ranges monitored by Raptor Study Groups is impressive, with 595 home ranges receiving checks in 2006 (Table 15). Of these, 352 (59%) were occupied by a pair and a further 39 (7%) by single birds. A total of 330 possible breeding attempts were monitored. Fifty-eight pairs (18%) failed early in the attempt or were non-breeding and a further 67 pairs (20%) that were confirmed egg layers, failed at a later stage. There were 205 successful breeding pairs (62%) and a minimum of 442 young recorded. Mean brood size per monitored occupied home range was 1.3 young.

Home range occupancy rates for inland and coastal locations are compared in Table 16. Inland eyries have a lower percentage occupancy rate than coastal ones. This finding is similar to that of 2005, though in 2006 the difference between the two was not so marked.

Orkney

Sixteen home ranges were checked in the spring and 14 of them were occupied; 11 (69%) with pairs and 3 with single birds. Five pairs were confirmed to lay eggs with the remaining six pairs either failing early or non-breeding. All five pairs bred successfully and reared a minimum of nine young. Mean brood size per monitored pair was 0.8 young.

Level of coverage of Peregrine Falcon

Uist

Visits were made to 12 known home ranges in the island chain. Nine pairs (75%) and a single bird were present. Six pairs received follow up checks. All six bred successfully (100%) and reared at least 11 young. Mean brood size was 1.8 young per monitored occupied home range.

Highland

The number of home ranges monitored in this region remains at a low level. Spring visits were made to 22 home ranges and 16 (73%) held possible breeding pairs. Two failed early or were non-breeding and another four failed at a later stage of breeding. The ten successful pairs (63%) raised 20 young. Mean brood size was 1.3 young per monitored occupied home range.

Northeast Scotland

Across all habitats in the region, visits were made to 99 known home ranges that have held breeding pairs in previous years. Forty-six (46%) pairs were present and single birds occupied an additional two home ranges. Monitoring checks were carried out on 44 pairs. Fifteen pairs were either non-breeders or failed during early incubation. Of the remaining 29 pairs, 27 bred successfully (61% of those monitored) and reared 52 young. The mean brood size per monitored occupied home range was 1.2 young.

Tayside & Fife

Four regional teams monitor breeding Peregrines in this area. Initial checks were made to 103 home ranges in the region and 59 pairs (57%) and 10 single birds (10%) were present. All 59 pairs received further monitoring checks. Fifteen failed early or were non-breeders (25%) and another fifteen (25%) failed during the breeding attempt. Overall, 29 pairs (49%) fledged a minimum of 54 young. Mean brood size per monitored occupied home range was 0.9 young.

Perthshire and Fife, west of the A9 and M90

Thirty-three home ranges were checked for occupation. Twenty-six were occupied: 22 (67%) by pairs and four by single birds. Of the pairs, ten failed early or were non-breeders and a further pair failed during their breeding attempt. Eleven pairs (50%) succeeded and 19 young fledged. Mean brood size per monitored occupied home range was 0.9 young.

Perthshire and Fife, east of the A9 and M90

There were 27 home ranges checked in this district. Thirteen (48%) held pairs and three held single birds. Off the 13 monitored, one pair failed to lay eggs, another two failed during incubation and finally two pairs failed with small young. The eight (62%) successful pairs reared 12 young. Mean brood size per monitored occupied home range was 0.9 young.

Angus inland

In the glens and on the grouse-moors of Angus, 33 home ranges received checks in the spring. Pairs occupied 16 (48%) and single birds were present at two. Breeding success of the 16 pairs was poor; two failed early or were non-breeding and nine failed during the breeding attempt. There were only five (31%) successful pairs, rearing ten young. Mean brood size was a low 0.6 young per monitored occupied home range.

Angus coastal plain

On lower ground in Angus and along the coast, checks were made at ten home ranges. Eight pairs (80%) and a single bird were found. Two of the pairs failed early or did not breed. Of the six confirmed layers, five (63%) succeeded in rearing 13 young. Mean brood size per monitored occupied home range was 1.6 young. One of the successful pairs was in the City of Dundee.

Central Scotland

Checks were made at 33 home ranges in this region. Twenty-five (76%) held pairs and a further three (9%) had single birds. Further visits were made to 20 pairs. One failed early or was non-breeding and another five pairs failed during the breeding attempt. The 14 successful pairs reared 26 young. Mean brood size per monitored occupied home range was 1.3 young.

Argyll

Mainland

Visits to 18 home ranges revealed 13 (72%) occupied by pairs. Eleven had follow up checks and there was just one failure. Ten pairs (91%) reared 19 young. Mean brood size per monitored occupied home range was 1.7 young. This is a big improvement after the poor breeding success in 2005 when just three young were reared.

Islands (Bute, Coll, Colonsay, Islay & Tiree)

Thirteen home ranges received initial checks and 12 held pairs. Of these, ten received further visits and eggs were laid at all nests. Six pairs succeeded in rearing 14 young. Mean brood size per monitored occupied home range was 1.4 young.

Table 15: Breeding success of Peregrine Falcons in Scotland, 2006.

Region	Home ranges checked	Home ranges occupied by pairs	Home ranges occupied by single birds	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Orkney	16	11	3	11	6	5	5	9
Uist	12	9	1	6	-	6	6	11
Highland								
- Sutherland	4	2	-	2	-	2	2	4
- Easter Ross	6	5	-	5	1	4	3	7
- Inverness	9	6	-	6	1	5	3	7
- Strathspey & Nairn	2	2	-	2	-	2	1	1
- Isle of Eigg	1	1	-	1	-	1	1	1
sub-total	22	16	-	16	2	14	10	20
Northeast Scotland	99	46	2	44	15	29	27	52
Tayside & Fife								
- west of A9 and A90	33	22	4	22	10	12	11	19
- east of A9 and M90	27	13	3	13	1	12	8	12
- Angus inland	33	16	2	16	2	14	5	10
- Angus coastal plain	10	8	1	8	2	6	5	13
sub-total	103	59	10	59	15	44	29	54
Central Scotland	33	25	3	20	1	19	14	26
Argyll								
- mainland	18	13	-	11	-	11	10	19
- Bute, Coll, Colonsay, Islay & Tiree	13	12	-	10	-	10	6	14
sub-total	31	25	-	21	-	21	16	33
South Strathclyde								
- inland	36	20	3	18	2	16	10	22
- coastal	11	9	-	9	-	9	8	19
- Isle of Arran	9	9	-	4	-	4	3	4
sub-total	56	38	3	31	2	29	21	45
Lothian & Borders								
- grouse-moor	29	12	2	11	-	11	9	27
- other upland area	26	15	1	15	4	11	6	13
-lowland farmland	21	17	2	17	3	14	10	26
- urban/industrial	8	6	1	6	2	4	4	8
- sea-cliff/coast	25	12	1	12	2	10	9	25
sub-total	109	62	7	61	11	50	38	99
Dumfries & Galloway								
- Wigtown & Kirkcudbright coast	355	253	45	253	1	22	165	35
- Moffat & Eskdale	20	14	1	14	4	10	9	22
- Nithsdale	26	8	3	8	-	8	3	8
- Galloway inland	33	16	2	16	1	15	11	28
sub-total	114	61	10	61	6	55	39	93
TOTAL	595	352	39	330	58	272	205	442

South Strathclyde

Inland

Thirty-six inland home ranges were checked for occupation. Twenty pairs (56%) and three single birds were located. Monitoring checks were carried out on 18 pairs. Two failed early or were non-breeding and a further six pairs failed during the breeding cycle. There were ten (56%) successful pairs, fledging 22 young. Mean brood size per monitored occupied home range was 1.2 young.

Coastal

Visits were made to 11 coastal home ranges and nine held pairs. All nine were monitored and were believed to lay eggs. There was just a single failure and eight pairs reared 19 young. Mean brood size per monitored occupied home range was 2.1 young.

Table 16: Home range occupancy rates for Peregrine Falcon pairs in Scotland, 2006

Region	Inland	Coastal
Tayside & Fife		
- east of A9 & M90	48% (13/27)	
- west of A9 & M90	67% (22/33)	
Angus	48% (16/33)	80% (8/10)
Central Scotland	76% (25/33)	
Argyll		
- mainland	72% (13/18)	
- islands		92% (12/13)
South Strathclyde	56% (20/36)	82% (9/11)
Lothian & Borders	49% (27/55)	48% (12/25)
Dumfries & Galloway		
- Nithsdale	31% (8/26)	
- Galloway	48% (16/33)	
- Moffat & Eskdale	70% (14/20)	
- Wigton & Kirkcudbright	66% (23/35)	
TOTAL SAMPLE MEAN	55% (174/314)	68% (64/94)

Isle of Arran

Nine home ranges were checked on the island and were occupied by a pair of birds in each case. Four pairs that laid eggs received further checks and three succeeded in rearing a minimum of four young. Mean brood size per monitored occupied home range was 1.0 young.

Lothian & Borders

In this region, a considerable amount of effort is directed in monitoring breeding Peregrines. The detailed submission has allowed the breeding results to be compared across habitats rather than district and this shows some wide variations in home range occupancy, breeding success and productivity.

Grouse-moor

Heather moorland managed for grouse shooting offers much suitable hunting and nesting habitat for Peregrines. Twenty-nine home ranges are known and received early spring visits. Pairs were present at only 12 (41%) and single birds at two. Eleven pairs were monitored and laid eggs. There were two failures and nine pairs (82%) raised 27 young. Mean brood size was high at 2.5 young per monitored occupied home range.

Other upland areas

Away from the grouse moors, on sheep walk and in other upland habitats, 26 home ranges were checked. Pairs occupied 15 home ranges (58%) and a single bird was present at another. At four, the pair either failed early or was non-breeding. Six (40% of pairs monitored) of the remaining 11 pairs were successful, rearing 13 young. Mean brood size per monitored occupied home range was a low 0.9 young.

Lowland farmland

The species has also spread into lowland farmland utilising quarries as nest sites. Twenty-one potential home ranges were visited and 17 (81%) held pairs and two had single birds. Of the pairs, three failed early or were non-breeders. There were 14 pairs that were confirmed to lay eggs and ten (59%) were successful, raising 26 fledged young. Mean brood size per monitored occupied home range was 1.5 young.

Urban/industrial

An increasing number of pairs are using man-made structures such as power stations or town buildings. Eight locations were checked and six pairs (75%) and a single bird were present. Two pairs failed early or were non-breeding. The remaining four (67%) all bred successfully, rearing at least eight young. Mean brood size per monitored occupied home range was 1.3 young.

Coastal

Visits were made to 25 home ranges along the east coast. Twelve pairs (48%) and a single bird were present. All pairs were monitored but two pairs either failed early or were not breeding. Of the ten confirmed layers, nine (75% of monitored pairs) produced 25 flying young. Mean brood size per monitored occupied home range was high at 2.1 young.

Dumfries & Galloway

The Peregrine is a popular species for study in this region as well, and 114 known home ranges received attention in 2006. Sixty-one pairs (54%) and ten single birds (9%) were present. Thirty-nine pairs (64%) were successful and 93 young were reared. Overall, the mean brood size per monitored home range was 1.5 young. The region is divided into one coastal and three inland study areas.

Wigtown & Kirkcudbright coast

Along the south coast in Wigtown and Kirkcudbrightshire, 35 home ranges were checked. Pairs were present at 23 (66%) and single birds at four. There was one early breeding failure and six during a later part of the breeding cycle. The 16 successful pairs (70%) fledged 35 young. Mean brood size per monitored occupied home range was 1.5 young.

Moffat & Eskdale

Twenty home ranges were checked in the area and 14 pairs (70%) and a singleton was present. Four of the pairs failed early or were non-breeding and another failed during incubation. The nine (64%) pairs remaining reared 22 young. Mean brood size per monitored occupied home range was 1.6 young.

Nithsdale

In an area dominated by grouse-moors, the species fared badly. Checks were made at 26 home ranges but just eight (31%) held pairs with an additional three single birds. Of the eight pairs, only three (38%) were successful, rearing eight young. Persecution by shooting was recorded at four home ranges and a brood was lost to an unknown cause at a fifth. Mean brood size was 1.0 young per monitored occupied home range.

Galloway inland

In the most westerly of the three inland study areas, checks were made at 33 home ranges. Sixteen pairs (48% occupancy) and two single birds were present. One pair failed early to an unknown cause and the remaining 15 all laid eggs. There were four failures, two due to a clutch and a brood being robbed by humans. Eleven pairs (69%) successfully reared 28 young. A mean brood size of 1.8 young per monitored occupied home range was recorded.

4.16 Barn Owl *Tyto alba*

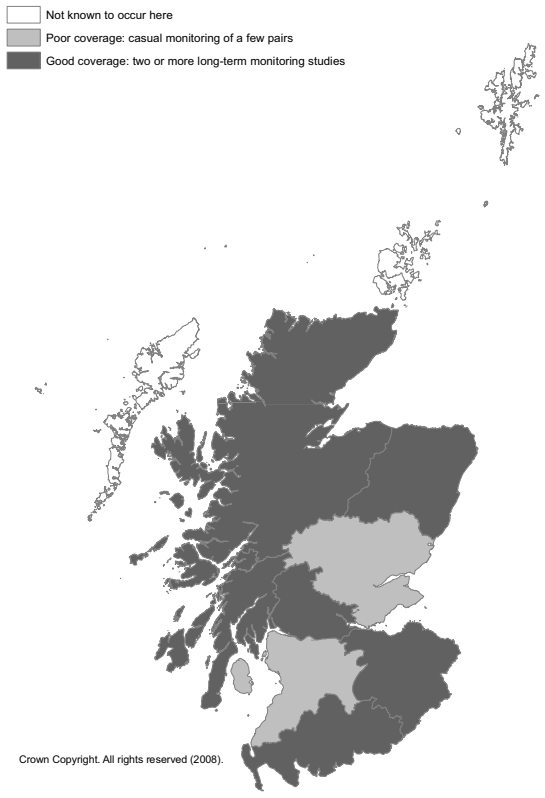
Like the Osprey and Tawny Owl, the focus of attention by Barn Owl field workers is the monitoring of a known nest site (a nest box, farm building or hollow tree), rather than a territory. The last four years have seen a steady increase in the number of nesting locations monitored and this may reflect an increasing Barn Owl population throughout the country. A recent estimate has put the Scottish breeding population at 500–1000 breeding pairs (Shaw 2007). Several factors may have brought about the changing status of this well studied species such as better survival following a run of mild winters, changes in agricultural practices and improved hunting habitat. Barn Owls take readily to man-made boxes and many of the studies in Scotland are based around the provision of these (Taylor & Walton 2003). The milder, predominantly pastoral and forested landscape of Dumfries & Galloway is the Barn Owl's stronghold in Scotland with the species remaining absent only from the treeless Outer Hebrides and Northern Isles. In 2006, checks were made at 368 nesting locations throughout the country (Table 17). Pairs were present at 278 (76%) and single birds at 32 (9%). The breeding attempts of 267 pairs were monitored and 249 (93%) were confirmed to lay eggs. 227 pairs (85%) hatched their eggs and 215 (80%) fledged at least one young (Table 17). There were 591 young counted, giving a mean brood size per monitored pair of 2.2.
These figures are a small improvement after the 3-year low recorded in 2005.

Highland

Based on the records of Highland Raptor Study Group, breeding pairs are slowly expanding northwards into Caithness and westwards through Sutherland and Ross-shire. Forty-two nesting locations were checked for occupation and 25 pairs (60%) were present. Further monitoring checks were carried out on 23 pairs and at least 21 laid clutches of eggs. Nineteen pairs hatched their eggs and 16 (70% of monitored pairs) succeeded in fledging 50 young. Mean brood size per monitored pair was 2.2 young.

Northeast Scotland

A sample of 34 nesting locations was checked and 20 pairs (59% of those checked) were located. Eighteen pairs received follow up checks and 16 were known to lay eggs. Nesting success was high with 15 pairs (83%) rearing young. The 40 young recorded give a mean brood size per monitored pair of 2.2.



Level of coverage of Barn Owl

Central Scotland

Thirty-nine pairs were present in one study area and 37 were closely monitored. All 37 pairs laid eggs with 32 pairs (86%) reaching the hatching stage. There were no failures during chick rearing and 82 young fledged. Mean brood size per monitored pair was again 2.2 young.

Argyll

Good samples of breeding pairs were monitored in Kintyre & Knapdale, in Cowal and on neighbouring Bute. A single pair was monitored on Islay. In total, 47 nesting locations were checked for owls and 42 (89%) held pairs. Thirty-eight received further visits, and 36 were known to lay eggs. Thirty-two pairs reached hatching but six further failures during the fledging period reduced hatching success. Twenty-six pairs (68%) reared 75 young. Mean brood size per monitored pair was 2.0 young.

Lothian & Borders

Forty-six nesting pairs were monitored in this region and 40 (87%) bred successfully, rearing 116 young. Mean brood size per monitored pair was 2.5 young.

Dumfries & Galloway

A large sample of 160 known nesting locations was examined in three study areas during the spring and 106 pairs (66%) and 18 (11%) single birds were present. Of these, 105 pairs were

Table 17: Breeding success of Barn Owls in Scotland, 2006.

Region	Nesting locations checked	Occupied by pairs	Occupied by single birds[1]	Pairs monitored	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Highland	42	25	7	23	21	19	16	50
Northeast Scotland	34	20	2	18	16	15	15	40
Central Scotland	39	39	-	37	37	32	32	82
Argyll								
- Kintyre & Knapdale	21	18	3	18	18	15	13	32
- Cowal & Bute	22	20	2	19	17	16	12	40
- Islay	4	4	-	1	1	1	1	3
sub-total	47	42	5	38	36	32	26	75
Lothian & Borders	46	46	-	46	46	-	40	116
Dumfries & Galloway								
- Galloway Forest	17	13	2	13	12	12	12	37
- West Wigtonshire	104	66	16	66	55	52	49	125
- Kircudbrightshire & Dumfries	39	27	-	26	26	25	25	66
sub-total	160	106	18	105	93	89	86	228
TOTAL	368	278	32	267	249	227	215	591

[1]includes nesting locations with fresh signs of occupation but no birds seen or breeding

monitored, at least 93 (89%) laid eggs and 86 (82%) succeeded in fledging at least one chick. The 228 fledged young recorded in the region give a mean brood size per monitored pair of 2.2 young.

Galloway Forest

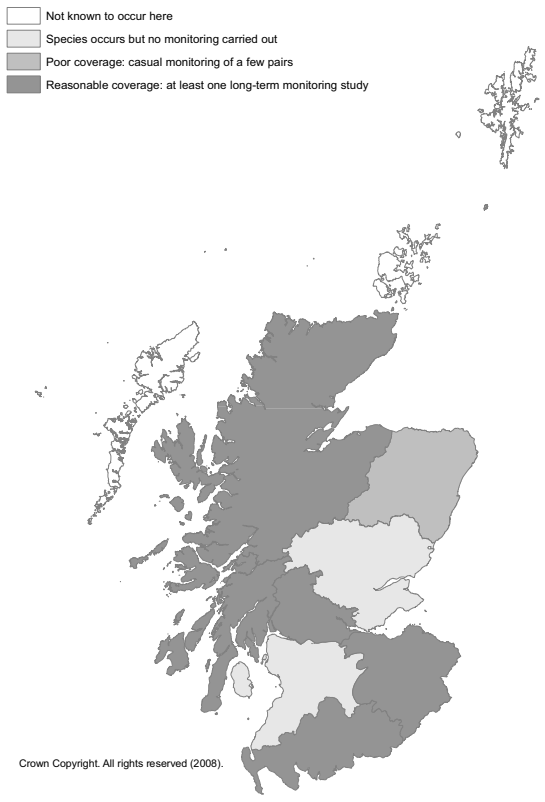
Seventeen nesting locations were checked and 13 (76%) held pairs and received further checks. Twelve were known to lay eggs and all nested successfully rearing 37 young. A mean brood size of 2.8 young per monitored pair was recorded.

West Wigtownshire

An impressive 104 known nesting sites were examined and 66 (63%) held pairs with a further 16 (15%) with single birds. All 66 pairs were monitored and at least 55 laid eggs. There were six further failures during the breeding season and 49 pairs (74%) fledged 125 young. Mean brood size per monitored pair was 1.9 young.

Kirkcudbrightshire & Dumfries

Visits were made to 39 known nesting locations in the spring and 27 (69%) pairs were present. Follow-up visits were carried out on 26 nesting pairs. There was only one breeding failure amongst them, with 25 pairs fledging 66 young. Nesting success at 96% was high and the mean brood size per monitored pair was 2.5.



Level of coverage of Tawny Owl

4.17 Tawny Owl *Strix aluco*

Since 2003, there has been a steady increase in Tawny Owl nest data submitted. This was maintained in 2006 with a 34% rise; up from 92 nest histories in 2005 to 123 this year (Table 18). The great majority of active nests monitored are situated in nest boxes that are provided to encourage occupation by owls and to allow easy access for studies of breeding success. Across Scotland, 72% of nesting pairs bred successfully and fledged 173 young, giving a mean brood size of 1.4 young per breeding pair.

Highland

2006 was a poor year in a long running Easter Ross study where the rate of nest-box occupation by breeding pairs fell to 53% from 74% in the previous year. However, breeding success (72%) and productivity (1.3 young per nesting pair) were both very similar to 2005. The nearby Black Isle nest box study based in commercial forests attracts few birds and may be affected by the

Table 18: Breeding success of Tawny Owls in Scotland, 2006.

Region	Nest boxes checked	Nest boxes occupied	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Highland					
- Black Isle	23[1]	4	4	1	2
- Easter Ross	34	19	18	13	23
- other areas	7	7	7	7	10
sub-total	64	30	29	21	35
Northeast Scotland	7	5	5	5	11
Argyll	50	50	50	30	65
Lothian & Borders	29	28	24	21	41
Dumfries & Galloway	18	15	15	11	21
TOTAL	168	128	123	88	173

[1]many boxes had signs of Pine Marten occupation

presence of Pine Martens, as there is evidence of their visits in many boxes. Only four boxes (17%) had nesting Tawny Owls and only one (25%) reared any young.

Northeast Scotland

In this region, a small sample of boxes was monitored but they suggest that the breeding Tawny Owls fared better than in Highland. Seven boxes were checked and five (71%) were occupied by nesting pairs. All five bred successfully, rearing 11 young. Mean brood size per nesting pair was 2.2 young.

Level of coverage of Long-eared Owl

Argyll

A sample of 50 nesting pairs was monitored in a forest study on the Cowal peninsula. The average clutch size obtained from 45 boxes was 2.6 eggs. Eight nests failed due to predation of eggs or young by Pine Martens. Thirty pairs (60%) bred successfully. With 65 fledged young, the mean brood size of per nesting pair was 1.3 young.

Lothian & Borders

Tawny Owls did well in the sample of 29 boxes checked. Twenty-eight (97%) were occupied and 24 pairs laid eggs and were monitored. Of these, 21 (88%) succeeded in fledging 41 young. Mean brood size per nesting pair was 1.7 young.

Dumfries & Galloway

Of 18 boxes checked, 15 (83%) were occupied by breeding pairs. Eleven pairs (73%) succeeded in rearing 21 young. Mean brood size was 1.4 young per nesting pair.

4.18 Long-eared Owl *Asio otus*

Compared with 2005, there was a 100% increase in the number of known Long-eared Owl territories checked for occupation in 2006 (Table 19). However, this remains a much under-recorded species in Scotland. Given its secretive nature, this is not surprising. In the Uists, birds were found in five suitable locations but there were no follow up checks. In Highland, three nests were successful from which at least four young fledged. In Northeast Scotland, two nesting pairs were found but only one bred successfully, rearing an unknown number of young. A Tayside nest was also successful and fledged two young. In Argyll, three territorial pairs were found on Colonsay. Two pairs laid eggs and reared a minimum of five young. Finally, in Lothian & Borders, six territories showed signs of occupation. A single nest found reared three chicks. Combining this information shows that there were 20 occupied territories located in 2006. Nine breeding pairs were monitored and eight reared at least 15 young.

Table 19: Breeding success of Long-eared Owls in Scotland, 2006.

Region	Known territories checked for occupation	Territories showing signs of occupation	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Uists	5	5	-	-	-
Highland	3	3	3	3	4+
Northeast Scotland	12	2	2	1	1+
Tayside	1	1	1	1	2
Argyll - Colonsay	3	3	2	2	5+
Lothian & Borders	8	6	1	1	3
TOTAL	32	20	9	8	15+

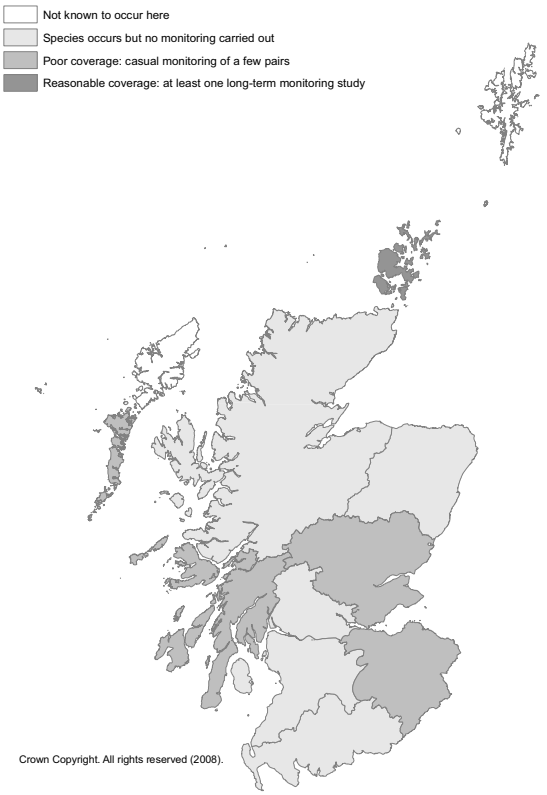
Table 20: Breeding success of Short-eared Owls in Scotland, 2006

Region	Pairs or single birds present	Nests found	Nests monitored	Pairs fledging young	Minimum number of young fledged
Orkney	35	2	2	2	2+
Uists	22	8	1	1	1+
Tayside	2	0	-	-	-
Argyll	9	4	4	4	9+
Lothian & Borders	13	4	3	3	8+
TOTAL	81	18	10	10	18+

4.19 Short-eared Owl *Asio flammeus*

The two species of eared owls are much overlooked in the breeding season. Whilst the Long-eared Owl is considered resident, the Short-eared Owl tends to be nomadic in response to changing prey abundance, moving away from areas where voles are scarce and quickly colonising those where voles are more abundant. The Short-eared Owl's response to these changes can mean that breeding pairs can be widespread in one region yet totally absent in another. Such was the case in 2006, where on the Uists and Orkney, pairs or single birds were present at a minimum of 22 and 35 sites respectively, whilst in Highland there were no records for the second year running (Table 20). Despite the finding of 81 pairs or single birds in suitable habitat in the spring of 2006, only 18 nests were discovered and just ten monitored. All ten were successful, but very few broods were accurately counted and the 18 young seen is a minimum figure.

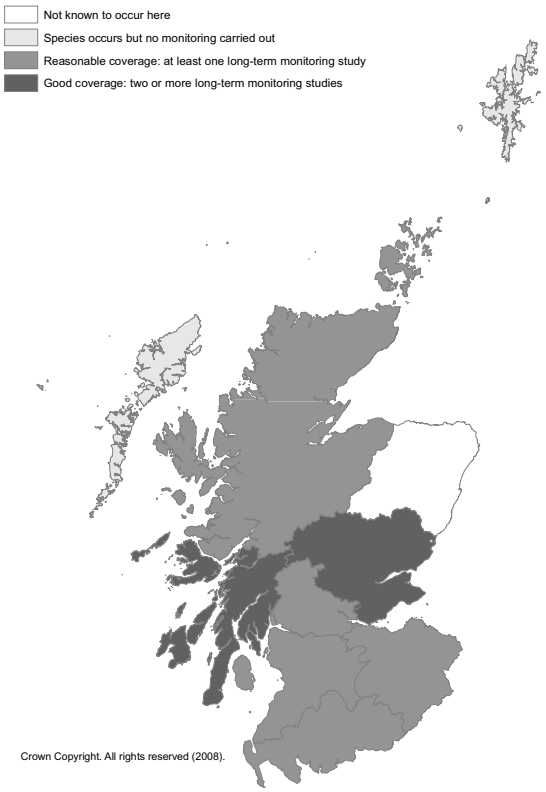
2006 was the first breeding season of a two-year study by SRMS partners to assess possible field techniques for surveying Short-eared Owls (Wernham & Humphreys 2006). Fieldwork was carried out within three Scottish breeding areas (Ayrshire, Borders and Perthshire), in liaison with local raptor workers. The work aimed to assess the detectability of breeding owls at different times of day and stages of the breeding cycle, and suitable detection distances from vantage points. Point counts from road routes driven through suitable Short-eared Owl habitat were also tested as a possible method for indexing between-year changes in the abundance of breeding owls over a wider geographical area. Following analyses of the 2006 data (Calladine *et al.* 2007), a further breeding season of fieldwork was agreed, to establish whether or not 2006 was a representative year, to test a practical survey protocol, and to further assess the attractiveness of the road point count surveys to volunteers.



Level of coverage of Short-eared Owl

4.20 Common Raven *Corvus corax*

In the south of their Scottish range, particularly in Lothian & Borders, an increasing number of Raven pairs (and proportion of the population) are nesting in trees, a practice still unknown further north, in Highland and the islands. As this habit spreads through the population, the species could increasingly colonise lower agricultural ground and thus, be less affected by the persecution it is believed to suffer in some upland areas. 2006 saw a substantial 25% increase in the number of home ranges monitored, together with improved recording of breeding success. In total, 360 home ranges were visited and 324 (90%) held pairs. Follow up visits were made on 289 pairs. A minimum of 249 pairs laid eggs, the remaining 40 either failed early or were non-breeding. Two hundred and twenty-three pairs (90%) hatched their eggs and there were 217 successful pairs (87%) fledging at least 603 young. This is a minimum figure as broods in 25 nests could not be counted and were classed at 1+ young. If it were assumed that the average brood size from this sample of the 25 nests would be similar to the other 192 that were counted, the overall mean brood size per monitored pair would be 2.2 young.



Level of coverage of Common Raven

Orkney

In an on-going study on Mainland, 49 pairs attempted to nest and a further two pairs held territory but did not breed. Thirty-six pairs (71%) bred successfully and fledged 89 young. Mean brood size per monitored pair was 1.7 young.

Highland

Checks were carried out at 19 mainland home ranges and 18 pairs were found. Sixteen pairs were monitored and fifteen were confirmed to lay eggs. Of these, 11 (69%) nested successfully, rearing 39 young. On Eigg, all five pairs bred successfully, rearing 13 young. The overall mean brood size was 2.5 young per monitored pair.

Tayside

Angus & Fife

In the eastern part of the region, 18 home ranges were checked for occupation and 15 pairs (83%) were present. Twelve pairs received follow up visits. Four pairs either failed early or were non-breeding. Of the eight pairs (678%) that laid eggs, seven bred successfully (58% of those pairs monitored), fledging 19 young. Mean brood size per monitored pair was 1.6 young.

Perth & Kinross

To the west, visits to 46 home ranges were visited and 42 pairs located (91%). Forty pairs of Ravens received further visits, and 36 were confirmed to lay eggs, the other four either failing early or not breeding. Subsequently, there was just a single failure and 35 pairs (88%) fledged 85 young. Mean brood size was 2.1 young per monitored pair.

Central Scotland

In this region, checks to 34 home ranges in the early spring revealed the presence of 30 pairs (88%). Twenty-eight pairs were revisited but a large number of them (36%) had failed early or were non-breeding. Of the 18 pairs that laid eggs, there were only three failures and 15 (54%) successful pairs reared 35 young. Mean brood size was 1.3 young per monitored pair.

Argyll

Colonsay, Islay and Tiree

On the islands, 38 pairs were checked for occupation and 33 pairs (87%) were present. Monitoring checks were made on 26 pairs. Four pairs either failed early or were non-breeding, but the remaining 22 bred very successfully, rearing 83 young. Mean brood size per monitored pair was an excellent 3.2 young.

Cowal, Bute and Kintyre

Elsewhere in Argyll, checks were made at 66 home ranges. Pairs were present at 56 (85%) ranges and 44 received repeat visits. Eight pairs failed early or did not breed. Of the 36 pairs that were confirmed to lay eggs, there were six further failures. The 30 successful pairs (68%) raised at least 69 young. Mean brood size per monitored pair was 1.6 young.

South Strathclyde

Inland

Visits were made to 16 home ranges. Fourteen (88%) held pairs and 13 received follow up checks. Two failed early or were non-breeding and the eleven laying pairs all bred successfully fledging 29 young. Mean brood size per monitored pair was 2.2 young.

Coastal

At coastal locations five pairs all succeeded and produced 15 young. Mean brood size per monitored pair was 3.0 young.

Lothian & Borders

There are several cliff nesting pairs along the east coast, but the majority of inland birds are tree nesting and the number of pairs found in this habitat are steadily increasing. Early spring visits were made to 29 home ranges of which 26 held pairs and received further monitoring visits. Two pairs were thought to be non-breeding, the remaining 24 pairs all laid eggs and with only

Table 21: Breeding success of Common Ravens in Scotland, 2006.

Region	Home ranges checked	Home ranges occupied by pair	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs hatching young	Pairs fledging young	Minimum number of young fledged
Orkney	[51]	51	51	2	49	[36]	36	89
Highland								
- mainland	19	18	16	1	15	14	11	39
- Eigg	5	5	5	-	5	5	5	13
sub-total	24	23	21	1	20	19	16	52
Tayside								
- Angus & Fife	18	15	12	4	8	7	7	19
- Perth & Kinross	46	42	40	4	36	35	35	85
sub-total	64	57	52	8	44	42	42	104
Central Scotland	34	30	28	10	18	15	15	35
Argyll								
- Colonsay, Islay, & Tiree	38	33	26	4	22	22	22	83
- Bute, Cowal & Kintyre	66	56	44	8	36	33	30	69
sub-total	104	89	70	12	58	55	52	152
South Strathclyde								
- inland	16	14	13	2	11	11	11	29
- coastal	5	5	5	-	5	5	5	15
sub-total	21	19	18	2	16	16	16	44
Lothian & Borders	29	26	26	2	24	23	23	74
Dumfries & Galloway								
- inland	21	17	14	3	11	8	8	24
- coastal	12	12	9	-	9	9	9	29
sub-total	33	29	23	3	20	17	17	53
TOTAL	360	324	289	40	249	223	217	603

a single breeding failure, 23 pairs reared at least 74 young. The mean brood size was 2.8 young per monitored pair.

Dumfries & Galloway

Inland

Pairs were present at 17 (81%) out of 21 home ranges at inland sites. Monitoring checks were carried out on 14 pairs and three were early failures or held non-breeding pairs. Another three failed during incubation. Eight successful pairs (57%) reared 24 young. Mean brood size per monitored pair was 1.7.

Coastal

At coastal breeding locations, nine pairs were monitored. All were successful rearing 29 young. Mean brood size per monitored pair was 3.2 young.

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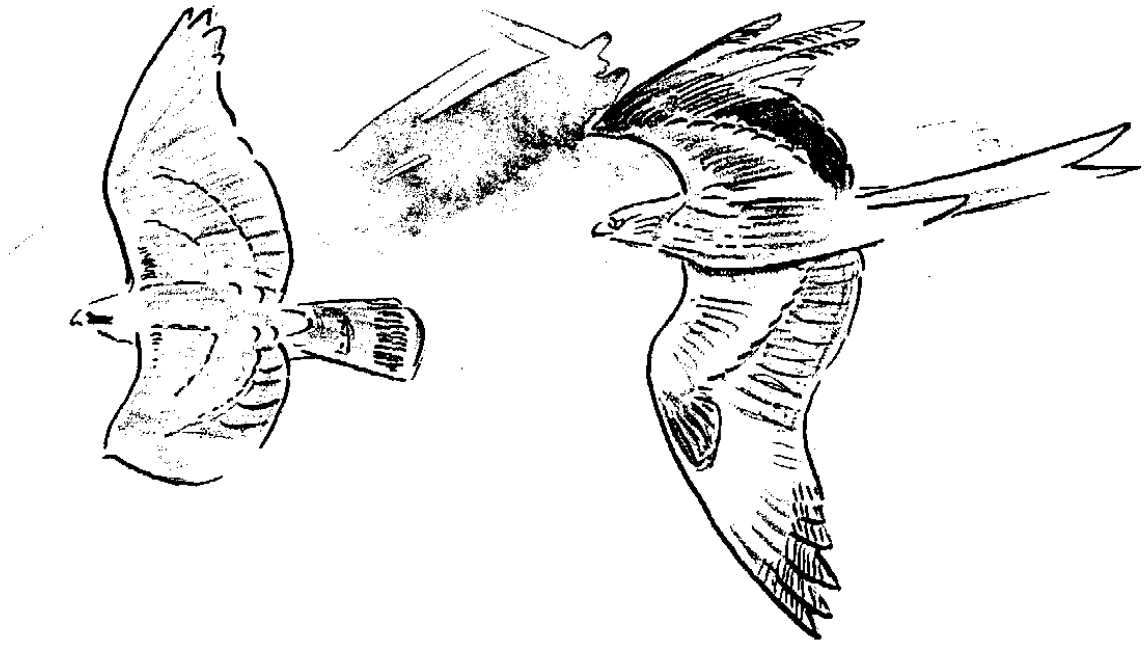

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Annex 1: Raptor, owl and Common Raven nest site and home ranges data submitted under the Scottish Raptor Monitoring Scheme in 2006.

Species	Argyll RSG	Central Scotland RSG	Dumfries & Galloway RSG	Highland RSG	Lothian & Borders RSG	Northeast Scotland RSG	Orkney RSG	South Strathclyde RSG	Tayside RSG	Uist RSG	Shetland	RSPB Scotland	TOTAL
European Honey-buzzard				5									5
Red Kite		[37]	[19]	[71]					[20]			147	147
White-tailed Eagle												36	36
Eurasian Marsh Harrier				2		3	2		7				14
Hen Harrier	143	5	22	34	4	20	71	40	46	43			428
Northern Goshawk			24	5	57	30							116
Eurasian Sparrowhawk	5			4			10	64	1				84
Common Buzzard	123	136		108	76		7	12	14	23			499
Golden Eagle	74	8	4	122	3	20			31	28			290
Osprey	11	21	3	106	12	19			34				206
Common Kestrel	10			10	35	8	4	42	3	1			113
Merlin	9		8	80	52	96	21	15	82	24	75		462
Eurasian Hobby				2									2
Peregrine Falcon	31	33	114	22	109	99	16	56	103	12			595
Barn Owl	47	39	160	42	46	34							368
Tawny Owl	50		18	64	29	7							168
Long-eared Owl	3			3	8	12			1	5			32
Short-Eared Owl	9				13		35		2	22			81
Common Raven	104	34	33	24	29		51	21	64				360
TOTAL	619	276	386	633	473	348	217	250	388	158	75	183	4006

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

Annex 1 shows the total number of all breeding sites and home ranges (by Raptor Study Group (RSG) area) checked in 2006 and reported under the SRMS. The sources of data are listed in the Acknowledgments. This includes traditional nesting sites and home ranges that were found unoccupied during survey visit(s), and also sites and home ranges which were found occupied but received no follow-up visits, so their breeding success is unknown. Some area breakdowns are not given to protect localities.

Annex 2: Raptor, owl and Common Raven breeding attempts monitored under the Scottish Raptor Monitoring Scheme in 2006.

Species	Argyll RSG	Central Scotland RSG	Dumfries & Galloway RSG	Highland RSG	Lothian & Borders RSG	Northeast Scotland RSG	Orkney RSG	South Strathclyde RSG	Tayside RSG	Uist RSG	Shetland	RSPB Scotland	TOTAL
European Honey-buzzard				1									1
Red Kite		[19]	[17]	[40]					[11]			87	87
White-tailed Eagle												31	31
Eurasian Marsh Harrier				1		1			7				9
Hen Harrier	65	2	19	27	4	13	71	13	33	31			278
Northern Goshawk			17	2	25	21							65
Eurasian Sparrowhawk	2			4			8	32	1				47
Common Buzzard	53	95*		92	66		2	8	14	7			337
Golden Eagle	57	8	2	96	3	16			14	22			218
Osprey	10	18	3	74	6	19			25				155
Common Kestrel	2			9	20	8	3	28	3	1			74
Merlin	4		8	32	17	42	21	5	36	7	17		189
Eurasian Hobby				1									1
Peregrine Falcon	21	20	61	16	61	44	11	31	59	6			330
Barn Owl	38	37	105	23	46	18							267
Tawny Owl	50		15	30	28	5							128
Long-eared Owl	2			3	1	2			1				9
Short-Eared Owl	4				3		2			1			10
Common Raven	70	28	23	21	26		51	18	52				289
TOTAL	378	208	253	432	306	189	169	135	245	75	17	118	2525

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 Raptor Study Group (RSG) area) that were found to be occupied and which received follow-up visits in 2006, i.e. they were effectively monitored to enable breeding success and productivity to be estimated. Some area breakdowns are not given to protect localities.