SCOTTISH RAPTOR MONITORING SCHEME

REPORT 2009

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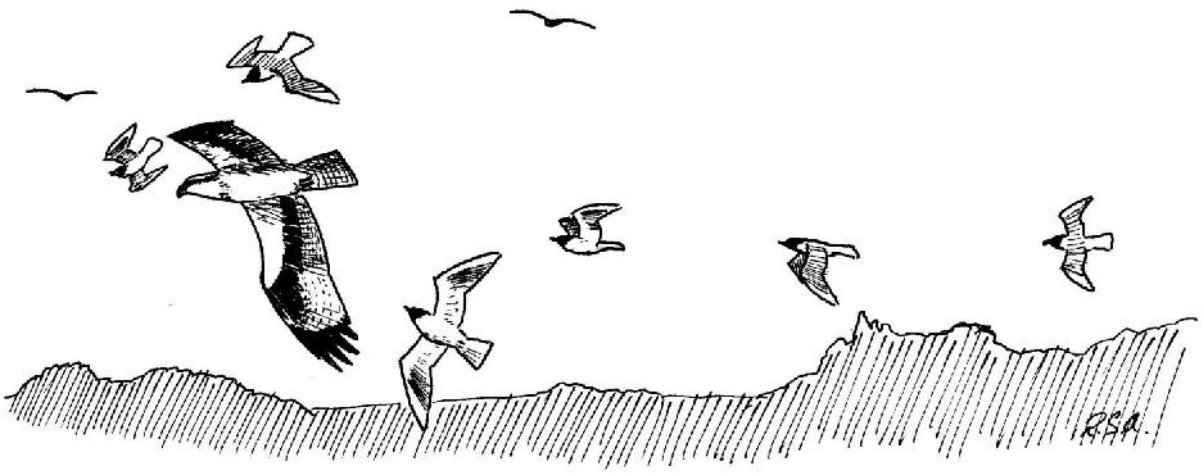


Foreword

One thing I think everyone involved with the Scottish Raptor Monitoring Scheme wants to see is progress, and I think we now are 'on a roll' with this 2009 report helping with the catch up on the backlog of annual reporting. Even though financial times are harsh we have also made significant strides in the database management and are starting to put the Scheme data to use in other ways, for example in looking at providing trends and indicators from the data. This is important work as the Scheme needs to generate good quality outputs to inform everyone of the health of Scotland's raptor populations and I'm confident we are heading in the right direction.

The need for the information from the Scheme has if anything increased, be it for example in relation to impacts of development, especially renewable energy projects or to help fully put the impacts of illegal persecution on raptors into context.

I would also take this opportunity to reinforce some of the appeals made in the report about improving coverage of species such as Sparrowhawk, Buzzard, Kestrel and most of the owls. Although there are some excellent regional studies of most of these species more reporting of these species generally would be extremely helpful to the Scheme. This is particularly so for the Kestrel as the BTO Breeding Bird Survey is indicating a much larger and more worrying decline in Scotland than in the UK as a whole.

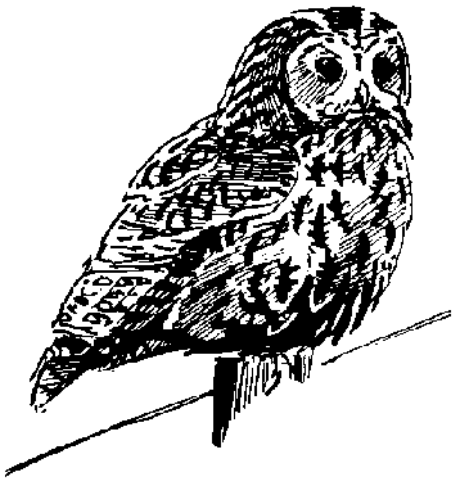
The annual reports of the Scheme highlight the huge amount of fieldwork that is undertaken each year and it was notable at the Raptor Research Foundation Conference at Pitlochry in 2009 that many foreign delegates remarked on the high level and quality of both professional and amateur monitoring of raptors that goes on in Scotland. So a huge thank you to all those who have contributed data to the Scheme.

In 2009 the Scheme achieved further recognition by winning first prize in the Institute of Ecology and Environmental Management's prestigious award for best practice in the UK. Key factors in this victory were the role of volunteer fieldworkers in collecting valuable environmental data, the partnership approach to working within the Scottish Raptor Monitoring Group, the research that has been undertaken into the conservation status of birds of prey and the publication of the raptor survey guide (Hardey *et al.* 2009).

I would like to thank the following for all their work: David Stroud (Joint Nature Conservation Committee), Patrick Stirling-Aird, Wendy Mattingley, Alan Heavisides and Jon Hardey (Scottish Raptor Study Groups), Chris Wernham, Liz Humphreys, Staffan Roos and Anne Cotton (British Trust for Ornithology, Scotland), Mark Holling (Rare Breeding Birds Panel), Arjun Amar, Duncan Orr-Ewing and Jeremy Wilson (Royal Society for the Protection of Birds, Scotland), Gordon Riddle (Scottish Ornithologists' Club), Nigel Buxton and Des Thompson (SNH), Brian Etheridge and Helen Riley for supporting the secretariat. In particular, I would like to thank the Raptor Monitoring Officer, Brian Etheridge, for leading the compilation of this report, and for his tireless work for the Scheme.

Andrew Stevenson

Chair of the Scottish Raptor Monitoring Group



SCOTTISH RAPTOR MONITORING SCHEME – REPORT 2009

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1 Introduction

This is the seventh report of the Scottish Raptor Monitoring Scheme, covering the year 2009. The aim of the report, as in previous years (Etheridge, 2005; Etheridge *et al.*, 2006, 2007, 2008, 2010, 2011) is to provide clear and factual information on breeding birds of prey in Scotland.

The Scottish Raptor Monitoring Group is moving towards making much more effective use of Scheme data to underpin raptor conservation efforts. A review of data submitted to the Scheme thus far has been completed, and we are particularly looking forward to catching up with the annual reports, to developing trends reporting for raptors in Scotland (the first trends will be published as an SNH commissioned report shortly; Roos *et al.* in prep.), and to making information available on a Scheme website.

1.1 Scottish Raptor Monitoring Scheme (SRMS)

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

1.2 Scottish Raptor Study Groups (SRSGs)

The SRSGs form a consortium of eleven regional raptor study groups (Figure 1) active during 2009 with a combined membership of over 260 amateur and professional ornithologists. Members have extensive expertise in the field study of breeding birds of prey and conduct these studies largely in their own time. They have provided the bulk of the data collected in this report on raptor numbers, distribution and productivity. Now that the majority of data submitted to the SRMS come in electronically on the MS Excel recording spreadsheet, some of the routine data checking and processing can be done automatically, and the standard tables for the annual report can be generated more quickly and efficiently. We are very grateful to all those SRSG Members who now submit their data in this way, and encourage those that do not to please attempt this (with assistance from the RMO if required) in future. This will mean that information can be processed and reported more quickly and made available for important raptor conservation purposes.

1.3 Scottish Raptor Monitoring Group (SRMG)

The SRMG consists of representatives of the seven organisations who were signatories to the SRMS agreement. They meet up to four times a year and oversee the work of the scheme. A part-time Raptor Monitoring Officer (RMO), funded by SNH and employed by BTO Scotland, 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. The group is pleased to see numbers of raptor workers increasing, and is promoting this through the SRSG website (www.scottishraptorgroups.org/) and various publications (e.g. Thompson *et al*., 2010).

2 Breeding report for 2009

2.1 Introduction

Members of the eleven regionally based raptor study groups in Scotland (Figure 1), all of which are part of the Scottish Raptor Study Groups, were the main contributors to this breeding report. Important data were also supplied by species officers employed by RSPB Scotland, primarily to monitor the reintroduced populations of Red Kite and White-tailed Eagle. Other organisations supplying data were Haworth Conservation Ltd, Natural Research Ltd and RPS Group. Rare Breeding Birds Panel data were also extracted from the annual returns to SNH and BTO by the small number of Schedule 1 licence holders who are not members of the SRSGs. Annex 1 provides a regional breakdown, based on Scottish Raptor Study Group boundaries (Figure 1), of the raptor home ranges that received at least one visit in the spring of 2009 to check on occupancy. A total of 4472 home ranges were visited. Not all these home ranges will hold pairs: some have only single birds and others are apparently vacant. If the monitoring effort is carried out rigorously each year, the occupancy rate expressed as a percentage of home ranges visited may reflect changes in population levels. Equally important are follow up visits to confirm the findings of the first visit and to monitor the nesting success of pairs present. This nesting success, normally expressed as the percentage of monitored pairs producing fledged young, together with the mean brood size, can also provide a window on the health of the population. A regional summary of monitored pairs is provided in Annex 2. This shows that 2592 potential breeding pairs received further visits enabling their nesting success to be determined.

2.2 Observer coverage

For some of the scarcer species, such as Red Kite, Marsh Harrier, White-tailed Eagle and perhaps Osprey, a high proportion of the breeding population, reaching 90-100% for some species, is monitored each year, mainly by RSPB personnel and specialist groups. Amongst amateur fieldworkers, the appeal of carrying out fieldwork on open moorland and mountain habitats is strong. Thus four widely but thinly spread upland species, Hen Harrier, Golden Eagle, Merlin and Peregrine Falcon, with Scottish breeding populations in the range of 400–800 pairs, receive excellent coverage, with up to 50% of the breeding population monitored annually. Also receiving good coverage are two lowland owl species, Barn and Tawny Owl, both because they readily adapt to nest boxes, thus allowing easier study. Common Buzzard and Common Raven attract support from a growing number of raptor enthusiasts, though there are several substantial regional gaps in coverage for the former offering monitoring opportunities for new fieldworkers. A few species in Scotland, either because of their extreme scarcity (Honey-buzzard and Hobby), sporadic occurrence and/or secretive behaviour (Short-eared and Long-eared Owl), present challenges as far as monitoring is concerned. Two widespread species attract little attention from the majority of field workers. Coverage of breeding Eurasian Sparrowhawks and Common Kestrels needs to increase if we are to achieve effective monitoring to determine estimates of population size, annual productivity and long-term trends. This requirement is becoming ever more urgent as the declining status of these two species, in particular the Common Kestrel (Risely *et al.*, 2011), is now causing concern.

2.3 Occupation of home ranges

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

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

Cyclic changes in the annual and seasonal abundance of the Field Vole *Microtus agrestis* can have a profound effect on the breeding success on a number of raptor and owl species (e.g. see Lambin *et al.*, 2000; Petty *et al.*, 2000), particularly Common Kestrel, Barn Owl and Short-eared Owl (Village 1990; Korpimaki & Norrdahl, 1991; Taylor, 1994). If vole populations reach a peak during the spring and summer months, these predators can respond with an increase in the number of pairs settling to breed and corresponding increases in brood size, nesting success and productivity. Conversely, when vole numbers are low, the reverse can occur. Through much of 2009 vole numbers remained low following a crash in numbers the previous year. This appears to have had a marked impact on the numbers of Common Kestrel, Barn Owl and Tawny Owl found breeding and all three species had poorer productivity than previous years. There is an indication that Common Buzzard may also have been affected as home range occupancy rates fell to their lowest since monitoring began in 2003. Conversely, there were high numbers of another vole specialist, the Short-eared Owl, in the Uists and Orkney, suggesting the vole abundance in these islands are out of synchrony with mainland populations.

2.4 Terminology

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

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

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

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

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

Occupancy - a nesting range is occupied if a single bird or pair of birds is recorded during the breeding season, usually on more than one occasion, or if there

is strong evidence that birds are present (moulted feathers, pellets, plucks, faecal splash).

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

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

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

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

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

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

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

2.5 Estimating breeding success: a note of warning

Ideally, all breeding attempts should be monitored from the start of pair formation to either breeding failure or the successful fledging of young. In a national report of this size using data from a wide range of field workers, this ideal is not always achievable. The timing of survey visits may bias estimates of raptor breeding success. Individual fieldworkers often cover large geographical areas so first visits to different parts of the study area must necessarily be staggered, and usually areas which held breeding pairs of a target species in the previous year are prioritised. First visits to an area that occur later in the season may miss breeding attempts that failed early and overestimate nesting success. Non-breeding territorial pairs are a common component in raptor populations and these can be easily overlooked, exacerbating the problem. Therefore, there is a bias in favour of detection of nesting attempts that have a longer period of survival. In particular, nests are most likely to be found and examined at the chick stage; this places a strong positive slant on estimations of breeding success, as failure is more likely to occur at the pre-lay stage or during incubation. In the early years of the SRMS, it was not always possible to determine from data submitted at what stage in the breeding cycle individual nests were found, nor in many cases of nest failure, what caused this to happen. The nest recording spreadsheet introduced at the start of 2005 (updated in 2009) and now widely adopted by raptor workers is helping to address these issues, and raptor observers are strongly encouraged to submit information on the dates that they carry out monitoring visits.

2.6 Persecution

Many factors influence the numbers, distribution and productivity of birds of prey in Scotland. A large proportion of the uplands, particularly in the south and east of Scotland, is managed for driven grouse shooting. Gamekeepers are employed to manage the

heather through regular burning and cutting to maximise the number of Red Grouse *Lagopus lagopus* available for shooting, and to control common and widespread predators such as crows *Corvus spp.*, stoats *Mustela erminea*, weasels *Mustela nivalis* and foxes *Vulpes vulpes*. However, research has shown that illegal activities directed at birds of prey such as nest destruction and the killing of sub-adults and adults, are adversely affecting the conservation and status of several species, and are associated with some intensively managed grouse moors. On many such areas some raptor species are scarce or absent and many attempts to breed fail (Etheridge *et al.*, 1997; Hardey *et al*., 2003; Whitfield *et al.*, 2004a & b, 2008; Fielding *et al.*, 2011; Redpath *et al.*, 2010). This can have a severe effect on species at a local, regional and national level by reducing the number of breeding pairs present and their breeding success. It also impacts on surrounding populations, if birds are drawn into areas of apparently suitable habitat which are unoccupied because previous inhabitants have evidently been removed – the so-called "black hole" or "ecological trap" effect (Whitfield *et al.*, 2004a). Population modelling has indicated that persecution is responsible for an estimated 3–5% of annual deaths of adult golden eagles, and in the absence of this mortality the Scottish population would increase (Whitfield *et al.*, 2004b, 2008). Illegal poisoning is also a major cause of poor population growth of re-introduced Red Kites in north Scotland, compared with similar populations in England (Smart *et al.,* 2010). A negative association has been found between recorded incidents of Hen Harrier persecution in different areas of Scotland and the proportion of successful nests, and there is mounting evidence that illegal persecution is causing many breeding attempts to fail in a number of areas (Fielding *et al.,* 2011).

Such illegal interference may diminish the enthusiasm of a volunteer raptor worker for monitoring raptors in what he or she perceives to be a hostile environment. Consequently there appears to be a shift of survey effort away from some grouse-moors, particularly where this form of land management is dominant at the regional scale. This means that:

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

(ii) persecution and other forms of nest failure may be under-recorded.

Ongoing SRMS work is examining differences in survey effort, habitat and the causes of breeding failure with the aim of addressing whether these issues do indeed lead to any biases in the data collected and conclusions relating to human interference.

The Scheme aims to provide intelligence and evidence relating to alleged illegal persecution to the National Wildlife Crime Unit. The Scheme makes a direct input to the recently formed Raptor Task Group formed under the Partnership for Action against Wildlife Crime (PAW). PAW publishes annual maps of poisoning incidents[1] which complement other sources of information on the persecution of birds of prey, such as annual reviews published by the RSPB (RSPB 2010, 2011).

There is a growing effort to stamp out raptor persecution, which actively involves land use, conservation and enforcement bodies. The evidence base being amassed by the Scheme is vital to supporting this. A range of other ongoing studies involving satellite tracking of raptors and the development of new forensic tools is complimentary to this effort, and again involves members of the Scheme.

[1] www.scotland.gov.uk/Topics/Environment/Wildlife-Habitats/paw-scotland/types-of-crime/crimes-against-birds/Poisoninghotspotmaps2010/2010

3 Species accounts

3.1 European Honey-buzzard

Pernis apivorus

Honey-buzzards are easily overlooked especially in areas where Common Buzzards are abundant. They often occur in a monoculture coniferous landscape, a habitat not as popular with raptor fieldworkers who prefer the challenge offered by open habitats such as farmland and the uplands. The reality is that this scarce summer visitor may be far more widespread and abundant in Scotland than the records suggest. It is known to occur in at least five different regions but finding active nests or proving breeding is a challenge for even the most experienced fieldworker. In 2009, three pairs were known to breed successfully, fledging five young.

3.2 Red Kite *Milvus milvus*

(Tables 1 & 2)

The breeding population in Scotland is closely monitored by the RSPB and it is thought that only a small proportion of the actual population is undetected each year, possibly no more than 10%. The number of pairs laying eggs, 152, was a 26% increase on the previous year. This increase was most pronounced in Tayside, Central and Dumfries & Galloway; regions where the illegal persecution of this species is not as prevalent as in Highland (Smart *et al*., 2010). Two years after the first birds were released, the recently re-established population in Aberdeenshire recorded its first successful breeding attempts, with three pairs rearing seven young from the five pairs that laid eggs – an impressive start. Overall there were checks on 234 known home ranges and 160 pairs (68%) were located. One hundred and fifty-three pairs were monitored but one pair failed at an early stage, possibly before eggs were laid. Of the 152 pairs that laid, 113 (74%) were successful in rearing at least one young. The 235 young that fledged give a mean brood size per monitored occupied home range of 1.5.

3.3 White-tailed Eagle

Haliaeetus albicilla (Tables 3 & 4)

Like the Red Kite, the White-tailed Eagle has been successfully reintroduced using chicks from Norway, with initial releases between 1975 and 1985 on the island of Rum and between 1993 and 1998 in Wester Ross. The growth of the breeding population in the north-west has improved recently, with the number of pairs more than doubling in the last ten years (Evans *et al.* 2009). Productivity has also increased - in the current year 39 egg-laying pairs reared a minimum of 36 young, over 0.92 young each. A third reintroduction programme commenced in 2007, this time on the east coast in Fife. Fourteen young eagles were collected from Norway in 2009, bringing the total number of released birds in Fife to 40 individuals. The project aims to continue to 2012, with the goal of releasing 100 White-tailed Eagles in Fife.

3.4 Marsh Harrier

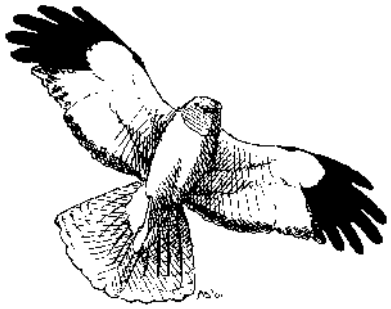
Circus aeruginosus (Table 5)

The Marsh Harrier clings on as a breeding species in Scotland, mainly on the strength of the small nesting colony in the Tay reed-beds. Four pairs were located in the spring of which three were confirmed as breeding, rearing a total of ten young. Elsewhere, single pairs found in Northeast Scotland and Argyll were non-breeding.

3.5 Hen Harrier *Circus cyaneus*

(Tables 6 & 7)

There are concerns about the long-term future for Hen Harriers in some areas of Scotland. Once a familiar bird of the upland breeding assemblage, Hen Harriers are now absent from many areas formerly occupied - where driven grouse-shooting dominates land use (Redpath *et al.*, 2010; Fielding *et al.,* 2011; see section 2.6 above). The regions used to summarise the Scheme data (Table 6) are the same as those used for the national surveys carried out in 1988/89, 1994 and 2004 (Figure 2). In 2009, 394 home ranges were visited and 263 (67%) were occupied by pairs of Hen Harriers. Of these, 236 pairs were monitored, of which, 130 (55%) successfully fledged 389 young, a mean figure of 1.6 young per monitored home range. The number of occupied home ranges and successful nests reported to the Scheme in 2009 was the lowest so far (Table 7). These changes may reflect a decline of the Hen Harrier in Scotland, as predicted by the Hen Harrier conservation framework, which found the species to be at unfavourable conservation status in 15 of 20 Natural Heritage Zones (Figure 3) in Scotland (Fielding *et al.* 2011). Further investigations are being carried out into the status of the Hen Harrier, including a revision of the Hen Harrier conservation framework to incorporate data from the 2010 national survey.



3.6 Northern Goshawk

Accipiter gentilis (Tables 8 & 9)

This forest raptor is apparently well established in the three main Scottish study areas, in the north east, Lothian & Borders and Dumfries & Galloway, and is now showing signs of an increase. In 2009, 128 home ranges were checked. Of these 85 (66%) were occupied and 84 were monitored. Seven pairs failed at an early stage and further seven during incubation but 68 pairs were proved successful, fledging at least 167 young, making 2009 the most productive year since the start of the SRMS (Table 9).

3.7 Eurasian Sparrowhawk

Accipiter nisus (Table 10)

A welcome expansion in the monitoring of breeding Sparrowhawks occurred in 2009 with an 80% increase recorded, reflected across most RSG regions. The largest increase occurred in Lothian with the start of a new amateur study within the urban confines of the city of Edinburgh. Here 51 historic home ranges dating back to an earlier study (McGrady 1991) were re-visited, many of them in parks and cemeteries, and 25 were found to be still occupied. Overall, throughout the country, 89 breeding pairs were monitored and at least 87 were known to lay full clutches of eggs. Hatching success of laying pairs was 94% and fledging success 90% and a minimum of 182 young fledged. Mean brood size per monitored pair was just over 2.0 young.

3.8 Common Buzzard *Buteo buteo*

(Tables 11 & 12)

The abundance of Buzzards in some regions of Scotland is reflected in the high numbers of home ranges checked in 2009. In the spring, 660 received at least one visit and 491 (74%) were found occupied by pairs (Table 12). This level of home range occupancy is below the long-term average which over the period 2003-2008 has shown greater stability. However, the percentage of breeding pairs that successfully raised young remained high and close to the long-term average. Of the 382 occupied home ranges monitored, 275 pairs (72%) succeeded in rearing 476 young. Mean brood size per monitored occupied home range was 1.2, the lowest number since the start of SRMS in 2003. The Wildlife and Countryside Act 1981 fully protects Common Buzzards at all times. Despite this, reported incidents in recent years

have shown the Buzzard to be the raptor species that is most frequently killed illegally in Scotland (RSPB 2010, 2011).

3.9 Golden Eagle *Aquila chrysaetos*

(Table 13)

Golden Eagles have a high profile in Scotland partly through their iconic association with wild mountain country and the Highland landscape. Adult birds have the potential to be long-lived and the Scottish population in modern times has shown great stability. Nevertheless, many Natural Heritage Zones (Figure 3) hold populations in a less than satisfactory condition (Whitfield *et al.,* 2008). The main constraint in parts of their range where driven grouse-shooting dominates upland land use is illegal killing (Whitfield *et al.,* 2004a). This factor is reflected in Table 13 in the number of occupied home ranges, with the lowest number in the eastern, central and southern parts of the country where grouse management is prolific and highest totals in the north and west where it is not. In 2009, visits were made to 312 known home ranges and 243 held pairs with a further 29 showing evidence of eagle use but no pair seen. Repeat visits were made on 233 pairs of which a third (77 and 33%) either failed at an early stage or were non-breeding. There were further failures during incubation (57) and chick rearing (4). Ninety-five successful pairs (41% of those monitored) reared 111 young. The mean brood size per home range occupied by a pair was 0.48 young. These figures represent a decline on those for 2008.

3.10 Osprey *Pandion haliaetus*

(Table 14)

The Osprey is another raptor species very closely linked in the public eye with Scotland and the Highlands. However, unlike the Golden Eagle, it is no longer confined to the one country within Great Britain as a breeding species and small numbers are now nesting in both England and Wales. This colonisation has come about partly as a result of a reintroduction scheme at Rutland Water in the English Midlands and partly through natural expansion across the border from an increased Scottish population. The growth in Scotland from the initial Loch Garten pair in the 1950's has been quite spectacular and pairs are now breeding in all regions except the western and northern isles. It is almost certain that the monitoring effort reported in Table 14 covers only a proportion of the current breeding population and that 100% coverage is no longer possible, particularly in Highland and Tayside where the greatest numbers occur. In 2009, checks were carried out at 209 nest sites and pairs were present at 168 (80%). Single adults were present through the summer at a further 12 nests. The breeding output of 166 pairs were monitored and 130 (78%) successfully reared at least one young. The mean brood size per successful pair was 2.0 young and for the monitored pairs, 1.6 young.

3.11 Common Kestrel *Falco tinnunculus* (Tables 15 & 16)

At its current rate of decline in the countryside, the Common Kestrel may soon have to lose its 'common' tag. From being the most widespread and abundant bird of prey only a few decades ago, the population has undergone a significant change in recent years. The most recent Breeding Bird Survey for Scotland recorded a 58% decline for the period 1995-2009 (Risely *et al.,* 2011). The reasons behind this trend are currently unknown but may be linked to increased usage of the more powerful second-generation rodenticides, changes in the countryside related to agricultural intensification and competition with other raptor species. One hundred and five home ranges were checked in 2009 and pairs were present at 58 (55%). Of the 52 pairs receiving monitoring visits, 45 (87%) bred successfully rearing a minimum of 140 young. There is currently only a single long-term study in Scotland. Based in Ayrshire, it showed a 38% fall in the number of home ranges found occupied by pairs compared to the previous year (Table 16), and although breeding success was high at 88%, mean brood size was down to 3.0 young per occupied monitored home range. This population is known to fluctuate matching cycles in local vole abundance.

3.12 Merlin *Falco columbarius*

(Table 17)

Following a national breeding survey in 2008 (Ewing *et al.* 2011), when survey effort to record the species was at its highest, in 2009 the number of home ranges checked decreased to 318. The decline in coverage was most marked in the north and west; in Shetland and Highland. Of the 318 home ranges checked, 204 (64%) had signs of occupancy and 128 pairs received further visits. Nineteen pairs failed either through non-breeding or at an early stage and a further 14 during the breeding cycle. There were 112 successful pairs (88%) rearing 353 fledged young. Mean fledged brood size per monitored occupied home range was 2.8 young. These figures are all higher than 2008.

3.13 Eurasian Hobby

Falco subbuteo

Two pairs were reported, both in Highland. A regular site in Strathspey again held a breeding pair but their outcome was not reported. The second pair was located in early August near Inverness at a location where birds have been seen in previous years but no breeding attempt has so far been confirmed.

3.14 Peregrine Falcon

Falco peregrinus (Tables 18, 19 & 20)

There was a 12% decline in the number of home ranges checked between 2008 and 2009 (Table 18). This was due to reduced survey effort in Northeast Scotland. In other recording areas, reporting rates either increased (e.g. Orkney) or were maintained. Across the country, home range checks were carried out at 529 known nest sites; 303 were occupied, 272 (51%) with pairs and 31 (6%) with single birds. Of the 249 pairs that received follow-up visits, 160 (64%) were successful in their breeding attempt. A minimum of 351 young fledged, giving a mean brood per pair of 1.4 young per monitored occupied home range. These breeding success and productivity figures are the same or very similar to those achieved in 2008.

Tables 19 and 20 show variation in home range occupancy and breeding success by habitat. Occupancy was lowest where the local habitat was classed as woodland, lowland farmland and urban/industrial. It was highest at coastal locations with both grouse moor and other upland locations coming in between. For breeding success, grouse moors were lowest in all the categories recorded, with just over half of breeding pairs in this habitat producing young and averaging only one young per monitored pair. Pairs nesting in other upland areas faired almost as badly. Coastal breeding pairs achieved the highest breeding success and productivity. Over three-quarters of the coastal pairs bred successfully, averaging 1.8 young per monitored pair.

3.15 Barn Owl *Tyto alba* (Table 21)

Despite an increase in monitoring effort, 2009 saw a drop in the percentage of nesting sites occupied by pairs and an increase in those with single birds. There were 579 monitored nest sites, of which 337 (58%) held pairs and 70 (12%) single birds. This was not unexpected following the crash in vole numbers the previous year. The breeding success of 308 pairs was monitored, with 262 pairs (85%) rearing at least 795 young. The mean brood size per monitored pair was 2.6 young. Both these figures show an improvement on 2008 and a return to the levels of breeding success and productivity the species had in 2007.

3.16 Little Owl *Athene noctua*

A single breeding record was reported in 2009; a pair nested successfully in Dumfries & Galloway and produced at least one young. According to Forrester *et al*. (2007), no nesting by Little Owls in Scotland had been reported since the early 1990s.

3.17 Tawny Owl *Strix aluco*

(Tables 22 & 23)

The Tawny Owl is the most abundant and widespread owl in Scotland, but the species remains a long way behind the Barn Owl in popularity amongst raptor workers, despite its ready use of artificial sites when provided. Checks were made of 127 nest sites (mostly nest boxes) in the spring. Ninety-three nest sites (73%) held pairs and 91 received follow-up visits, and laid eggs. Sixty-four pairs (70%) bred successfully rearing a minimum of 93 young. Mean brood size was just over one chick per monitored pair. Both breeding success and productivity were the lowest so far recorded by the SRMS for the period 2003-2009, probably because of the crash in vole numbers in the previous year (Table 23).

3.18 Long-eared Owl *Asio otus*

(Table 24)

Long-eared Owls are possibly the most secretive and difficult species to monitor in the breeding season. A small sample of 39 known territories was checked of which 16 showed signs of occupation. Twelve pairs with eggs were monitored and 11 succeeded in rearing 24 young.

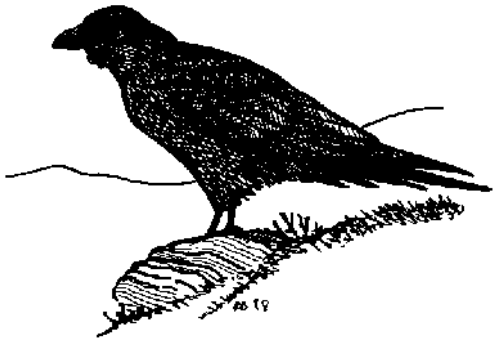
3.19 Short-eared Owl *Asio flammeus* (Table 25)

Not as secretive as the previous species, but Short-eared Owls are equally challenging to get to grips with in the breeding season. Given their preference for nesting in heather moorland, a habitat that is well covered by raptor workers, it is perhaps surprising that so few nests of Short-eared Owls are found, even by accident. Although birds, both pairs and singles, were seen in 162 locations during the spring and summer, just 20 nests were found and monitored. Fourteen (70%) were successful in rearing young. Given the dispersal behaviour of nestlings, the figure of 22 young fledged should be treated as an absolute minimum. The number of birds present in suitable habitat in 2009, particularly the Uists and Orkney, was the highest since the start of SRMS reporting in 2003. It suggests the reasons behind the occurrence of Short-eared Owls in the breeding season are far more complex than currently known.

3.20 Common Raven *Corvus corax*

(Table 26)

Monitoring of breeding Ravens has increased annually since 2003, by an average of 25% each year in the first four years of SRMS, the rate slowing down in more recent years. This change probably reflects a combination of the species' enhanced popularity amongst raptor workers and an increase in the numbers of pairs available to monitor. The largest changes in numbers monitored have occurred in Argyll, Tayside, South Strathclyde, Dumfries & Galloway and Lothian & Borders. These changes should be contrasted with Northeast Scotland where the uplands are managed extensively for deer stalking and grouse-shooting. In the last seven years no breeding records have been received from this area. Raven pairs occupied 394 (85%) of the 463 home ranges visited in 2009. Monitoring checks on 330 pairs revealed that 271 (82%) bred successfully, producing a min of 707 young. The mean brood size per monitored pair was 2.1 young.



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

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6 Species Tables

Table 1. Population growth and breeding success of Red Kites in Scotland, 1992-2009. The mean values given for the final columns are the unweighted means, i.e. the sample sizes for each year have not been taken into consideration.

Year [1]	Pairs laying eggs	Pairs fledging young	Total young fledged	% of pairs that fledged young	Productivity: young laying pair
1992	1	1	1	100.00	1.00
1993	5	3	7	60.00	1.40
1994	8	7	13	87.5	1.63
1995	15	11	26	73.33	1.73
1996	17	16	39	94.12	2.29
1997	23	19	39	82.61	1.70
1998	25	22	49	88.00	1.96
1999	34	27	59	79.41	1.74
2000	39	35	86	89.74	2.21
2001	43	38	95	88.37	2.21
2002	50	43	112	86.00	2.24
2003	54	48	106	88.89	1.96
2004	60	49	115	81.67	1.92
2005	76	61	131	80.26	1.72
2006	84	69	151	82.14	1.80
2007	93	73	162	78.49	1.74
2008	121	97	210	80.00	1.74
2009	152	113	235	74.34	1.55

[1] Breeding in North Scotland started in 1992, in Central Scotland in 1998, in Dumfries & Galloway in 2003 and in Aberdeenshire in 2008.
[2] Some totals published in earlier reports have been corrected in this table.

Table 2. Breeding success of Red Kites in Scotland in 2009.

Region	Home ranges checked	Pairs located	Pairs monitored	Pairs failing early	Pairs laying eggs	Pairs hatching young[1]	Pairs fledging young	Minimum number of young fledged
Highland	86	53	51	0	51	46	42	95
Aberdeen	5	5	5	0	5	5	3	7
Tayside	52	33	30	0	30	[23]	23	48
Central Scotland	49	28	26	0	26	[14]	14	26
Dumfries & Galloway	42	41	41	1	40	33	31	59
TOTAL	**234**	**160**	**153**	**1**	**152**	**121**	**113**	**235**

[1]Hatching success was not provided for Tayside and Central Scotland, so the no. of pairs fledging young is given as a minimum..

Table 3. Breeding success of White-tailed Eagles in Scotland, 2009.

Study area	Pairs monitored	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young
Isle of Skye	11	8	6	3	3
Argyll islands	11	9	9	8	11
Western Isles	12	11	8	7	9
NW Mainland & Small Isles	12	11	8	7	13
TOTAL	**46**	**39**	**31**	**24**	36

Table 4. White-tailed Eagle breeding success and productivity in Scotland, 1996-2009.

Year	Territorial pairs	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Total young fledged	Young fledged per pair laying	Young fledged per territorial pair
1996	12	12	8	7	9	0.75	0.75
1997	14	11	6	5	9	0.64	0.64
1998	19	16	9	9	13	0.81	0.68
1999	20	16	9	6	11	0.69	0.55
2000	22	19	12	8	12	0.63	0.55
2001	23	17	10	7	11	0.65	0.48
2002	25	22	14	8	12	0.55	0.48
2003	31	25	20	16	26	1.04	0.84
2004	32	28	19	15	19	0.68	0.59
2005	33	28	21	17	24	0.86	0.73
2006	36	31	25	21	29	0.94	0.81
2007	42	35	31	24	34	0.97	0.81
2008	44	35	21	20	28	0.80	0.64
2009	46	39	31	24	36	0.92	0.78

Table 5. Breeding success of Marsh Harriers in Scotland in 2009.

Region	Pairs located	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Northeast Scotland	1	0	**0**	**0**
Argyll	1	0	0	0
Tayside	4	3	3	10
TOTAL	**6**	**3**	**3**	**10**

Table 6. Breeding success of Hen Harriers in Scotland in 2009. For this species, the regions are those used to summarise the findings of national surveys carried out in 1988/89, 1994 and 2004 (Figure 2).

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	**72**	**72**	**72**	**19**	**53**	**32**	**31**	**92**
Hebrides								
North Uist	20	20	15	0	15	13	11	30
Benbecula	9	9	8	0	8	8	7	17
South Uist	16	15	12	0	12	11	11	32
Skye, Rum & Eigg	18	10	10	1	9	7	4	14
Sub-total	**63**	**54**	**45**	**1**	**44**	**39**	**33**	**93**
North Highlands								
Sutherland	15	15	15	4	11	10	8	24
Ross-shire & Inverness	9	9	9	4	5	5	5	17
Sub-total	**24**	**24**	**24**	**8**	**16**	**15**	**13**	**41**
East Highlands								
Moray & Nairn	18	9	9	0	9	8	5	15
Aberdeenshire	4	3	3	2	1	0	0	0
Angus	1	0	0	0	0	0	0	0
Perthshire	37	26	22	5	17	15	14	49
Sub-total	**60**	**38**	**34**	**7**	**27**	**23**	**19**	**64**
West Highlands and Islands								
Central	10	1	1	0	1	1	1	5
Argyll mainland	7	2	1	0	1	1	1	1
Mull & Coll	43	23	13	1	12	12	12	25
Cowal & Bute	13	10	10	4	6	5	3	8
Islay & Colonsay	10	7	7	0	7	5	4	17
Sub-total	**83**	**43**	**32**	**5**	**27**	**24**	**21**	**56**
Southwest and Southern Uplands								
South Strathclyde	72	21	19	3	16	13	8	23
Lothian & Borders	4	2	1	0	1	1	1	4
Dumfries & Galloway	16	9	9	3	6	4	4	16
Sub-total	**92**	**32**	**29**	**6**	**23**	**18**	**13**	**43**
TOTAL	**394**	**263**	**236**	**46**	**190**	**151**	**130**	**389**

Table7. Home range occupancy and breeding success of Hen Harriers in Scotland, 2003-2009.

Year	Home ranges checked	Home ranges occupied by pairs	%	Occupied home ranges monitored	Pairs known to lay eggs	%	Pairs known to fledge young	%	Minimum number of young fledged	Mean brood size	Mean brood size per laying pair	Mean brood size per monitored occupied home range
2003	379	335	88	303	271	89	171	56	529	3.1	2.0	1.7
2004	457	417	91	359	236	91	219	61	630	2.9	1.9	1.8
2005	395	342	87	310	268	86	175	56	466	2.7	1.7	1.5
2006	428	355	83	278	223	80	144	52	381	2.6	1.5	1.4
2007	415	298	72	253	213	84	147	58	432	2.9	2.0	1.7
2008	422	311	74	311	232	75	128	41	370	2.9	1.6	1.2
2009	394	263	67	236	190	81	130	55	389	3.0	2.0	1.6

Table 8. Breeding success of Northern Goshawks in Scotland in 2009.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
North-east Scotland	53	40	40	3	37	34	34	82
Lothian & Borders	50	26	26	3	23	21	21	52
Dumfries & Galloway	25	19	18	1	17	15	13	33
TOTAL	**128**	**85**	**84**	**7**	**77**	**70**	**68**	**167**

Table 9. Home range occupancy and breeding success of Northern Goshawks in Scotland, 2003-09.

Year	Home ranges checked	Home ranges occupied (%)	Pairs known to lay eggs	Pairs known to fledge young (%)	Minimum number of young fledged
2003	117	84 (72%)	62	52 (84%)	121
2004	132	86 (65%)	67	60 (90%)	126
2005	116	81 (70%)	58	47 (81%)	117
2006	116	78 (67%)	60	48 (80%)	108
2007	136	87 (64%)	70	60 (86%)	127
2008	139	89 (64%)	70	61 (87%)	163
2009	128	85 (66%)	77	68 (88%)	167

Table 10. Breeding success of Sparrowhawks in Scotland in 2009.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	17	7	4	1	3	3	3	9
Highland	9	7	7	0	7	7	7	16
Tayside	2	2	2	0	2	2	2	5
Argyll	18	8	6	0	6	6	6	6
Central	8	8	8	0	8	8	8	22
South Strathclyde	64	33	32	1	31	28	24	61
Lothian & Borders	51	25	24	0	24	22	22	51
Dumfries & Galloway	7	7	6	0	6	6	6	12
TOTAL	**176**	**97**	**89**	**2**	**87**	**82**	**78**	**182**

Table 11. Home range occupancy and breeding success of Common Buzzards in Scotland, 2003-2009.

Year	Home ranges checked	Home ranges occupied by pairs (%)	Pairs known to lay eggs	Pairs known to fledge young (%)	Minimum number of young fledged
2003	342	298 (87%)	246	209 (85%)	435
2004	-	-	279	240 (86%)	505
2005	418	349 (83%)	261	218 (84%)	377
2006	499	416 (83%)	300	251 (84%)	475
2007	652	528 (81%)	360	307 (85%)	590
2008	742	627 (85%)	346	311 (90%)	546
2009	660	491 (74%)	325	275 (85%)	476

Table 12. Breeding success of Common Buzzards in Scotland in 2009.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	**5**	**5**	**5**	**0**	**5**	**5**	**5**	**8**
Lewis & Harris	**7**	**7**	**7**	**0**	**7**	**7**	**7**	**14**
Uists	**18**	**17**	**17**	**3**	**14**	**11**	**11**	**18**
Highlands								
Isle of Eigg	5	5	5	0	5	5	5	10
Caithness & Sutherland	24	15	14	1	13	12	12	27
Ross-shire	68	54	53	9	44	25	25	40
Inverness-shire	2	1	0	0	0	0	0	0
Badenoch & Strathspey	11	11	11	0	11	11	11	22
sub-total	**110**	**86**	**83**	**10**	**73**	**53**	**53**	**99**
Northeast Scotland	**33**	**24**	**21**	**0**	**21**	**14**	**14**	**16**
Tayside & Fife	**46**	**43**	**21**	**0**	**21**	**20**	**20**	**37**
Central Scotland								
Falkirk	39	32	-	-	-	-	-	-
North Lanark	8	8	8	-	8	8	8	16
Stirling	168	135	108	31	77	64	62	91
sub-total	**215**	**175**	**116**	**31**	**85**	**72**	**70**	**107**
Argyll								
Tiree	12	12	0	0	0	0	0	0
Colonsay	58	21	15	5	10	9	9	18
Islay	5	5	5	3	2	2	2	4
Bute	70	19	18	3	15	15	15	18
Cowal	11	11	11	0	11	11	11	15
sub-total	**156**	**68**	**49**	**11**	**38**	**37**	**37**	**55**
South Strathclyde	**4**	**4**	**2**	**0**	**2**	**2**		**2**
Dumfries & Galloway	**14**	**14**	**14**	**0**	**14**	**14**	**14**	**30**
Lothian & Borders								
Lothian	34	31	31	2	29	27	26	52
Borders	18	17	16	0	16	16	16	38
sub-total	**52**	**48**	**47**	**2**	**45**	**43**	**42**	**90**
TOTAL	**660**	**491**	**382**	**57**	**325**	**278**	**275**	**476**

Table 13. Breeding success of Golden Eagles in Scotland in 2009.

Region	Home ranges checked	Home ranges occupied by pairs	Of which imm. pairs[1]	Further home ranges in use[2]	Pairs moni-tored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Min. number of young fledged
Lewis & Harris	**21**	**21**	**2**	**0**	**21**	**6**	**15**	**12**	**12**	**12**
Uist	**27**	**23**	**0**	**1**	**23**	**4**	**19**	**13**	**12**	**12**
Highland										
Sutherland	13	10	2	3	9	3	6	4	4	6
Ross-shire	20	8	0	5	8	3	5	4	4	4
Skye	34	29	0	0	29	18	11	11	11	13
Rum, Canna & Eigg	6	6	0	0	6	0	6	5	5	8
West Inverness-shire	19	12	1	2	11	5	6	3	3	4
Ardnamurchan, Morvern & Sunart	24	20	1	2	19	9	10	2	2	2
East Inverness-shire	11	2	2	8	2	1	1	1	1	1
Badenoch	13	12	2	1	11	3	8	4	4	6
Sub-total	**140**	**99**	**8**	**21**	**95**	**42**	**53**	**34**	**34**	**44**
North-east Scotland	**17**	**15**	**0**	**0**	**15**	**7**	**8**	**8**	**8**	**12**
Tayside										
Perthshire west of the A9 road	14	10	1	2	8	1	7	4	4	4
Perthshire east of the A9 road	5	5	0	0	5	2	3	3	3	3
Angus Glens	7	5	0	0	5	0	5	2	1	1
Sub-total	**26**	**20**	**1**	**2**	**18**	**3**	**15**	**9**	**8**	**8**
Central Scotland	**8**	**5**	**0**	**1**	**5**	**2**	**3**	**1**	**1**	**1**
Argyll										
Islay & Colonsay	6	6	0	0	6	0	6	4	4	5
Mull & Jura	33	28	1	2	24	6	18	8	7	8
Mainland incl. Bute	26	22	0	0	22	7	15	6	5	5
Arran[3]	3	3	0	0	3	0	3	3	3	3
Sub-total	**68**	**59**	**1**	**2**	**55**	**13**	**42**	**21**	**19**	**21**
Lothian & Borders	**3**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
Dumfries & Galloway	**2**	**1**	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**1**
TOTAL	**312**	**243**	**12**	**29**	**233**	**76**	**156**	**99**	**95**	**111**

[1] These immature pairs are included in the column 'Home ranges occupied by pairs'. For the purpose of this report, we regard pairs consisting of either one or two birds with immature plumage as immature pairs.
[2] Additional home ranges occupied by single birds or showing signs of occupation but no pair seen.
[3] Arran lies within the South Strathclyde RSG recording area but is listed under Argyll for convenience.

Table 14. Breeding success of Ospreys in Scotland in 2009.

Region	Nest sites checked	Pairs present	Single bird present	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Highland	61	52	5	51	2	49	43	80
Northeast Scotland	34	18	5	18	1	17	13	26
Tayside	50	45	1	45	2	43	32	60
Central Scotland	28	23	1	22	2	20	17	37
Argyll	19	15	0	15	1	14	12	28
Lothian & Borders	10	9	0	9	0	9	9	22
Dumfries & Galloway	7	6	0	6	2	4	4	6
TOTAL	**209**	**168**	**12**	**166**	**10**	**156**	**130**	**259**

Table 15. Breeding success of Common Kestrels in Scotland in 2009.

Region	Home ranges checked	Pairs present	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Uist	3	3	3	0	3	3	3	10
Highland	13	11	11	0	11	11	11	34
Tayside	6	5	3	0	3	2	2	6
Central Scotland	8	8	8	0	8	8	8	29
Argyll	30	9	7	1	6	5	5	6
South Strathclyde	41	19	18	1	16	16	15	51
Lothian & Borders	3	2	1	1	0	0	0	0
Dumfries & Galloway	1	1	1	0	1	1	1	4
TOTAL	**105**	**58**	**52**	**3**	**48**	**46**	**45**	**140**

Table 16. Home range occupancy and breeding success of Common Kestrels in Ayrshire, 2003-2009.

Year	Home ranges checked	Home ranges occupied by pairs	%	Occupied home ranges monitored	Pairs laying eggs	%	Pairs hatching eggs	%	Pairs fledging young	%	Minimum number of young fledged	Mean brood size per monitored occupied home range
2003	30	20	67	20	17	85	16	80	16	80	62	3.1
2004	33	28	85	26	24	92	23	88	23	88	109	4.2
2005	38	20	53	17	14	82	11	65	11	65	45	2.6
2006	36	24	67	24	21	88	20	83	20	83	77	3.2
2007	36	20	56	13	12	92	12	92	12	92	59	4.5
2008	43	29	67	27	25	93	24	89	23	83	99	3.7
2009	40	18	45	17	16	94	16	95	15	88	51	3.0
Mean	**37**	**23**	**62**	**21**	**18**	**86**	**17**	**85**	**17**	**85**	**72**	**3.4**

Table 17. Breeding success of Merlins in Scotland in 2009.

Region	Home ranges checked	Home ranges with signs of occupation[1]	Pairs monitored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Shetland	**2**	**2**	**2**	**0**	**2**	**2**	**2**	**6**
Orkney	**14**	**14**	**14**	**6**	**8**	**8**	**8**	**26**
Lewis & Harris	**9**	**9**	**5**	**0**	**5**	**4**	**4**	**11**
Uists	**21**	**21**	**8**	**0**	**8**	**8**	**8**	**25**
Highland								
Skye & Rum	9	8	5	1	4	3	3	10
Ross-shire/ Sutherland	24	24	18	2	16	12	11	25
Inverness/ Strathspey	2	2	0	0	0	0	0	0
West Moray/Nairn	23	5	5	0	5	5	5	18
Sub-total	**58**	**39**	**28**	**3**	**25**	**20**	**19**	**53**
North-east Scotland								
East Moray	19	7	7	0	7	6	6	17
Lower Deeside	7	7	6	0	6	6	6	21
Mid/Upper Deeside	28	16	16	0	16	13	13	45
Donside	17	7	7	0	7	6	6	23
Sub-total	**71**	**37**	**19**	**0**	**36**	**31**	**31**	**106**
Tayside								
Perthshire	31	14	8	3	5	5	5	14
Angus	31	17	11	1	10	10	10	28
Sub-total	**62**	**31**	**19**	**4**	**15**	**15**	**15**	**42**
Central Scotland	**2**	**2**	**2**	**0**	**2**	**2**	**2**	**3**
Argyll	**4**	**2**	**1**	**0**	**1**	**1**	**1**	**4**
South Strathclyde	**10**	**10**	**8**	**2**	**6**	**5**	**5**	**16**
Lothian & Borders								
Moorfoot Hills	9	3	2	0	2	2	2	8
Lammermuir Hills	25	14	8	1	7	6	6	25
Pentland Hills	13	2	0	0	0	0	0	0
South of Peebles	7	7	7	2	5	5	5	14
Sub-total	**54**	**26**	**17**	**3**	**14**	**13**	**13**	**47**
Dumfries & Galloway	**11**	**11**	**5**	**1**	**4**	**4**	**4**	**14**
TOTAL	**318**	**204**	**128**	**19**	**126**	**113**	**112**	**353**

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

Table 18. Breeding success of Peregrine Falcons in Scotland in 2009.

Region	Home ranges checked	Home ranges occupied by single birds	Home ranges occupied by pairs	Pairs moni-tored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Orkney	**24**	**1**	**11**	**9**	**1**	**8**	**8**	**8**	**15**
Lewis & Harris	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
Uist	**9**	**0**	**8**	**8**	**1**	**7**	**6**	**6**	**13**
Highland									
Sutherland & Easter Ross	9	1	6	4	1	4	3	2	4
Inverness, Strathspey & Nairn	10	0	6	5	0	5	5	5	12
Isles of Canna & Eigg	2	0	2	2	0	2	2	2	5
Sub-total	**21**	**1**	**14**	**11**	**1**	**11**	**10**	**9**	**21**
North-east Scotland	**15**	**0**	**9**	**8**	**3**	**5**	**4**	**4**	**8**
Tayside & Fife									
west of A9 and M90	29	3	19	15	2	13	9	9	20
east of A9 and M90	28	0	22	20	6	14	14	14	33
Angus upland	34	4	10	8	2	6	5	5	9
Angus coastal plain	11	1	7	7	2	5	3	3	6
Sub-total	**102**	**8**	**58**	**50**	**12**	**38**	**31**	**31**	**68**
Central Scotland	**34**	**4**	**19**	**17**	**2**	**15**	**10**	**10**	**20**
Argyll									
Mainland	15	0	13	12	4	8	7	7	11
Tiree, Coll, Mull, Colonsay & Islay	12	2	9	9	3	6	5	5	10
Sub-total	**27**	**2**	**22**	**21**	**7**	**14**	**12**	**12**	**21**
South Strathclyde									
Inland	32	1	17	17	1	16	7	5	8
Coastal	12	0	9	8	3	5	5	4	6
Isle of Arran	1	0	1	1	0	1	1	1	3
Sub-total	**45**	**1**	**27**	**26**	**4**	**22**	**13**	**10**	**17**
Lothian & Borders									
Sea-cliff/coast	54	1	15	15	1	14	14	14	40
Grouse moor	32	2	11	11	2	9	6	5	11
Other upland	25	1	8	8	1	7	6	5	13
Lowland farmland	23	0	14	13	2	11	10	10	24
Urban/Industrial	12	4	7	7	1	6	6	6	13
Sub-total	**146**	**8**	**55**	**54**	**7**	**47**	**42**	**40**	**101**
Dumfries & Galloway									
Kirkcudbright & Wigtown coast	24	4	15	13	0	13	11	10	20
Moffat & Eskdale	24	0	15	14	0	14	12	12	29
Nithsdale	25	1	5	5	1	4	2	2	4
Galloway inland	32	1	13	13	4	9	9	6	14
Sub-total	**105**	**6**	**48**	**45**	**5**	**40**	**34**	**30**	**67**
TOTAL	**529**	**31**	**272**	**249**	**43**	**207**	**170**	**160**	**351**

Table 19. Variation in home range occupancy of Peregrine Falcons between different habitat types within 1km^2 of the nest site in Scotland in 2009.

Habitat type[1]	Home ranges checked	Home ranges occupied by pairs	%	Home ranges occupied by single birds	%	Vacant home ranges	%
Grouse moor	107	45	42	8	7	54	50
Other upland	113	50	44	2	2	61	54
Woodland	37	19	51	0	0	18	49
Lowland farmland	53	34	64	1	2	18	34
Urban/Industrial	34	20	59	2	6	12	35
Coastal	112	58	52	6	5	48	43
Total	**456**	**226**	**50**	**19**	**4**	**211**	**46**

[1] Based on habitat details submitted by the following Raptor Study Groups: Argyll (70% of their records submitted with a habitat description), Central Scotland (40%), Dumfries & Galloway (93%), Highland (91%), Lothian & Borders (99%), Orkney (100%), South Strathclyde (97%) and Tayside (78%). North-east Scotland and Uist did not supply any habitat descriptions for this year.

Table 20. Variation in breeding success of Scottish Peregrine Falcons in 2009 between different habitat types within 1km of the nest site.

Habitat type[1]	Pairs moni-tored	Pairs failing early or non-breeding	%	Pairs laying eggs	%	Pairs hatching eggs	%	Pairs fledging young	%	Min. no. of young fledged	Mean no. of young fledged per monitored pair
Grouse moor	40	12	30	28	70	23	58	21	53	39	1.0
Other upland	47	12	26	35	74	29	62	26	55	49	1.0
Woodland	19	2	11	17	89	15	79	12	63	28	1.5
Lowland farmland	33	6	18	27	82	25	76	23	70	50	1.5
Urban/Industrial	20	4	20	16	80	15	75	13	65	31	1.6
Coastal	55	6	11	49	89	42	76	41	75	98	1.8
Total	**214**	**42**	**20**	**172**	**80**	**149**	**70**	**136**	**64**	**295**	**1.4**

[1] Based on habitat details submitted by the following Raptor Study Groups: Argyll (70% of their records submitted with a habitat description), Central Scotland (40%), Dumfries & Galloway (93%), Highland (91%), Lothian & Borders (99%), Orkney (100%), South Strathclyde (97%) and Tayside (78%). North-east Scotland and Uist did not supply any habitat descriptions for this year.

Table 21. Breeding success of Barn Owls in Scotland in 2009.

Region	Nesting sites checked	Occupied by pairs	Occupied by single birds[1]	Pairs moni-tored	Pairs failing early or non-breeding	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Minimum number of young fledged
Highland									
Sutherland & Caithness	1	1	0	1	0	1	1	1	4
Ross-shire	20	7	1	6	0	6	5	5	18
Inverness & Badenoch	4	3	1	3	1	2	2	2	8
Sub-total	**25**	**11**	**2**	**10**	**1**	**9**	**8**	**8**	**30**
North-east Scotland	**34**	**25**	**5**	**20**	**3**	**17**	**15**	**15**	**42**
Tayside	**8**	**8**	**0**	**6**	**0**	**6**	**6**	**6**	**16**
Central Scotland									
Clackmannan	7	7	0	7	0	7	7	7	27
FCS woodland	18	16	2	16	1	15	13	13	33
Stirling & Falkirk	20	20	0	20	0	20	19	19	62
Sub-total	**45**	**43**	**2**	**43**	**1**	**42**	**39**	**39**	**122**
Argyll									
Cowal & Bute	23	18	3	18	0	17	13	12	33
Islay	6	5	1	4	2	2	2	2	4
Kintyre & Knapdale	17	14	1	11	0	11	11	11	29
Sub-total	**46**	**37**	**5**	**33**	**2**	**30**	**26**	**25**	**66**
South Strathclyde	**66**	**35**	**10**	**33**	**1**	**32**	**31**	**31**	**86**
Lothian & Borders	**122**	**62**	**23**	**52**	**2**	**50**	**46**	**44**	**162**
Dumfries & Galloway									
Wigtown & Galloway forest	63	22	8	21	1	20	19	16	53
Stranraer, The Rhins & west Wigtown	94	51	11	50	4	46	42	40	96
Kirkcudbright-shire & Dumfries	76	43	4	40	2	38	38	38	122
Sub-total	**233**	**116**	**23**	**111**	**7**	**104**	**99**	**94**	**271**
Grand total	**579**	**337**	**70**	**308**	**17**	**290**	**270**	**262**	**795**

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

Table 22. Breeding success of Tawny Owls in Scotland in 2009.

Region	Nest sites checked	Pairs present	Pairs monitored	Pairs laying eggs	Pairs hatching eggs	Pairs fledging young	Min. no. of young fledged
Highland							
Inverness-shire	2	2	2	2	2	2	3
Sutherland	6	6	5	5	5	5	7
Black Isle	24	2	1	1	1	0	0
Easter Ross	16	15	15	15	11	11	15
Badenoch & Strathspey	1	1	1	1	0	0	0
sub-total	**49**	**26**	**24**	**24**	**19**	**18**	**25**
Tayside	**14**	**14**	**14**	**14**	**10**	**10**	**14**
Argyll	**34**	**33**	**33**	**33**	**27**	**24**	**34**
South Strathclyde	**2**	**2**	**2**	**2**	**2**	**1**	**1**
Lothian & Borders	**26**	**16**	**16**	**16**	**11**	**10**	**18**
Dumfries & Galloway	**2**	**2**	**2**	**2**	**2**	**1**	**1**
Grand total	**127**	**93**	**91**	**91**	**71**	**64**	**93**

Table 23. Annual breeding success and productivity in Scottish Tawny Owls, 2003-2009.

Year	Pairs monitored	Pairs fledging young (%)	Minimum number of young fledged	Mean brood size per pair monitored
2003	70	60 (86%)	131	1.9
2004	67	57 (85%)	108	1.6
2005	92	63 (68%)	103	1.1
2006	123	88 (72%)	173	1.4
2007	101	78 (77%)	142	1.4
2008	77	62 (81%)	111	1.4
2009	91	64 (70%)	93	1.0

Table 24. Breeding success of Long-eared Owls in Scotland in 2009.

Region	Known territories checked for occupation	Territories with signs of occupation	Pairs laying eggs	Pairs fledging young	Minimum number of young fledged
Highland	5	4	4	3	4
North-east Scotland	22	4	2	2	5
Tayside	2	2	2	2	4
Argyll	3	0	0	0	0
Lothian & Borders	7	6	4	4	11
TOTAL	**39**	**16**	**12**	**11**	**24**

Table 25. Breeding success of Short-eared Owls in Scotland in 2009.

Region	Sites checked	Pairs found	Additional single birds recorded	Nests monitored	Pairs fledging young	Minimum number of young fledged
Orkney[1]	[67]	[67]		0		
Uists	[43]	43	16	5	5	9
Highland	2	2	0	2	0	0
Tayside	18	12	4	3	1	2
Central Scotland	3	0	0	0	0	0
Argyll	5	3	1	2	1	2
South Strathclyde	3	3	0	3	3	5
Lothian & Borders	11	8	2	5	4	4
Dumfries & Galloway	1	1	0	0	0	0
TOTAL	**153**	**139**	**23**	**20**	**14**	**22**

[1] No nests were located on Orkney, but 56 apparently occupied territories were found on west Mainland, 4 on east Mainland, 3 on Rousay, 2 on South Ronaldsay and singles on Hoy and Burray.

Table 26. Breeding success of Common Ravens in Scotland in 2009.

Region	Home ranges checked	Home ranges occupied by pairs	Occupied home ranges monitored	Pairs failing early or non-breeding	Pairs known to lay eggs	Pairs known to hatch eggs	Pairs known to fledge young	Minimum number of young fledged
Orkney	**[56]**	**56**	**54**	**0**	**54**	**[39]**	**39**	**97**
Lewis & Harris	**16**	**16**	**13**	**1**	**12**	**12**	**11**	**28**
Uist	**14**	**14**	**13**	**0**	**13**	**11**	**11**	**35**
Highland								
Mainland	17	16	13	0	13	13	13	41
Isle of Eigg	5	5	5	0	5	4	4	11
Sub-total	**22**	**21**	**18**	**0**	**18**	**17**	**17**	**52**
Tayside								
Angus & Fife	23	18	14	4	10	10	9	23
Perth & Kinross	52	48	34	2	32	30	30	74
Sub-total	**75**	**66**	**48**	**6**	**42**	**40**	**39**	**97**
Central Scotland	**31**	**27**	**25**	**0**	**25**	**18**	**18**	**38**
Argyll								
Mid Argyll	2	2	2	0	2	2	2	2
Tiree	10	10	1	0	1	1	1	3
Colonsay	19	13	13	0	13	13	13	47
Islay	2	2	2	0	2	2	2	7
Bute	22	14	14	2	12	12	10	23
Cowal peninsula	44	34	22	1	21	15	15	21
Sub-total	**99**	**75**	**54**	**3**	**51**	**45**	**43**	**103**
South Strathclyde								
Inland	34	27	21	0	21	20	20	56
Coastal	13	10	10	0	10	10	10	20
Sub-total	**47**	**37**	**31**	**0**	**31**	**30**	**30**	**76**
Lothian & Borders								
Inland	41	30	29	4	25	24	23	62
Coastal	15	15	15	0	15	15	15	45
Sub-total	**56**	**45**	**44**	**4**	**40**	**39**	**38**	**107**
Dumfries & Galloway	**47**	**37**	**30**	**0**	**30**	**27**	**25**	**74**
Total	**463**	**394**	**330**	**14**	**316**	**278**	**271**	**707**

Annex 1: Raptor, owl and Common Raven nest site and home ranges data submitted under the Scottish Raptor Monitoring Scheme in 2009.

Species	Argyll	Central Scotland	Dumfries & Galloway	Highland	Lewis & Harris	Lothian & Borders	Northeast Scotland	Orkney	South Strathclyde	Tayside & Fife	Uist	Shetland	TOTAL
European Honey-buzzard				3									**3**
Red Kite		49	42	86			5			52			**234**
White-tailed Eagle	11			23	8						4		**46**
Eurasian Marsh Harrier	1						1			4			**6**
Hen Harrier	73	10	16	60		4	4	72	72	38	45		**394**
Northern Goshawk			25			50	53						**128**
Eurasian Sparrowhawk	18	8	7	9		51		17	64	2			**176**
Common Buzzard[1]	156	215	14	110	7	52	33	5	4	46	18		**660**
Golden Eagle	68	8	2	140	21	3	17			26	27		**312**
Osprey	19	28	7	61		10	34			50			**209**
Common Kestrel	30	8	1	13		3			41	6	3		**105**
Merlin	4	2	11	58	9	54	71	14	10	62	21	2	**318**
Eurasian Hobby				2									**2**
Peregrine Falcon	27	34	105	21	1	146	15	24	45	102	9		**529**
Barn Owl	46	45	233	25		122	34		66	8			**579**
Tawny Owl	34		2	49		26			2	14			**127**
Long-eared Owl	3			5		7	22			2			**39**
Short-eared Owl	5	3	1	2		11		67	3	18	43		**153**
Common Raven	99	31	47	22	16	56		56	47	75	14		**463**
TOTAL	**594**	**441**	**513**	**689**	**62**	**595**	**289**	**255**	**354**	**505**	**184**	**2**	**4472**

[1] 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 area) checked in 2009 and reported under the SRMS. This includes traditional nesting sites and home ranges that were found unoccupied during the visit, and also sites and home ranges which were found occupied but received no follow-up visits, so their breeding success is unknown.

Annex 2: Raptor, owl and Common Raven breeding attempts monitored under the Scottish Raptor Monitoring Scheme in 2009.

Species	Argyll	Central Scotland	Dumfries & Galloway	Highland	Lewis & Harris	Lothian & Borders	Northeast Scotland	Orkney	South Strathclyde	Tayside & Fife	Uist	Shetland	TOTAL
European Honey-buzzard				3									**3**
Red Kite		26	41	51			5			30			**153**
White-tailed Eagle	11			23	8						4		**46**
Eurasian Marsh Harrier	1						1			4			**6**
Hen Harrier	31	1	9	43		1	3	72	19	22	35		**236**
Northern Goshawk			18			26	40						**84**
Eurasian Sparrowhawk	6	8	6	7		24		4	32	2			**89**
Common Buzzard[1]	49	116	14	83	7	47	21	5	2	21	17		**382**
Golden Eagle	55	5	1	95	21	0	15			18	23		**233**
Osprey	15	22	6	51		9	18			45			**166**
Common Kestrel	7	8	1	11		1			18	3	3		**52**
Merlin	1	2	5	28	5	17	19	14	8	19	8	2	**128**
Eurasian Hobby													**0**
Peregrine Falcon	21	17	45	11		54	8	9	26	50	8		**249**
Barn Owl	33	43	111	10		52	20		33	6			**308**
Tawny Owl	33		2	24		16			2	14			**91**
Long-eared Owl				4		6	4			2			**16**
Short-eared Owl	2			2		5			3	3	5		**20**
Common Raven	54	25	30	18	13	44		54	31	48	13		**330**
TOTAL	**319**	**273**	**289**	**464**	**54**	**302**	**154**	**158**	**174**	**287**	**116**	**2**	**2592**

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

Annex 2 shows the total number of all breeding sites and home ranges (by area) that were found to be occupied and which received follow-up visits in 2007, i.e. they were effectively monitored to enable a level of breeding success and productivity to be estimated.

Figure 1. Scottish Raptor Study Groups in 2009

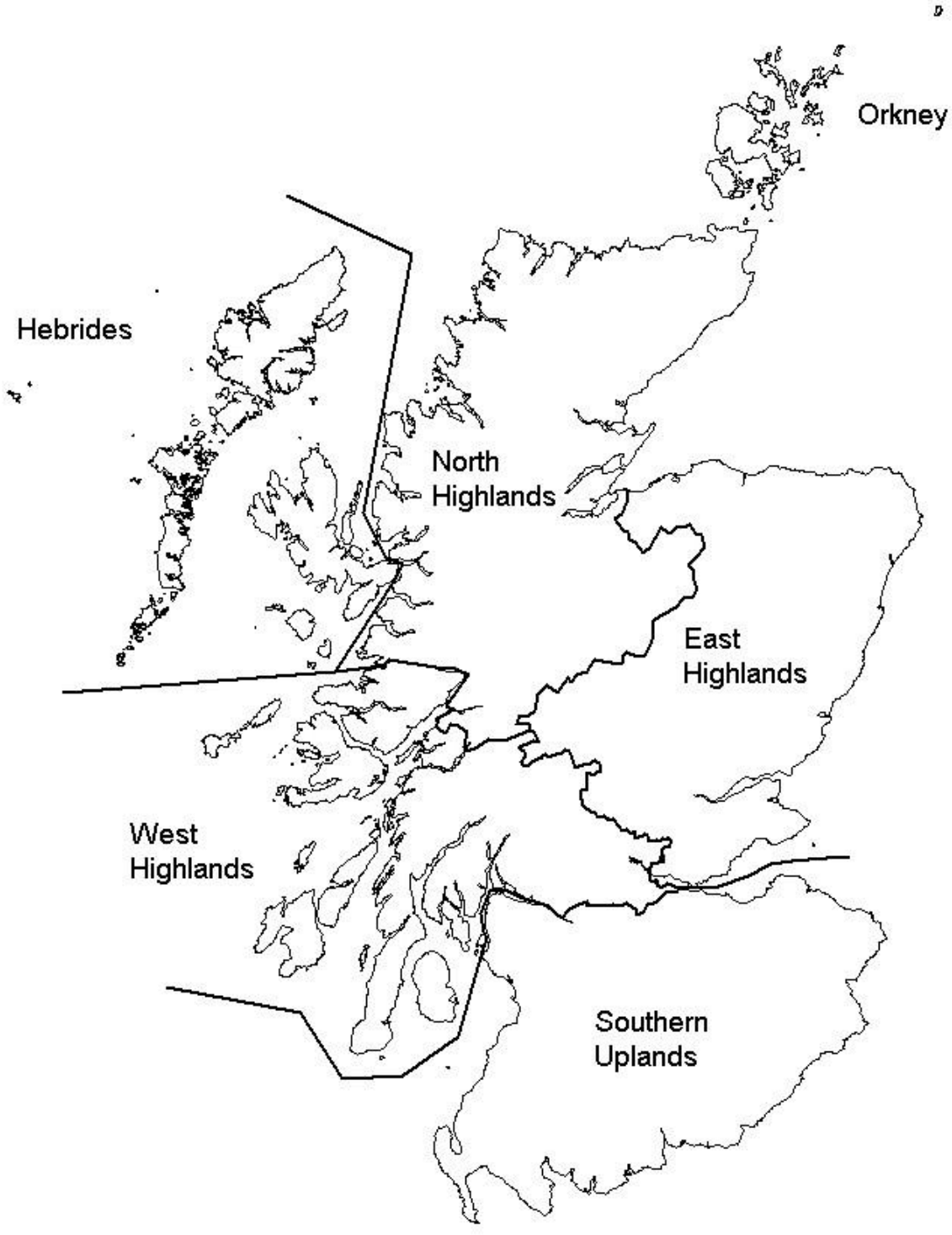

Figure 2. The regions used to summarise Hen Harrier breeding data in this report and in the 1988/89, 1998 and 2004 national surveys (from Sim *et al.* 2007)