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**A Review of the Status  
and Population Trends  
of Ground-Nesting Birds  
Vulnerable to Mink Predation  
on Harris and Lewis**

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## 1. SUMMARY

- (1) A literature review and search for additional data were conducted to assess whether there was any evidence that the populations and breeding success of ground-nesting birds on Harris and Lewis had declined as Mink populations have become established on the islands in recent decades. In addition field visits were made to collect new data on breeding waders in areas inhabited by Mink. Relevant data on long-term trends in breeding success were found to be almost completely lacking so the report focused on trends in population sizes and breeding distribution.
- (2) The species covered by the review were divers, grebes, herons, wildfowl, raptors, gamebirds, crakes, waders and seabirds.
- (3) There was little evidence of widespread declines in avian populations in Harris and Lewis that could be associated with the spread of Mink. However, a major problem is that for most bird species there is a dearth of long-term high quality data.
- (4) There was an indication that populations of breeding waders on Mink-inhabited islands in the Sound of Harris may have been affected by Mink. Numbers of breeding waders generally showed very large declines between 1983 and 1999 on the islands of Ensay and Killegray. This, especially for Lapwing and Redshank, was in contrast to the situation on Mink-free sites further south. Furthermore, in 1999 the breeding success of Oystercatchers on Ensay and Killegray was very low relative to that in similar habitat on mainland North Uist where Mink were absent.
- (5) The effects of Mink on breeding waders need to be confirmed through intensive work involving studies of breeding success and Mink control. Craik (1998a) has shown that local control of Mink can lead to much improved breeding success of terns and gulls. It is highly desirable that similar experiments are conducted in potential wader breeding habitats currently occupied by Mink.
- (6) There was no evidence that populations of small gulls or terns had declined on Harris and Lewis over the last 30 years. This contrasts with findings in Argyll where Mink predation is considered by Craik (1997, 1998a) to be a principal cause of population declines in these species. If Mink have been causing widespread breeding failures on Harris and Lewis for several years, which seems likely to be the case according to work conducted in 1999 by Stuart Rae, populations must have been maintained by immigration.
- (7) There is circumstantial evidence that the extinctions of Little Grebe, Moorhen and Coot on Harris and Lewis were associated with the spread of Mink.
- (8) It is possible that some breeding sites of terns and Corncrakes on Harris and Lewis may have become population sinks, following the attraction of birds to apparently high quality habitat where predation pressure from Mink (and possibly also from other introduced predators) is high.



## 2. INTRODUCTION

This report provides a review of the status and population trends of those ground-nesting bird species on Harris and Lewis that are potentially vulnerable to predation by feral American Mink *Mustela vison* (hereafter referred to as Mink). Mink were reared on three farms on Lewis in the 1950s but these closed in the early 1960s as a result of legal changes introduced in the Mink Keeping Order 1962 (Angus 1992, Swan 1999). Wild living Mink were first noted on Lewis in 1969 and had spread through both southern Lewis and North Harris by 1972 (Cuthbert 1973, Swan 1999). The rest of Harris and Lewis are believed to have been colonised by the early 1980s. Trapping in 1988 indicated a population of 7,500-9,000 females (Hudson & Cox 1989) and thus an estimated total population of 15,000-18,000 (Swan 1999). Mink are good swimmers (Dunstone 1993) and there has been long-standing concern that the animals could colonise the Southern Isles (*i.e.* North Uist, Benbecula, South Uist) by swimming across the Sound of Harris. Trapping along the southern coast of Harris has aimed to prevent southward expansion of Mink (Swan 1999). In conservation terms, this is extremely important because the machair and blackland of the Uists and Benbecula hold one of the major concentrations of breeding waterfowl, especially of waders (Fuller *et al.* 1986), in western Europe. Unfortunately, this trapping scheme has not prevented this happening. In June 1999, Mink were found to be apparently established on Ensay and Killegray in the Sound of Harris and subsequently several Mink were found on North Uist.

There have been a number of studies of the effects of Mink predation on birds. Craik (1995a, 1995b, 1997, 1998a, 1998b) has investigated the effects of Mink on island colonies of Black-headed Gulls *Larus ridibundus*, Common Gulls *Larus canus*, Herring Gulls *Larus argentatus*, Common Terns *Sterna hirundo* and Arctic Terns *Sterna paradisaea* along the mainland coast of west Scotland. Where Mink were present, breeding failures were high and this resulted in the abandonment of smaller colonies often within one or two years. As Mink live singly and territorially, however, they are unlikely to make as much impact on larger larid colonies. In his study area, Craik (1995b) also found that Mink caused breeding failures in Shags *Phalacrocorax aristotelis* and Mute Swans *Cygnus olor* and that they preyed upon adult Eider *Somateria mollissima*, Red-breasted Merganser *Mergus serrator* and Black Guillemot *Cephus grylle* as well as their eggs and chicks (see also Craik 1995b). Craik (1998a) has presented data suggesting that annual widespread breeding failures at gull and tern colonies as a result of Mink predation may lead to regional population decline in these species.

Clode (1993) studied the effects of Mink predation on Arctic Terns and Common Terns in Harris and Lewis and on islands in the Sound of Harris. She found that Mink did not affect the distribution of colonies, but that there was evidence that terns formed larger colonies where Mink were present, in order to aid defence. Mink predated both adults and chicks. The effects of Mink predation on Arctic Terns and other seabirds have additionally been documented by Folkestad (1982), Moors and Atkinson (1984) and Barrett and Vader (1984). Olsson (1974) found that the introduction of Mink to areas of the Swedish east coast led to reduced breeding success in Black Guillemots and a population decline. Similar declines in Black Guillemot numbers in south-west Sweden (Asbirk 1978) and Iceland (Petersen 1981) have also been attributed to Mink. Effects on species other than seabirds are less well documented. Craik (1997) reported that Oystercatchers *Haematopus ostralegus* disappeared from his study area following Mink predation. Elsewhere in Scotland, Mink have been found to predate upon breeding Shelduck *Tadorna tadorna* and some other wildfowl species (Bignal 1978, 1979). Other species which have been recorded in the diet

of Mink in Great Britain include Pheasant *Phasianus colchicus*, Grey Partridge *Perdix perdix*, Lapwing *Vanellus vanellus*, Woodcock *Scolopax rusticola* (Birks & Dunstone 1984), Moorhen *Gallinula chloropus* and Coot *Fulica atra* (Chanin & Linn 1980, Wise *et al.* 1981). Mink are also believed to be an important cause of mortality in Corncrakes *Crex crex* (Tucker & Heath 1994).

### 3. SPECIES COVERAGE AND DATA SOURCES

This report aims to provide information on the current numbers and population trends of those ground-nesting bird species on Harris and Lewis that are potentially vulnerable to predation by Mink. For the purposes of this report, this includes those species of divers, grebes, herons, wildfowl, raptors, gamebirds, crakes, waders and seabirds for which there was breeding evidence on Harris or Lewis in at least one of the two periods covered by the Breeding Atlases of Britain and Ireland (BTO/Scottish Ornithologists' Club (SOC)/Irish Wildbird Conservancy), *i.e.* 1968-72 (Sharrock 1976) and 1988-91 (Gibbons *et al.* 1993). It excludes species which nest exclusively on cliffs and which are therefore less likely to be affected by Mink, Pheasant which is only present on Harris and Lewis as an introduced species, Hen Harrier *Circus cyaneus* which has never conclusively been proved to breed on the islands and Golden Eagle *Aquila chrysaetos*. Puffin *Fratercula arctica* is potentially vulnerable to predation by Mink, but it has been excluded because its current breeding status on mainland Harris and Lewis is uncertain. According to Harris (1984), there appears to be just one very small colony - at Toe Head, Harris - but Lloyd *et al.* (1991) do not appear to include this colony on their map. A full list of the species covered by the report is given in Table 1. All available information of which we are aware has been consulted or considered for inclusion in the report. Where relevant information is available on trends in breeding production this has been included, but generally such information is lacking.

To place the populations on the islands in context, recent British population estimates are provided for all species, primarily from the Avian Population Estimates Panel (Stone *et al.* 1997), the 1988-91 Breeding Atlas (Gibbons *et al.* 1993) and, in the case of seabirds, from the national survey of 1985-87 (Lloyd *et al.* 1991). Population estimates for the islands themselves are taken, where available, from relevant papers, Scottish Bird Reports (SOC: Murray 1992, 1993, 1994, 1995, 1996, 1998) and Outer Hebrides Bird Reports (Outer Hebrides Ornithologists' Club: Dix & Cunningham 1991, 1992, Rabbitts 1999). For some species, data in these reports originate from Royal Society for the Protection of Birds (RSPB) surveys. Where possible comparison is made to population trends on the Southern Isles of the Outer Hebrides, where Mink are thought to have been absent until very recently. Data for the Sound of Harris islands, where Mink are present but their status unclear, are included with that for the Southern Isles or reported separately. Data for Harris and Lewis do not include information from the Shiant Islands, Gasker or Flannan Isles. To determine whether species' ranges on the islands have changed, a comparison is also made of the number of 10 km squares occupied by species in each of the two atlas periods, both in Harris and Lewis and the Southern Isles.

For breeding waders additional data have been drawn from surveys undertaken in the Uists and Sound of Harris between 1983 and 1987 (Fuller *et al.* 1986, Fuller & Percival 1988). Further survey work on waders was undertaken on North Uist and Berneray in 1998 and 1999 by RJF (Fuller & Jackson in press). In 1999, the BTO was commissioned by MESH to undertake surveys of breeding waders on at Northton, Harris. The latter site was known in earlier years to be the major concentration of breeding waders on mainland Harris and Lewis but no recent surveys have been conducted there. In addition, waders were surveyed in 1999 on the islands of Ensay and Killegray, in the Sound of Harris. The aim of these surveys was to provide data on the population changes and status of breeding waders in areas inhabited by Mink for comparison with areas not inhabited by Mink. All the surveys of breeding waders in the 1980s and 1990s were undertaken using single-visit transect methods in June (see Reed & Fuller 1983 and Fuller & Jackson in press).

for description and discussion of the methods). In June 1999 data were also collected on the apparent breeding success of Oystercatchers at Ensay and Killegray, where Mink were present, for comparison with data collected in similar coastal habitats at Griminish Point, North Uist, (grid reference NF730765) where Mink were absent.

For seabirds, data were available from Operation Seafarer, the first national survey of breeding seabirds which took place in 1969-70. These data are not, however, necessarily comprehensive, particularly as only a few inland colonies were covered (Lloyd *et al.* 1991). Furthermore, in some cases, individuals, not pairs or occupied nests, were counted. In view of these problems the data do not always form an unambiguous baseline against which trends in seabirds on Harris and Lewis can be measured. Accordingly, we have not obtained the site-specific seabird counts from the 1985-87 Seabird Colony Register because in many cases they could not be directly compared with the 1969-70 data. Caveats are given under the appropriate species accounts.

Figure 1 indicates some of the major locations named in the accounts.

## 4. SPECIES ACCOUNTS

### 4.1 Divers, Grebes, Herons, Wildfowl and Crakes

An estimated 935-1,500 pairs of **RED-THROATED DIVERS** *Gavia stellata* and 155-189 pairs of **BLACK-THROATED DIVERS** *Gavia arctica* breed in Great Britain (Stone *et al.* 1997). Both species occur on Harris and Lewis, with the population of Black-throated Divers being of particular importance. Reported numbers vary between sources, however, and it is thus difficult to assess population changes. Dix and Cunningham (1991) reported that there were 15 breeding pairs of Red-throated Divers on the islands in 1989 and 19 in 1990 (12 of which successfully produced young). In contrast, Murray (1992) reported only 15 pairs in 1990. In 1994, there were reported populations of 10 pairs of Red-throated Divers and 19 pairs of Black-throated Divers on Harris and Lewis (Murray 1996). The range of neither species changed on Harris and Lewis between the two atlas periods (Table 1), although Red-throated Divers were significantly more widespread on the Southern Isles in 1988-91.

The **LITTLE GREBE** *Tachybaptus ruficollis* population of Great Britain is estimated at 5,000-10,000 pairs (Gibbons *et al.* 1993). In the Outer Hebrides, the main breeding population is found in the Uists and Benbecula and the species apparently no longer breeds on Harris and Lewis (Cunningham 1987, Gibbons *et al.* 1993, Rabbitts 1999). The small breeding population on Harris and Lewis had been in decline since 1960 and by 1983 only a maximum of three pairs remained, one each on Loch Stiapavat, Loch Cromore and Loch an Dùin on Lewis. Loch Stiapavat formerly held up to three pairs, whilst Lochs Tuamister, Dalbeg, a' Bhaile at Tolstachaolais and na Cartach on Lewis and the loch at Rodel on Harris also held single pairs (Cunningham 1983). The loss of Little Grebes from Harris and Lewis has been attributed to predation by Mink (Cunningham 1987).

There were an estimated 10,300 **GREY HERON** *Ardea cinerea* nests in Great Britain in 1991 (Gibbons *et al.* 1993). Grey Herons colonised the Outer Hebrides in the early part of the century (Campbell 1949). There were approximately 300 nests in the late 1930s and a similar number were observed in 1982-84 (Marquiss 1989). Only 112 breeding pairs were recorded in the 1954 Grey Heron survey, however (Garden 1958). In Harris and Lewis, a total of 28 pairs were recorded at four heronries in 1954. A maximum of 40 pairs were recorded, also at four heronries, in 1998 (Rabbitts 1999). Ten pairs were recorded near Shawbost, a maximum of 10 in Stornoway woods, 12 near Laxay and eight at Little Loch Roag. Thirteen occupied nests had been recorded at the latter site in 1989 (Dix & Cunningham 1991). The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated a significant increase in the species' range on Harris and Lewis.

Native populations of **GREYLAG GEESE** *Anser anser* in Great Britain are confined to the Outer Hebrides and north Scotland (Gibbons *et al.* 1993). On the Southern Isles there was an estimated post-breeding population of 1,630 birds in 1986, double that in the 1960s (Paterson 1987), and the 1988-91 Breeding Atlas indicated that the species had become significantly more widespread (Gibbons *et al.* 1993, Table 1). Thom (1986) gave estimated populations of 10-15 pairs on Lewis and two or three pairs on Harris. Although Cunningham (1983) reported that Greylag Geese had become less widespread on Harris and Lewis (and were subject to predation and disturbance by man, gulls and crows), Dix and Cunningham (1992) more recently suggested that the species was becoming more numerous. The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated a slight increase in distribution on Harris and Lewis.

The **SHELDUCK** population in Great Britain is estimated at 10,600 pairs (Gibbons *et al.* 1993). The majority of pairs nest on the coast, often in rabbit burrows, and as a result nests may be particularly susceptible to Mink predation, although adults are highly defensive. In the Outer Hebrides, the majority of Shelduck are found in the Southern Isles and only a few breed on Harris and Lewis. Cunningham (1983) reported that five to 10 pairs bred regularly at Broadbay, a few pairs at Loch Erisort and at Uig and between five and seven pairs between Northton and Luskentyre on Harris. Rabbitts (1999) reported breeding at Bac, Branahuie and Balallan. There was no indication from the 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) that the species had become less widespread.

There are an estimated 770 pairs of **GADWALL** *Anas strepera* in Great Britain, most of which breed in England (Gibbons *et al.* 1993). It is a rare breeder in the Outer Hebrides, where the only regularly used site was at Balranald on North Uist (Cunningham 1983, Gibbons *et al.* 1993). Since 1986, breeding has only been recorded in 1991 on Benbecula (Dix & Cunningham 1992, Rabbitts 1999). The 1988-91 Breeding Atlas suggested that breeding may have also occurred on Harris (Gibbons *et al.* 1993).

The British **TEAL** *Anas crecca* population is estimated at 1,500-2,600 pairs (Gibbons *et al.* 1993). It is a patchily distributed species in the Outer Hebrides and only 1-2 pairs were reported on Harris and Lewis by Dix and Cunningham (1991). The 1988-91 Breeding Atlas suggested that breeding was concentrated around Ness, probably at Loch Stiapavat. There was no indication from the 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) that the species has become less widespread.

The **MALLARD** *Anas platyrhynchos* is found throughout Great Britain and has an estimated British population of 100,000-130,000 pairs (Owen *et al.* 1986). It is a common breeding species in Harris and Lewis, and elsewhere in the Outer Hebrides (Cunningham 1983), and the 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated no apparent change in its range.

The **SHOVELER** *Anas clypeata* is less widely distributed and has an estimated British population of 1,000-1,500 pairs (Gibbons *et al.* 1993). It is a local breeder in the Southern Isles, but rare in Harris and Lewis. There was evidence of breeding on Harris from the 1988-91 Breeding Atlas (Gibbons *et al.* 1993), whilst single pairs were recorded at Loch Stiapavat in 1974 and 1980 (Cunningham 1983).

The British **TUFTED DUCK** *Aythya fuligula* population is estimated at 7,000-8,000 pairs (Owen *et al.* 1986). It is widely distributed in the Southern Isles and became markedly more widespread on Harris and Lewis in the period between the two Breeding Atlases (Gibbons *et al.* 1993, Table 1). Breeding was first reported on Lewis in 1989, but the species is still scarce and there have been no more than three broods reported in a given year (Dix & Cunningham 1991, 1992).

There are an estimated 31,000-32,000 pairs of **EIDER** in Great Britain, the majority of which breed in Scotland (Gibbons *et al.* 1993). Although the species is known to be a widespread breeder in the Outer Hebrides (Hopkins & Coxon 1979), population trends are unknown. The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated no apparent change in its range.

The British population of **RED-BREASTED MERGANSER** is estimated at 2,200 pairs (Gibbons *et al.* 1993). Cunningham (1983) reported that it was an abundant species in Harris and Lewis, but



less common in the Southern Isles (see also Hopkins & Coxon 1979). Although population trends are unknown, there has been no apparent change in its range on the islands (Gibbons *et al.* 1993, Table 1).

The **SPOTTED CRAKE** *Porzana porzana* is a rare breeder in Great Britain (Gibbons *et al.* 1993) and there have been only occasional records from Harris and Lewis (Cunningham 1983). Although breeding has not been proved, calling males have been heard at Loch Stiapavat and Bac in Lewis (Cunningham 1983), most recently at the former site in 1991 (Dix & Cunningham 1992).

The **CORNCRAKE** was formerly a widespread and, in places, abundant species in Britain and Ireland, but over the last 150 years the species has undergone a massive decline (Hudson *et al.* 1990, Gibbons *et al.* 1993, Stowe *et al.* 1993). There were an estimated 2,640 singing males in Britain at the time of the first Breeding Atlas in 1968-1972 (Cadbury 1980), 700-746 during a national BTO/SOC survey in 1978-79 (although this figure is believed to be an underestimate; Hudson *et al.* 1990, Green 1995), 551-596 during RSPB surveys in 1988 (Hudson *et al.* 1990) and 480 in 1993 (Green 1995). Corncrakes are now largely restricted to the Inner and Outer Hebrides and of the 480 singing Corncrakes recorded in 1993, 56% were in the Outer Hebrides and 23% in Harris and Lewis alone (Green 1995). The results of these national surveys and of annual surveys undertaken by the RSPB indicate that the population on Harris and Lewis has remained relatively stable through the 1990s (Table 2). The population on the Southern Isles underwent a slight decline at the start of the decade but has since recovered (Table 2). The main causes of the Corncrake's decline in the UK and elsewhere in Europe are believed to be habitat loss and the modernisation and mechanisation of farming practices (Green & Stowe 1993, Stowe *et al.* 1993). Corncrakes breed in damp areas of tall grass and herbs and are particularly associated with hay meadows and in the Outer Hebrides, with *Iris pseudacorus* beds (Stowe & Hudson 1991). The recent stabilisation in numbers in the Outer Hebrides has followed RSPB research highlighting the need to change mowing techniques (Stowe & Hudson 1991) and the importance of cover and habitat diversity (Williams *et al.* 1991).

The **MOORHEN** population in Great Britain is estimated at 240,000 pairs and that of the **COOT** at 46,000 pairs (Gibbons *et al.* 1993). Although both species breed in small numbers on the Southern Isles of the Outer Hebrides, they became extinct on Harris and Lewis in the 1970s and 1980s (Cunningham 1987, Dix & Cunningham 1992, Gibbons *et al.* 1993, Rabbitts 1999). There were formerly six to eight pairs of Moorhens on Loch Stiapavat and others on Loch a'Bhaile at Tolstachaolais and at the Bayhead river and drainage canal at Stornoway. The latter may have been lost due to pollution and herbicide-induced eutrophication (Cunningham 1983) but elsewhere predation by Mink is considered to be an important factor (Cunningham 1987). Loch Stiapavat was also the stronghold of the Coot on Harris and Lewis, where there were 30 pairs in 1915, six in 1932 but none by 1974. A single pair may have bred there in 1980 (Cunningham 1983).

## 4.2 Raptors

The **BUZZARD** *Buteo buteo* population in Great Britain was estimated at 12,000-17,000 territorial pairs in 1983 (Taylor *et al.* 1988). In Harris and Lewis there was a minimum of 22 occupied territories in 1989 and 18 in 1990 (Dix & Cunningham 1991). The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated no apparent change in its range.

There are an estimated 50,000 pairs of **KESTRELS** *Falco tinnunculus* in Great Britain (Gibbons *et al.* 1993). The species has been in decline in north-west Scotland for much of this century and in the Outer Hebrides, it is scarce outwith the Uists and Benbecula. Although the 1968-72 Breeding Atlas indicated that there was breeding evidence for the species from three squares on Lewis, Cunningham (1983) later purported that there had never been any proof that the species had bred. However, he did report that two pairs had been seen on Harris, in 1976 and 1978. There was no breeding evidence at the time of the 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1), but breeding was recorded on Lewis near Tamanavay in 1998 (Rabbitts 1999).

The **MERLIN** *F. columbarius* has an estimated British population of 1,100-1,500 pairs (Stone *et al.* 1997). It is relatively abundant in Harris and Lewis (Cunningham 1983; Gibbons *et al.* 1993), probably because of the abundance of Meadow Pipits *Anthus pratensis*, its favoured prey, on the moors. The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated a slight, but non-significant increase in its range on the islands.

### 4.3 Gamebirds

The **RED GROUSE** *Lagopus lagopus scoticus*, a subspecies of the Willow Grouse, is native to Britain and Ireland. It has an estimated British population of 250,000 pairs (Gibbons *et al.* 1993), although numbers have been in long-term decline throughout the country (Barnes 1987, Gibbons *et al.* 1993). In Lewis, the decrease of the species has been associated with over-stocking of sheep on heather moors, uncontrolled burning of these moors, disease and predation by Hooded Crows *Corvus corone cornix*, Ravens *Corvus corax* and Great Black-backed Gulls *Larus marinus* (Cunningham 1983). The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated that there had been a slight, but non-significant increase in its range on Harris and Lewis.

### 4.4 Waders

With the exception of the work of Stroud *et al.* (1988) and Whitfield (1997) on Lewis blanket bog, we are unaware of any systematic counts of breeding waders in Harris and Lewis. This is in striking contrast to the Southern Isles where there have been long-running counts for several sites and where a comprehensive survey was undertaken of machair and blackland in 1983. The western seaboard of Harris and Lewis has always carried much lower populations of breeding waders than those associated with the west coasts of the Uists and Benbecula. The machair north of the Sound of Harris exists as relatively small, discrete patches that are often drier and with a lower shell-sand content than on the Uists. All available counts are summarised for Oystercatcher, Ringed Plover *Charadrius hiaticula*, Lapwing, Dunlin *Calidris alpina* and Redshank *Tringa totanus* for Northton machair (mainland Harris), three islands in the Sound of Harris (Ensay, Killegray, Berneray), and for two sites on mainland North Uist (Sollas and Baleshare). Details of these six study areas are given in Table 3 and the summarised counts are given for each of the five species in Tables 4-8. In 1999, Mink were thought to absent at Northton as a result of trapping, but Mink were definitely present on Ensay and Killegray. There was no evidence that Mink were present on Berneray, Sollas and Baleshare in 1999. Comparison of population changes at these different sites gives some insight into possible effects of Mink on wader populations.

The British population of **OYSTERCATCHERS** in the mid-1980s was thought to be within the range 33,000 to 43,000 breeding pairs (Stone *et al.* 1997). The species is a characteristic bird of

the coastal habitats of the Outer Hebrides and is by far the most numerous breeding wader along the coastlines of Harris and Lewis. Buxton *et al.* (1984) estimated that as many as 1,000 pairs bred along the coastlines of Harris and Lewis in the early 1980s. The broad distribution of the species has not altered in the islands over the last 30 years (Table 1), but there is evidence of a substantial increase on Berneray and North Uist since the early 1980s (Table 4). In contrast, however, the populations have remained remarkably stable on Ensay and Killegray.

The behaviour of Oystercatchers on Ensay and Killegray in June 1999 was strikingly different to that on mainland North Uist (Table 9). A high proportion of pairs on the islands were entirely silent and only 4% of pairs were behaving as if they had chicks. This contrasted with the situation at Griminish where 62% of pairs behaved as if they had young. The behaviour of Oystercatchers at Griminish was typical of that at Baleshare, Sollas and Berneray during the first two weeks of June. The implication of these observations is that in 1999 Oystercatchers on Ensay and Killegray experienced extremely low breeding success relative to Oystercatchers on mainland North Uist. The most recent estimate of British breeding **RINGED PLOVERS** was 8,500 pairs in 1984 (Stone *et al.* 1997). In the early 1980s the machair of the Uists and Benbecula held more than 20% of Britain's breeding Ringed Plovers but there were no major concentrations on Harris and Lewis. While the distribution has changed little in the last 30 years (Table 1) it is clear from the counts presented in Table 5 that the species is widely declining in the Outer Hebrides. Since the mid-1980s numbers have declined by more than 50% at Baleshare and Berneray, though at Sollas numbers have remained relatively stable (Table 5). These declines may be linked with complex changes in predation pressure involving gulls and crows (Fuller & Jackson in press). On Ensay and Killegray numbers have collapsed but the causes are unknown (Table 5). Although there are no systematic population estimates for Northton prior to 1999, Ringed Plovers are known to have been far more abundant during the late 1970s and early 1980s when there was probably in excess of 10 pairs (N. Buxton pers comm.).

The range of **GOLDEN PLOVER** *Pluvialis apricaria* has increased in the Outer Hebrides over the last 30 years (Table 1). The latest British population estimate is 22,600 pairs (Gibbons *et al.* 1993). Blanket bog in Lewis is now amongst the most important breeding area for Golden Plovers in Britain (Whitfield 1997). Interestingly, there have been substantial increases in breeding populations on peatland sites in Lewis between the 1987 and the mid-1990s (Table 10) which appears to be contrary to population trends in much of upland Britain.

The last British population estimate of **LAPWINGS** was made in the mid-1980s when there were thought to be 190,000 to 240,000 pairs (Stone *et al.* 1997). However, numbers have declined considerably since then, especially in England and Wales (Wilson *et al.* in press). The crofting lands of the Outer Hebrides are now one of the most important breeding areas for the species in Britain. On North Uist and Berneray numbers have fluctuated between years but there is no evidence that populations were much different in the late 1990s to those in the mid-1980s (Table 6). On Ensay and Killegray, however, populations have collapsed. By contrast, at Northton there is still a reasonably high density of breeding Lapwings (Table 6). Unfortunately nothing is known about population trends elsewhere on Harris and Lewis.

The British population of **DUNLIN** was estimated at just below 10,000 pairs in the 1980s (Stone *et al.* 1997). Dunlin have shown a significant increase in distribution on Harris and Lewis but not

on the Southern Isles (Table 1). In the Outer Hebrides, large numbers breed both on the machair of

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the Southern Isles and on the peatlands of Lewis. On Lewis, numbers have recently been stable or increased (Table 10). Further south, however, the picture is different. There have been major declines on Ensay and Berneray but at Sollas and Berneray numbers have been more stable (Table 7). Breeding numbers at Northton represent a reasonably high population for the amount of suitable habitat available at the site.

The **SNIFE** *Gallinago gallinago* population in Britain in the late 1980s was estimated to be approximately 55,000 breeding pairs (Stone *et al.* 1997). There is no evidence that the distribution of the species has changed in the Outer Hebrides (Table 1). The species is an abundant breeder in wet habitats in the islands, perhaps reaching its highest densities in machair marshes and blackland. Most methods used for surveying other species of breeding waders are unsuitable for Snipe (Fuller & Jackson in press). Reliable estimates are best derived from counts of drumming birds at dawn and dusk (Gilbert *et al.* 1998). Such counts are unavailable from Harris, Lewis and the Southern Isles.

Britain holds a rather small population of breeding **WHIMBREL** *Numenius phaeopus* - less than 1,000 pairs with the great majority in Shetland (Richardson 1990). On Lewis and Harris the distribution of breeding season records has increased slightly in recent years (Table 1) but very few of these are breeding birds. The Outer Hebridean breeding population is extremely small.

The British breeding population of **CURLEW** *Numenius arquatus* was estimated at just under 40,000 pairs in the 1980s (Stone *et al.* 1997). There would appear to be much suitable habitat for the species in the Outer Hebrides, yet it was not until 1965 that the species was first recorded as breeding. The first breeding record was in Lewis and the species has subsequently colonised North Uist. There has been a significant increase in the breeding season distribution on Harris and Lewis (Table 1). Though hard data are lacking, it appears that the species is continuing to increase in numbers as a breeding bird.

**REDSHANK** *Tringa totanus* are thought to have a similar national population size as Curlew (Stone *et al.* 1997) and they have also shown a significant increase in range in Harris and Lewis (Table 1). No information is available on population trends on Harris and Lewis as a whole. The numbers breeding at Northton are approximately what one would expect for the area of suitable habitat that is available. At Ensay and Killegray there have been large declines in numbers since 1983. This contrasts with the situation at Berneray, Sollas and Baleshare where there has been stability or increases since the 1980s (Table 8).

A national survey in 1995 produced a British population estimate of 1100 - 1790 pairs of breeding **GREENSHANKS** *Tringa nebularia* (Hancock *et al.* 1997) with some 70 - 320 territories in the Western Isles. There has been no change in distribution in Harris and Lewis (Table 1). Whitfield (1997) presented data for Harris and Lewis that suggest little recent change in breeding numbers (Table 10).

The British breeding population of **COMMON SANDPIPER** *Actitis hypoleucos* is estimated at just under 16,000 pairs (Gibbons *et al.* 1993). The species is widely distributed in the Outer Hebrides. No information is available on population sizes or trends though the distribution has not changed in recent years (Table 1).

#### **4.5 Seabirds**

**STORM PETREL** *Hydrobates pelagicus* colonies are extremely difficult to census and it is thus difficult to obtain population estimates or to assess changes. The 1988-91 Breeding Atlas suggested a British population of between 20,000 and 150,000 pairs (Gibbons *et al.* 1993). In Harris and Lewis, there was evidence of breeding at Ness during the 1968-72 Atlas and around Toe Head and Shillay in the Sound of Harris during 1988-91 (see also Cunningham 1983). The only proven colony in the area, however, is on the Flannan Isles (Cunningham 1983).

There were an estimated 7,000 pairs of **CORMORANTS** *Phalacrocorax carbo* breeding in Great Britain in 1985-87, the majority on the coast (Lloyd *et al.* 1991). In the Outer Hebrides, there were 383 pairs in 1969-70 and 257 in 1985-87, the majority in the Southern Isles. Loch an Tomain on North Uist, the only inland colony, held four nests in 1947, 122 pairs in 1970 (Operation Seafarer) and over 200 birds in 1978 (Cunningham 1983). Operation Seafarer reported one pair on Shillay in the Sound of Harris and 21 on Kearstay off Scarp. Cunningham (1983) also reports that a few pairs nest on the islands in Loch Roag.

The population of **SHAGS** *Phalacrocorax aristotelis* in Great Britain is estimated at 38,500 (Lloyd *et al.* 1991). Numbers in the Outer Hebrides rose from 2,749 pairs in 1969-70 to 4,719 in 1985-87. Operation Seafarer reported 147 pairs on Lewis and 256 on Harris in 1969-70. The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated no apparent change in its range.

The populations of both **ARCTIC SKUAS** *Stercorarius parasiticus* and **GREAT SKUAS** *Catharacta skua* in Britain are confined to north and west Scotland. There were 3,350 'apparently occupied territories' of the former species in 1985-87 and 7,900 of the latter (Lloyd *et al.* 1991). Table 11 indicates that the population of Arctic Skuas on Lewis has remained relatively stable since 1969-70. These birds primarily breed on Druim Mor at Gress, with a few pairs between Gress and Tolsta Head. The numbers of Great Skuas in Scotland have been increasing since disturbance and persecution by man ceased in the early part of the century. Breeding was first confirmed on Lewis in 1945 and since then the population has steadily risen (Rennie 1988, Table 12). Ten pairs were recorded by Operation Seafarer in 1969 and a population of up to 39 pairs existed by the late 1980s (Table 12). The main colony of Great Skuas is also at Druim Mor, although they are now also found at a number of other sites in Lewis. The rapid growth of the Great Skua population at St Kilda has had an adverse effect on the populations of several other seabirds (Phillips *et al.* 1999). Such effects have not yet been documented in Lewis, but may be a confusion in understanding declines attributed to Mink.

A total of 167,000 **BLACK-HEADED GULLS** were estimated to be breeding in Great Britain in 1985-87, over 60% inland (Lloyd *et al.* 1991). In the Outer Hebrides, approximately 800 pairs were recorded both in 1969-70 by Operation Seafarer and in the 1985-87 survey. Operation Seafarer in 1969-70 reported 210 pairs in nine colonies on Harris and Lewis (Table 13). There is some evidence that numbers may have increased since then. Loch Stiapavat, which held 50 pairs in 1969, was reported to have over 200 pairs by the early 1980s (Cunningham 1983) and a similar number in 1991 (Dix & Cunningham 1992). In contrast, the 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated a slight, but non-significant decrease in the species' range on the islands.

Almost all **COMMON GULLS** in Britain breed in Scotland. A total of 14,800 pairs were reported

at coastal colonies in 1985-87 (Lloyd *et al.* 1991), but many others breed inland. The total British

population was estimated at 68,800 pairs (Lloyd *et al.* 1991; Stone *et al.* 1997). Numbers in the Outer Hebrides rose from approximately 660 pairs in 1969-70 to 740 in 1985-87. In Harris and Lewis, the species seldom nests gregariously (Cunningham 1983). Operation Seafarer reported 106-108 pairs in 10 colonies in 1969-70 (Table 13), but may have missed some inland breeders. The area around Loch Slacsavat, Uig held six pairs in 1969 and 9-10 in the early 1980s (Cunningham 1983). There were also 10-15 pairs on a pool between Stornoway and Barvas in the latter period. The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated no apparent change in its range. Chris Reynolds (pers. comm.) informs us that some Lewis Common Gull colonies have seriously declined, apparently as a result of Mink predation, but that there have been cases where local intensive control of Mink appears to have led to a restoration of numbers.

An estimated 83,500 pairs of **LESSER BLACK-BACKED GULLS** *Larus fuscus* bred in Great Britain in 1985-87 (Lloyd *et al.* 1991). In the Outer Hebrides, approximately 690 pairs were recorded in 1969-70 by Operation Seafarer and 600 in the 1985-87 survey. Only six pairs were recorded by Operation Seafarer in 1969-70 (Table 13) and it is probable that many inland breeding colonies were missed (see Cunningham 1983). The 1988-91 Breeding Atlas (Gibbons *et al.* 1993, Table 1) indicated no apparent change in the species' range.

In 1985-87 an estimated 160,000 pairs of **HERRING GULLS** nested in Britain (Lloyd *et al.* 1991). The distribution of Herring gull has shown little recent change in the Outer Hebrides (Table 1). Population trends on Harris and Lewis are uncertain. Operation Seafarer produced a total of 1752 (Table 14) but this must be interpreted cautiously due to variation in the count units used (*i.e.* pairs or individuals). The 1985-87 survey recorded 3316 pairs for the whole of the Outer Hebrides compared with 3,790 in 1969-70.

The British population size of **GREAT BLACK-BACKED GULL** *Larus marinus* in 1985-87 was some 19,000 pairs (Lloyd *et al.* 1991) of which the Outer Hebrides contributed just over 3,000 pairs compared with just under 3,000 pairs in 1969-70. Site counts of the species on Harris and Lewis in 1969-70 are summarised in Table 14. There has been no significant change in recent distribution (Table 1).

In 1985-87 the British **COMMON TERN** population estimate was approximately 12,000 pairs (Lloyd *et al.* 1991). There has been no recent change in breeding distribution in Lewis and Harris (Table 1) but available counts show a picture of considerable variation with higher numbers in 1980 than before or since (Table 15). It is unclear to what extent these difference reflect coverage. The current status of Common Terns on Harris and Lewis is rather unclear.

In 1985-87 the British population of **ARCTIC TERNS** was estimated to be 77,680 pairs (Lloyd *et al.* 1991) but Stone *et al.* (1997) give a considerably lower estimate for the late 1980s of 44,000 pairs. This difference is due to large-scale breeding failures and associated population declines on Shetland and Orkney in the 1980s. Overall population sizes of Arctic Terns in the Outer Hebrides are small compared with those of Shetland and Orkney. Lloyd *et al.* (1991) give estimates of approximately 1,300 pairs in 1985-87 compared with more than 30,000 in each of Shetland and Orkney. By 1989 the combined population of the Northern Isles was thought to about 30,000. The recent distribution of Arctic Terns on Harris and Lewis has not changed significantly (Table 1). Available population estimates, however, suggest considerable fluctuation, with no evidence of

overall decline since the late 1960s (Table 16). These figures need to be treated with caution. The  
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absence of counts at particular sites listed in Table 16 should not be taken to indicate absence of birds because sites may not have been covered in all years. Comprehensive counts have probably not been achieved in most years. The relatively high count for 1999 may merely reflect the fact that more thorough coverage was obtained in that year.

In the mid-1980s Britain held some 2,400 pairs of **LITTLE TERNS** *Sterna albifrons* (Lloyd *et al.* 1991) with an estimated Outer Hebridean population of just over 100 pairs, the majority of which are in the Southern Isles and on Sound of Harris islands. Available data on populations for Harris and Lewis show no clear pattern of increase or decrease over the last 30 years (Table 17).

The British **BLACK GUILLEMOT** population in the 1980s was estimated at about 37,500 birds (Lloyd *et al.* 1991) of which some 3,700 were in the Outer Hebrides. Black Guillemots are extremely difficult to census and no information is available on population trends. Data from Operation Seafarer and from the repeat 1985-87 survey are not directly comparable because different methods were used. Atlas data suggest that the species has increased its distribution on Harris and Lewis in recent decades (Table 1).





## 5. GENERAL DISCUSSION

This review has ascertained that there is little evidence of widespread avian population declines in Harris and Lewis that could be associated with the spread of Mink. We stress that absence of hard evidence does not mean that there have not been impacts of Mink on the ground-nesting bird populations of Harris and Lewis. The problem is one of a lack of hard historical data. This review has established that there is extremely little high quality information available on the population trends in Harris and Lewis for those breeding bird species that are vulnerable to Mink predation. Where historical data do exist they are often of uncertain quality, particularly with respect to the geographical completeness of the counts (*e.g.* Operation Seafarer).

### **Breeding waders**

There is no doubt that Mink can seriously reduce the breeding productivity of colonial nesting birds such as terns and gulls (see introduction). They may also cause significant mortality of colonial-nesting adults through surplus killing. It also appears that they can have serious impacts on bird species nesting close to water, perhaps especially along linear waterways. It is less clear what the impacts of Mink predation are on non-colonial, ground-nesting birds such as waders. The results presented in this report indicate that certain populations of breeding waders may have been affected by Mink. It is striking that numbers of breeding waders have generally shown very large declines on two Mink-inhabited islands in the Sound of Harris - Ensay and Killegray – in contrast to the situation on Mink-free sites further south. Ringed Plovers are virtually extinct on Ensay and Killegray (Table 5). The Lapwing has shown major declines on the islands, whilst on sites further south numbers have been relatively stable (Table 6). Dunlin have shown larger declines on Ensay than further south (Table 7). Redshank have also shown major declines on the islands in contrast to sites further south where numbers have been relatively stable or increased (Table 8).

The low breeding success of Oystercatchers on Ensay and Killegray relative to other areas (Table 9) was further evidence that different factors were operating on these islands. Again, it is quite possible that this low breeding success was Mink-related.

These results cannot be treated as conclusive proof that Mink have affected breeding wader productivity and numbers because there may be other factors affecting waders on Ensay and Killegray. These could include habitat change. Grazing ceased several years ago on Killegray and this may have resulted in a reduction in habitat quality for waders. However, this could not explain the declines on Ensay. Furthermore, it is possible that other predators, such as gulls or crows, may be having a serious impact on waders at Ensay and Killegray. It is clear that factors other than Mink could be implicated because some species of waders are currently declining in Mink-free areas such as Berneray and Baleshare. The only way to ascertain the real causes of the wader declines on Ensay and Killegray would be undertake intensive work on territory establishment and the fate of individual nests, ideally coupled with Mink removal or exclusion experiments. Work of this nature would be well worth undertaking in view of the results presented here.

It is unfortunate that no long-term data are available for breeding wader numbers at any mainland sites on Harris and Lewis. The breeding wader survey conducted at Northton in 1999 demonstrated that, with the exception of Ringed Plover, population sizes of waders were broadly what one might

expect for the habitat available, based on experience of similar sites in the Uists. We understand that Mink are currently controlled very effectively at Northton and this may be the reason why a dense population of waders has continued to exist there. Craik (1998a) has shown that local control of Mink can lead to much improved breeding success of terns and gulls. It is highly desirable that similar experiments are conducted in potential wader breeding habitats currently occupied by Mink.

The expansion of Mink into North Uist must be regarded as an extremely serious issue from the perspective of the important breeding wader populations that occur there. At several sites currently thought to be free of Mink, several species of breeding waders are in serious decline. For example, Ringed Plover and Dunlin, are declining at both Berneray and Baleshare (Tables 5 and 7, Fuller & Jackson in press). The exact causes are unknown but the addition of Mink to the habitats of populations that are already under pressure is cause for extreme concern. In addition, introduced hedgehogs *Erinaceus europaeus* are currently expanding their range northwards in the Uists. Predation of nests by hedgehogs has caused large reductions of certain wader populations in South Uist but the animals have yet to reach the north of North Uist. Numbers of feral ferrets also appear to be increasing in North Uist. The combined effects of predation by hedgehogs, mustelids and gulls could be devastating for these wader populations.

### **Terns and gulls**

In view of the findings of Craik (1997, 1998a) that Mink have had major impacts on gull and tern colonies in Argyll, it was surprising that we found no evidence of population declines in any of these species in Harris and Lewis. Common Gulls tend to nest in small, often inland colonies in Harris and Lewis (Cunningham 1983) and are perhaps not so vulnerable to Mink predation as the coastal-nesting terns. The available data for Arctic Tern, however, indicate a fluctuating but possibly stable population over the last 30 years (Table 16). Several points need to be made here. First, the data are not comprehensive and counts may be incomplete. Second, it is possible that bird numbers declined before the first counts were made. Third, with the exception of the work undertaken by Stuart Rae in 1999, little is known about breeding success.

If Mink have been causing widespread breeding failures over a protracted period, which appears now to be the case according to Stuart Rae's work, the only way that populations could have been maintained over the last 20-30 years would be through immigration. Such a process could have been happening if nesting sites in Harris and Lewis are perceived by birds as especially high quality habitat by terns. Under such circumstances increased predation pressure in otherwise high quality habitat could result in birds being drawn into what effectively becomes a population sink or trap. We stress that this is speculation, but with such mobile species as terns this possibility cannot be ruled out. To gain a true picture of the dynamics of tern populations one really needs to examine a larger geographical area than Harris and Lewis alone. It is quite likely that there is interchange of birds with the Southern Isles and mainland western Scotland.

### **Other species**

Little Grebe, Moorhen and Coot have become extinct since Mink have become established and it is quite likely that Mink predation may have been a contributory factor. In the case of Coot, however, the species was in decline prior to the presence of Mink (Cunningham 1983). Based on work in south-west England, Chanin and Linn (1980) suggest that both Coot and Moorhen are able

to maintain viable populations in the presence of Mink. This does not necessarily hold true in the Outer Hebrides where populations of these species tend to be small, and hence are potentially vulnerable. Furthermore, impacts of Mink on particular species of ground-nesting birds may depend partly on the diversity and abundance of available food so it would be imprudent to extrapolate results to completely different types of study areas.

Although there is no evidence that Corncrake has declined, this species could be highly susceptible to Mink predation. Birds may occupy relatively small patches of suitable habitat in which they become highly vulnerable to predation. Information on numbers may not reveal the full picture; information on breeding success is also needed to determine whether there is a risk of predation traps being formed for Corncrakes.

Finally, we must point out that Mink are not the only introduced predators of potential significance to bird populations in Harris and Lewis. Ferrets and hedgehogs may also exert strong local predation pressure on ground-nesting birds and any future studies should seek to distinguish between the impacts of various predators.

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## REFERENCES

- Angus, S. (1992) *A Proposed Mink Control Programme*. SNH Discussion Paper for Lewis and Harris Mink Control Group.
- Asbirk, S. (1978) Breeding numbers and habitat selection of Danish Black Guillemots *Cepphus grylle*. *Dansk Orn Foren. Tidsskr.*, **72**, 161-178.
- Barnes, R.F.W. (1987) Long-term declines of Red Grouse in Scotland. *Journal of Applied Ecology*, **24**, 735-741.
- Barrett, R.T. & Vader, W. (1984) The status and conservation of breeding seabirds in Norway. In *Status and Conservation of the World's Seabirds* (eds. J.P. Croxall, P.G.H. Evans & R.W. Schreiber), pp. 323-333. ICBP, Cambridge.
- Bigal, E. (1978) Mink predation of Shelduck and other wildfowl at Loch Lomond. *Western Nat.*, **7**, 47-53.
- Bigal, E. (1979) Predation of breeding Shelduck by American Mink. *Glasgow Nat.*, **19**, 511.
- Birks, J.D.S. & Dunstone, N. (1984) A note on prey remains collected from the dens of a coast-living Mink (*Mustela vison*) population. *J. Zool. Lond.*, **203**, 279-281.
- Brown, A.F. & Shepherd, K.B. (1993) A method for censusing upland breeding waders. *Bird Study*, **40**, 189-195.
- Buxton, N.E. (1985) The current status and distribution of terns in the Outer Hebrides. *Scottish Birds*, **13**, 172-178.
- Buxton, N.E., Green, G.H. & Langslow, D.R. (1984) The breeding wader populations of the machairs and blackland of the Southern Isles, Outer Hebrides. *Hebridean Naturalist* 8:5-9.
- Cadbury, C.J. (1980) The status and habitats of the Corncrake in Britain 1978/79. *Bird Study*, **27**, 203-218.
- Campbell, J.W. (1949) The breeding of the Heron in the Outer Hebrides. *Scott. Nat.*, **61**, 73-100.
- Chanin, P.R.F. & Linn, I.J. (1980) The diet of the feral Mink (*Mustela vison*) in south-west Britain. *J. Zool. Lond.*, **192**, 205-223.
- Clode, D. (1993) *New Colonists and Old Colonials: Mink Predation of Arctic and Common Terns*. D.Phil. thesis, University of Oxford.
- Craik, J.C.A. (1995a) Effects of North American Mink on the breeding success of terns and smaller gulls in west Scotland. *Seabird*, **17**, 3-11.

- Craik, J.C.A. (1995b) Effects of North American Mink on British seabirds. In: *Threats to Seabirds: Proceedings of the 5th International Seabird Group Conference* (ed. M.L. Tasker), pp. 17-18. Seabird Group, Sandy.
- Craik, J.C.A. (1997) Long-term effects of North American Mink *Mustela vison* on seabirds in western Scotland. *Bird Study*, **44**, 303-309.
- Craik, J.C.A. (1998a) Recent Mink-related declines in gulls and terns in west Scotland and the beneficial effects of Mink control. *Argyll Bird Report*, **14**, 98-110.
- Craik, J.C.A. (1998b) *Results of Mink-Seabird Project in 1998*. Unpublished Report.
- Cunningham, P. (1983) *Birds of the Outer Hebrides*. Melven Press, Perth.
- Cunningham, P. (1987) Mink in the Outer Hebrides. *Scottish Bird News*, **8**, 4.
- Cuthbert, J.H. (1973) The origin and distribution of feral Mink in Scotland. *Mammal Review*, **3**, 97-103.
- Dix, T. & Cunningham, P. (1991) *Outer Hebrides Bird Report 1989 and 1990*, **1**. Outer Hebrides Ornithologists' Group.
- Dix, T. & Cunningham, P. (1992) *Outer Hebrides Bird Report 1991*, **2**. Outer Hebrides Ornithologists' Group.
- Dunstone, N. (1993) *The Mink*. T. & A.D. Poyser, London.
- Everett, M.J. (1982) Breeding Great and Arctic Skuas in Scotland in 1974-75. *Seabird Report 1977-1981*, **6**, 50-58.
- Folkestad, A.O. (1982) The effect of Mink predation on some seabird species. *Viltrappport*, **21**, 42-49.
- Fuller, R.J. (1981) The breeding habitats of waders on North Uist machair. *Scottish Birds*, **11**, 142-52.
- Fuller, R.J., Reed, T.M., Buxton, N.E., Webb, A., Williams, T.D. & Pienkowski, M.W. (1986) Populations of breeding waders Charadrii and their habitats on the crofting lands of the Outer Hebrides, Scotland. *Biological Conservation*, **37**, 333-361.
- Fuller, R.J. & Jackson, D.B. (in press). Changes in populations of breeding waders on the machair of North Uist, Scotland, 1983-1998. *Wader Study Group Bulletin*.
- Fuller, R.J. & Percival, S.M. (1988) Surveys of breeding waders in the Southern Isles of the Outer Hebrides, 1983-1987. Report to the Nature Conservancy Council on contract HF3-03-294.
- Garden, E.A. (1958) The national census of heronries in Scotland, 1954. *Bird Study*, **5**, 90-109.

Gibbons, D.W., Reid, J.B. & Chapman, R.A. (eds) (1993) *The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991*. T. & A.D. Poyser, London.

Gilbert, G., Gibbons, D.W. & Evans, J.A. (1998) *Bird Monitoring Methods: a Manual of techniques for key UK species*. RSPB, Sandy.

Green, R.E. (1995) The decline of the Corncrake *Crex crex* in Britain continues. *Bird Study*, **42**, 66-75.

Green, R.E. & Stowe, T.J. (1993) The decline of the Corncrake *Crex crex* in Britain & Ireland in relation to habitat change. *Journal of Applied Ecology*, **30**, 689-695.

Hancock, M.H., Gibbons, D.W. & Thompson, P.S. (1997) Status of breeding Greenshank *Tringa nebularia* in the United Kingdom. *Bird Study*, **44**, 290-302.

Harris, M.P. 1984. *The Puffin*. Poyser, Calton.

Hopkins, P.G. & Coxon, P. (1979) Birds of the Outer Hebrides: waterfowl. *Proc. R. Soc. Edin.*, **77B**, 431-449.

Hudson, A.V., Stowe, T.J. & Aspinall, S.J. (1990) Status and distribution of Corncrakes in Britain. *British Birds*, **83**, 173-186.

Hudson, P.J. & Cox, R. (1989) Mink Problems in the Outer Hebrides: a Pilot Study. *Game Conservancy Annual Review*, **1988**, 133-135.

Lloyd, C.S., Tasker, M.L. & Partridge, K.E. (eds) (1991) *The Status of Seabirds in Britain and Ireland*. T. & A.D. Poyser, London.

Marquiss, M. (1989) Grey Herons *Ardea cinerea* breeding in Scotland: numbers, distribution, and census techniques. *Bird Study*, **36**, 181-191.

Moors, P.J. & Atkinson, I.A.E. (1984) Predation on seabirds by introduced animals, and factors affecting its severity. In: *Status and Conservation of the World's Seabirds* (eds. J.P. Croxall, P.G.H. Evans & R.W. Schreiber), pp. 667-690. ICBP, Cambridge.

Murray, R. (ed.) (1992) *Scottish Bird Report 1990*, **23**. Scottish Ornithologists' Club, Edinburgh.

Murray, R. (ed.) (1993) *Scottish Bird Report 1991*, **24**. Scottish Ornithologists' Club, Edinburgh.

Murray, R. (ed.) (1994) *Scottish Bird Report 1992*, **25**. Scottish Ornithologists' Club, Edinburgh.

Murray, R. (ed.) (1995) *Scottish Bird Report 1993*, **26**. Scottish Ornithologists' Club, Edinburgh.

Murray, R. (ed.) (1996) *Scottish Bird Report 1994*, **27**. Scottish Ornithologists' Club, Edinburgh.

Murray, R. (ed.) (1998) *Scottish Bird Report 1996*, **29**. Scottish Ornithologists' Club, Edinburgh.

- Olsson, V. (1974) Förändringar inom en population av Tordmule *Alca torda* och Tobisgrissla *Cephus grylle* i Östergötlands skärgård 1954-1973. *Vår Fågelvärld*, **33**, 3-14.
- Owen, M., Atkinson-Willes, G.L. & Salmon, D.G. (1986) *Wildfowl in Great Britain*. Cambridge University Press, Cambridge.
- Paterson, I.W. (1987) The status and distribution of Greylag Geese *Anser anser* in the Uists, Scotland. *Bird Study*, **34**, 235-238.
- Petersen, A. (1981) *Breeding Biology and Feeding Ecology of Black Guillemots*. D.Phil. thesis, University of Oxford.
- Phillips, R.A., Bearhop, S., Hamer, K.C. & Thompson, D.R. (1999) Rapid population growth of Great Skuas *Catharacta skua* at St Kilda: implications for management and conservation. *Bird Study*, **46**, 174-183.
- Rabbitts, B. (1999) *Outer Hebrides (Western Isles) Bird Report 1998*.
- Reed, T.M. & Fuller, R.J. (1983) Methods used to assess populations of breeding waders on machair in the Outer Hebrides. *Wader Study Group Bulletin*, **39**, 14-16.
- Rennie, F.W. (1988) The status and distribution of the Great Skua in the Western Isles. *Scottish Birds*, **15**, 80-82.
- Richardson, M.G. (1990) The distribution and status of Whimbrel *Numenius p. phaeopus* in Shetland and Britain. *Bird Study*, **37**, 61-68.
- Sharrock, J.T.R. (ed) (1976) *The Atlas of Breeding Birds in Britain and Ireland*. T. & A.D. Poyser, Berkhamsted.
- Stone, B.H., Sears, J., Cranswick, P.A., Gregory, R.D., Gibbons, D.W., Rehfisch, M.M., Aebischer, N.J. and Reid, J.B. (1997) Population estimates of birds in Britain and in the United Kingdom. *British Birds*, **90**, 1-22.
- Stowe, T.J. & Hudson, A.V. (1991) Radio-telemetry studies of Corncrake in Great Britain. *Vogelwelt*, **112**, 10-16.
- Stowe, T.J., Newton, A.V., Green, R.E. & Mayes, E. (1993) The decline of the Corncrake *Crex crex* in Britain and Ireland in relation to habitat. *Journal of Applied Ecology*, **30**, 53-62.
- Stroud, D.A., Reed, T.M., Pienkowski, M.A. & Lindsay, R.A. (1987) *Birds, Bogs and Forestry: The Peatlands of Caithness and Sutherland*. NCC, Peterborough.
- Stroud, D.A., Condie, M., Holloway, S.J., Rothwell, A.J., Shepherd, K.B., Simons, J.R. & Turner, J. (1988) *A Survey of Moorland Birds on the Isle of Lewis in 1987*. NCC, CSD Report 776. NCC, Peterborough.



Swan, M.C. (1999) *An Appraisal of the Mink Situation on Harris and Lewis in the Outer Hebrides and the Possibilities of an Eradication Scheme*. Game Conservancy Limited's Advisory Service.

Taylor, K., Hudson, R. & Horne, G. (1988) Buzzard breeding distribution and abundance in Britain and Northern Ireland in 1983. *Bird Study*, **35**, 109-115.

Thom, V.M. (1986) *Birds in Scotland*. T. & A.D. Poyser, Calton.

Thomas, G.J. (1982) Breeding terns in Britain and Ireland, 1975-79. *Seabird Report 1977-1981*, **6**, 59-69.

Tucker, G.M. & Heath, M.F. (1994) *Birds in Europe: their Conservation Status*. BirdLife International, Cambridge.

Whitfield, D.P. (1997) Waders (Charadrii) on Scotland's blanket bogs: recent changes in numbers of breeding birds. In: *Conserving Peatlands* (eds. L. Parkyn, R.E. Stoneman & H.A.P. Ingram), pp. 103-111. CAB International, Wallingford.

Williams, G., Stowe, T. & Hudson, A. (1991) Action for Corncrakes. *RSPB Conserv. Rev.*, **5**, 47-53.

Wilson, A.M., Vickery, J.A. & Browne, S.J. (in press). The numbers and distribution of Lapwings *Vanellus vanellus* breeding in England and Wales in 1998. *Bird Study*.

Wise, M.H., Linn, I.J. & Kennedy, C.R. (1981) Comparison of feeding ecology of the Mink (*Mustela vison*) and the Otter (*Lutra lutra*). *J. Zool. Lond.*, **195**, 181-213.



	a. Harris and Lewis			b. The Southern Isles		
	1968-72	1988-91	% change	1968-72	1988-91	% change
Red-throated Diver	25	25	0	8	15	+88*
Black-throated Diver	13	19	+46	9	8	-11
Little Grebe	6	3	-50	10	9	-10
Storm Petrel	1	1		1	2	
Cormorant	8	5	-38	10	5	-50
Shag	17	20	+18	7	11	+57
Grey Heron	21	30	+43*	22	21	-5
Greylag Goose	12	14	+17	9	16	+78*
Shelduck	9	10	+11	19	19	0
Gadwall	0	1		4	2	
Teal	10	11	+10	13	14	+8
Mallard	30	29	-3	18	21	+17
Shoveler	1	1		7	9	+29
Tufted Duck	3	12	**	12	17	+42
Eider	13	12	-8	21	26	+24
Red-breasted Merganser	23	20	-13	20	20	0
Buzzard	29	27	-7	19	25	+32
Kestrel	10	0	-100**	12	10	-17
Merlin	15	23	+53	9	12	+33
Red Grouse	26	31	+19	12	14	+17
Spotted Crake	2	0		2	2	
Corncrake	19	18	-5	16	15	-6
Moorhen	6	1	-83	7	7	0
Coot	1	0		10	5	-50

**Table 1** Changes in the numbers of 10 km squares in which ground-nesting species were recorded in **a.** Harris and Lewis and **b.** The Southern Isles including the Sound of Harris islands between 1968-72 and 1988-91 (data from Sharrock 1976 and Gibbons *et al.* 1993). Note that species were not necessarily breeding in all the squares where they were recorded as present.

Oystercatcher	36	36	0	30	28	-7
Ringed Plover	22	24	+9	20	19	-5
Golden Plover	31	37	+19*	12	19	+58*
Lapwing	32	34	+6	23	23	0
Dunlin	24	33	+38*	14	13	-7
Snipe	36	39	+8	23	26	+13
Whimbrel	7	12	+71	6	2	-67
Curlew	17	27	+59*	20	15	-25
Redshank	20	29	+45*	21	23	+10
Greenshank	23	23	0	10	5	-50
Common Sandpiper	36	36	0	20	20	0
Arctic Skua	4	5		5	7	+40
Great Skua	3	8		0	2	
Black-headed Gull	16	11	-31	16	16	0
Common Gull	24	22	-8	19	25	+32
Lesser Black-backed Gull	18	15	-17	17	15	-12
Herring Gull	30	33	+10	28	27	-4
Great Black-backed Gull	29	35	+21	25	26	+4
Common Tern	13	11	-15	9	17	+89
Arctic Tern	21	26	+24	23	25	+9
Little Tern	2	4		10	14	+40
Black Guillemot	22	31	+41*	17	23	+35

**Table 1 (Cont.)** Changes in the numbers of 10 km squares in which ground-nesting species were recorded in **a.** Harris and Lewis and **b.** The Southern Isles including the Sound of Harris islands between 1968-72 and 1988-91 (data from Sharrock 1976 and Gibbons *et al.* 1993). Note that species were not necessarily breeding in all the squares where they were recorded as present.

The table only includes those divers, grebes, herons, wildfowl, raptors, gamebirds, crakes, waders and seabirds, which were known to have bred on Harris or Lewis in at least one of the two atlas periods. It excludes species which nest exclusively on cliffs and which are therefore less likely to be affected by Mink, Pheasant which is only present on Harris and Lewis as an introduced species, Golden Eagle and Hen Harrier. Significance levels: \*  $P < 0.05$ , \*\*  $P < 0.01$ .

	1978-79	1988	1991	1993	1994	1995	1996	1998
a. Harris and Lewis	38-45 <sup>1</sup>	71-81	73	110	96	104	109	76
b. The Southern Isles	222-224 <sup>2</sup>	229-243	187-204	161	159	178	231	228
c. The Inner Hebrides and mainland Scotland	329-346	216-230		190	188	217	200	

**Table 2** Numbers of singing Corncrakes recorded in **a.** Harris and Lewis **b.** The Southern Isles including the Sound of Harris islands and **c.** The Inner Hebrides and mainland Scotland in 1978-79, 1988 (Green 1995), 1991 (Murray 1993), 1993-96 (Green 1995; Murray 1998) and 1998 (Rabbitts 1999).

1 The 1978 counts in these cases are known to be underestimates.

2 The 1978 counts in these cases are known to be underestimates.

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**1. Northton** (Grid reference NF985910 and NF997920)

The site consists of two separate areas lying to the west and east of Tràigh an Taoibh Thuath. Wader counts are presented for the two areas combined. The west area 1.1 km<sup>2</sup> is formed by the neck of land lying between Northton settlement and Chaipaval/Toe Head. It is the more diverse of the two areas with habitats comprising of saltmarsh, wet machair and swamp, dry cultivated machair and dry dune grassland. The east area 0.4 km<sup>2</sup> lies between Scarastabeg and Stangrigary, to the west of the A859 road. It consists of a fringing strip of saltmarsh, grading through dry to wet grassland towards the east. Mink are present in the general area but are apparently well controlled in the study area itself. Hooded Crows are numerous.

**2. Ensay** (Grid reference NF980860)

An island of 2 km<sup>2</sup> in the Sound of Harris. Waders were surveyed across the entire island in 1983 and 1999. Much of the island is moorland and rough grassland but, to the west of Ensay House, there is an area of damp grassland that holds most of the breeding waders. Mink were present in 1999. Hooded Crows are common.

**3. Killegray** (Grid reference NF975835)

An island of 1.6 km<sup>2</sup> in the Sound of Harris. Waders were surveyed across the entire island in 1983 and 1999. Predominantly moorland and rough grassland with a small area of dunes at the northern end. Mink were present in 1999. Hooded Crows are common.

**4. Berneray** (Grid reference NF905820)

The site covers the entire area of cultivated and uncultivated machair and dunes that forms the western half of the island (study area 5.5 km<sup>2</sup>). There are no permanently marshy areas, though substantial areas of dune slack are flooded in winter. Mink were not thought to be present in 1999. Hooded Crows are common.

**5. Sollas** (Grid reference NF815764)

This site is formed by the peninsula of cultivated and uncultivated machair and dunes that projects into the Sound of Harris from Sollas and Middlequarter on North Uist (study area 4.5 km<sup>2</sup>). There are only two permanently marshy areas, both on the southern boundary. Waders were not surveyed in the enclosed fields between the machair plain and the A865. Mink were not present in 1999, though ferrets *Mustela furo* were probably present. Hooded Crows are currently rare at Sollas.

**6. Baleshare** (Grid reference NF790610)

An island at the south-west corner of North Uist connected to the main island by a causeway. The island contains large samples of all the typical machair and blackland habitats (Fuller 1981). Waders were surveyed across the entire island (total area 8.8 km<sup>2</sup>). Mink were not present in 1999, though ferrets were definitely present. Hooded Crows are currently rare on Baleshare.

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**Table 3** Details of six machair study areas in Harris, Sound of Harris and North Uist, for which estimated numbers of breeding waders are summarised in Tables 4-8.

	1983	1984-87 <sup>1</sup>	1998	1999	% change <sup>2</sup> 1983-99
Northton (mainland Harris)	-	-	-	19	
Ensay (Sound of Harris)	36	-	-	33	-8%
Killegray (Sound of Harris)	21	-	-	24	+14%
Berneray (Sound of Harris)	57	85	120	161	+182% (+65%)
Sollas (North Uist)	94	98	140	156	+66% (+51%)
Baleshare (North Uist)	178	239	264	257	+44% (+22%)

**Table 4** Estimated population sizes (breeding pairs) of Oystercatchers on six study areas in Harris, Sound of Harris and North Uist. A dash indicates that no count data are available.

1 A median estimate is given for the four years 1984 to 1987.

2 With the exception of Northton, for which no data are available for 1983, the percentage change is given for 1999 compared with 1983. For Berneray, Sollas and Baleshare, the percentage change between the median estimates for 1984-87 and 1998-99 is given in parentheses. The reason for focusing on the periods 1984-87 and 1998-99 is that considerable consistency of survey personnel and field methods was achieved in those years for the surveys at Berneray, Sollas and Baleshare.

	1983	1984-87 <sup>1</sup>	1998	1999	% change <sup>2</sup> 1983-99
Northton (mainland Harris)	-	-	-	1	
Ensay (Sound of Harris)	13	-	-	2	-85%
Killegray (Sound of Harris)	7	-	-	0	-100%
Berneray (Sound of Harris)	203	176	76	57	-72% (-62%)
Sollas (North Uist)	140	177	142	142	+1% (-20%)
Baleshare (North Uist)	105	120	79	51	-51% (-46%)

**Table 5** Estimated population sizes (breeding pairs) of Ringed Plovers on six study areas in Harris, Sound of Harris and North Uist. A dash indicates that no count data are available.

1 A median estimate is given for the four years 1984 to 1987.

2 With the exception of Northton, for which no data are available for 1983, the percentage change is given for 1999 compared with 1983. For Berneray, Sollas and Baleshare, the percentage change between the median estimates for 1984-87 and 1998-99 is given in parentheses. The reason for focusing on the periods 1984-87 and 1998-99 is that considerable consistency of survey personnel and field methods was achieved in those years for the surveys at Berneray, Sollas and Baleshare.



	1983	1984-87 <sup>1</sup>	1998	1999	% change <sup>2</sup> 1983-99
Northton (mainland Harris)	-	-	-	61	
Ensay (Sound of Harris)	51	-	-	12	-76%
Killegray (Sound of Harris)	15	-	-	0	-100%
Berneray (Sound of Harris)	105	179	119	225	+114% (-4%)
Sollas (North Uist)	151	172	131	173	+15% (-12%)
Baleshare (North Uist)	228	267	266	291	+28% (+4%)

**Table 6** Estimated population sizes (breeding pairs) of Lapwings on six study areas in Harris, Sound of Harris and North Uist. A dash indicates that no count data are available.

1 A median estimate is given for the four years 1984 to 1987.

2 With the exception of Northton, for which no data are available for 1983, the percentage change is given for 1999 compared with 1983. For Berneray, Sollas and Baleshare, the percentage change between the median estimates for 1984-87 and 1998-99 is given in parentheses. The reason for focusing on the periods 1984-87 and 1998-99 is that considerable consistency of survey personnel and field methods was achieved in those years for the surveys at Berneray, Sollas and Baleshare.

	1983	1984-87 <sup>1</sup>	1998	1999	% change <sup>2</sup> 1983-99
Northton (mainland Harris)	-	-	-	21	
Ensay (Sound of Harris)	31	-	-	6	-81%
Killegray (Sound of Harris)	5	-	-	4	
Berneray (Sound of Harris)	156	168	68	60	-62% (-62%)
Sollas (North Uist)	41	63	74	67	+63% (+12%)
Baleshare (North Uist)	92	101	84	75	-18% (-22%)

**Table 7** Estimated population sizes (breeding pairs) of Dunlin on six study areas in Harris, Sound of Harris and North Uist. A dash indicates that no count data are available.

1 A median estimate is given for the four years 1984 to 1987.

2 With the exception of Northton, for which no data are available for 1983, the percentage change is given for 1999 compared with 1983. For Berneray, Sollas and Baleshare, the percentage change between the median estimates for 1984-87 and 1998-99 is given in parentheses. The reason for focusing on the periods 1984-87 and 1998-99 is that considerable consistency of survey personnel and field methods was achieved in those years for the surveys at Berneray, Sollas and Baleshare.

	1983	1984-87 <sup>1</sup>	1998	1999	% change <sup>2</sup> 1983-99
Northton (mainland Harris)	-	-	-	15	
Ensay (Sound of Harris)	25	-	-	12	-52%
Killegray (Sound of Harris)	19	-	-	4	-79%
Berneray (Sound of Harris)	37	84	73	92	+149% (-2%)
Sollas (North Uist)	35	29	36	50	+43% (+48%)
Baleshare (North Uist)	95	96	107	133	+40% (+25%)

**Table 8** Estimated population sizes (breeding pairs) of Redshank on six study areas in Harris, Sound of Harris and North Uist. A dash indicates that no count data are available.

1 A median estimate is given for the four years 1984 to 1987.

2 With the exception of Northton, for which no data are available for 1983, the percentage change is given for 1999 compared with 1983. For Berneray, Sollas and Baleshare, the percentage change between the median estimates for 1984-87 and 1998-99 is given in parentheses. The reason for focusing on the periods 1984-87 and 1998-99 is that considerable consistency of survey personnel and field methods was achieved in those years for the surveys at Berneray, Sollas and Baleshare.

	<b>Pairs entirely silent</b>	<b>Pairs vocalising but not giving alarm calls</b>	<b>Pairs giving sustained alarm calls</b>	<b>Total</b>
With Mink (Ensay & Killegray)	42 (74%)	13 (23%)	2 (4%)	57
Without Mink (Griminish, North Uist)	10 (24%)	6 (14%)	26 (62%)	42

$$\chi^2_2 = 40.79, P < 0.001$$

**Table 9** Behavioural responses of Oystercatchers along coasts<sup>1</sup>, with and without Mink in June 1999<sup>2</sup>.

- 
- 1 All Oystercatchers observed were within 100 m of the coast. The length of coast surveyed on Ensay and Killegray was approximately 6 km and at Griminish it was approximately 4 km.
  - 2 The dates of the observations were Ensay and Killegray 10 June 1999 and Griminish 13 June 1999. The slight difference in survey dates could not account for the difference in behaviour at the two areas.

	Number of Sites		
	Golden Plover	Dunlin	Greenshank
Decrease	0 (0)	1 (1)	3 (3)
Stable	1 (2)	3 (6)	2 (5)
Increase	6 (9)	3 (4)	2 (3)
% annual change	+13*	+1	-1

**Table 10** Changes in estimated numbers of breeding waders on seven peatland sites on Harris and Lewis between 1987 and 1994-95 (Whitfield 1997).

Sites were surveyed using the 'Line Transect' method of Stroud *et al.* (1987); figures in parentheses are for four additional sites surveyed by the Line Transect method in 1987 and by the 'Constant Search Effort' method of Brown and Shepherd (1993) in 1994-95. % annual change is calculated only for the seven main sites. Significance levels: \*  $P < 0.05$

	1969-70	1974-75	1983	1989	1990	1991	1992	1994
Druim Mor, Gress	25			23	23			
Gress to Tolsta Head	8		2					
<b>TOTAL</b>	33	22	2+	35	35	43	36+	50+

**Table 11** Numbers of pairs / apparently occupied territories of Arctic Skuas on Harris and Lewis in 1969-70 (Operation Seafarer), 1974-75 (Everett 1982), 1983 (Rennie 1988), 1989-91 (Dix & Cunningham 1991, 1992), 1992 (Murray 1994) and 1994 (Murray 1996).

	1969	1973	1977	1979	1980	1981	1982	1983	1984	1985	1986	1987	1989	1990	1991	1992	1993
Druim Fada					3												
Arnish Moor															3		
Seisiader / Pabail											5	4	3	4			
Druim Mor, Gress	7	12	26	15+							12	17	14	11	3+		
Tolsta Head	3							5					4	3			
Cuiashader								1+									
Galson Moor	0	0	0	0	0	1	1	2	2	3	4	4					
<b>TOTAL</b>	10+	12+	26+	15+	3+	1+	20	8+	2+	3+	21+	25+	39	38	36	18+	10-12+

**Table 12** Numbers of pairs / apparently occupied territories of Great Skuas on Harris and Lewis in 1969-70 (Operation Seafarer), 1973-1987 (Thom 1986, Rennie 1988) and 1989-91 (Dix & Cunningham 1991, 1992), 1992 (Murray 1994) and 1993 (Murray 1995).

Sites are listed according to their order around the coast of Lewis and Harris.

	<b>Black-headed Gull</b>	<b>Common Gull</b>	<b>Lesser Black-backed Gull</b>
Loch nam Faoileag		8-10	
Near Loch Oichean, Leurbost	17	2	
Melbost	15		
Coll	50		
Gress to Glen Tolsta		12	
Loch Bacavat		7	
Tolsta Head			1
N of Port of Ness		30	
Loch Stiapavat	50		
South Dell to Ballantrushal	60		
Bragar		1	
Loch Carloway			4
Eilean an Tighe, Loch Ceann Hulavig		18	
Loch Slacsavat, Uig	15	6	
Sgeir Fiavig Tarras	1		
<b>Lewis total</b>	<b>208</b>	<b>84-86</b>	<b>5</b>
Fladday		2	
Northton	1		
Toe Head	1	20	1
<b>Harris total</b>	<b>2</b>	<b>22</b>	<b>1</b>
Ensay / Killegray		2	
Saghay Beg		30	
<b>Sound of Harris total</b>		<b>32</b>	
<b>TOTAL</b>	<b>210</b>	<b>138-140</b>	<b>6</b>

**Table 13** Numbers of pairs of Black-headed Gulls, Common Gulls and Lesser Black-backed Gulls in colonies on Harris and Lewis in 1969-70 (data from Operation Seafarer).

Sites are listed according to their order around the coast of Lewis and Harris. The Sound of Harris includes Ensay, Killegray, Sgeir Vuran, the Leverburgh Skerries (including Saghay Beg, Suem and Sleicham), Gilsay, Gousman, Shillay and Little Shillay, but not Pabbay or Berneray. Note that during Operation Seafarer, birds were sometimes counted in units of individuals not pairs and these data may not be included in the figures above.



	Herring Gull	Great Black-backed Gull
Loch Erisort Islands	9	2
Loch nan Ritheanan	47	2
Loch Leurbost	45	1
Raerinish Point	12	5
Loch Grimshader to Tob Leiravay	2	
Loch nan Eilean	38	
Loch Orasay	593	2
Loch Tom an Fheidh	17	
Loch Airigh Riabhach	84	
Near Loch a' Leadharain	128	
Holm Island & Eilean nan Uan	8	2
Stac Suardail to Eilean a' Chrotaich (Suardail)	49	18
Eilean a' Chrotaich to Eilean a' Chaise (Pabail)	31	22
Eilean a' Chaise (Pabail) to Rubh' Dubh (Seisiadar)	39	6
Tiumpan Head	4	
Gress to Glen Tolsta, Druim Mor	15	65
Tolsta Head	65	12
Tràigh Geiraha to Dùn Bilascleiter	62	11
Dùn Bilascleiter to Cuiashader	18	11
Cuiashader to Skigersta	36	30
N of Port of Ness	7	2
Butt of Lewis	83	8
Dalmore		1
Loch Carloway	3	
Eilean an Tighe, Loch Ceann Hulavig	40	1
Gallan Head to Glas Eilean	2	
Sgeir Fiavig Tarras	8	
Greineim	20	30
<b>Lewis total</b>	<b>1465</b>	<b>231</b>

**Table 14** Numbers of pairs of Herring Gulls and Great Black-backed Gulls in colonies on Harris and Lewis in 1969-70 (data from Operation Seafarer). Note that during Operation Seafarer, birds were sometimes counted in units of individuals not pairs and these data may not be included in the figures above.

Greinskeir	30	30
Ostem		10
Scarp	17	1
Toe Head	31	5
Rubha Chluar	6	
Eilean Arderanish, Ardmeavag		1
Hamarsay & Rossay	200	
<b>Harris total</b>	<b>284</b>	<b>47</b>
Coppay		2
Shillay		2
Little Shillay	2	
Saghay Beg	1	2+
<b>Sound of Harris total</b>	<b>3</b>	<b>6+</b>
<b>TOTAL</b>	<b>1752</b>	<b>284</b>

**Table 14 (Cont.)** Numbers of pairs of Herring Gulls and Great Black-backed Gulls in colonies on Harris and Lewis in 1969-70 (data from Operation Seafarer). Note that during Operation Seafarer, birds were sometimes counted in units of individuals not pairs and these data may not be included in the figures above.

Sites are listed according to their order around the coast of Lewis and Harris. The Sound of Harris includes Ensay, Killegray, Sgeir Vuran, the Leverburgh Skerries (including Saghay Beg, Suem and Sleicham), Gilsay, Gousman, Shillay and Little Shillay, but not Pabbay or Berneray.

	1969-70	1980	1990
Near Loch Oichean, Leurbost	35		
Loch Innseag			3
Loch Breugach			4
Loch a'Chlachain			5
Holm, Holm Island & Eilean nan Uan	8		
Butt of Lewis			10
Loch Baravat	8		
Loch Cravadale			30
<b>Harris and Lewis total</b>	63+	314-321+	40+
<b>Sound of Harris total</b>		75	
<b>TOTAL</b>	63+	389-396+	40+

**Table 15** Numbers of pairs of Common Terns in colonies on Harris and Lewis in 1969-70 (Operation Seafarer), 1980 (Buxton 1985) and 1990 (Dix & Cunningham 1991).

Sites are listed according to their order around the coast of Lewis and Harris. The Sound of Harris includes Ensay, Killegray, Sgeir Vuran, the Leverburgh Skerries (including Saghay Beg, Suem and Sleicham), Gilsay, Gousman, Shillay and Little Shillay, but not Pabbay or Berneray. Note that during Operation Seafarer, birds were sometimes counted in units of individuals not pairs and these data may not be included in the figures above.

	1969-70	1980	1989	1990	1999
Loch nam Faoileag	2-3				
Near Loch Oichean, Leurbost	12				
Melbost	240	450	420	350	650
Loch an Tiumpan			30		20+
Holm & Holm Island	14				
Coll			20	23	
Gress	10		30	10	
Tolsta Head	36				
Knockaird	50		20	200	60
Swainbost					2
Dell				22	
South Dell / Aird Dell / Loch Drollavat				18	22
Loch an Dùin				5	
Barvas	40		125	206	150
Bragar & Labost	65			30	4
Shawbost			100	30	
Floday					138
Geile Sgeir			30	30	124
Sgeir Fiavig Tarras	2				
Gravel Pit, Uig					7
Greinheim			30		
<b>Lewis total</b>	471-473+	830-949	815+	924+	1177+
Loch a' Ghlinne / Loch Cravadale / Greine Sgeir			70	60	30
Isay			25		
Crago					14
Borve	25		25	5	
Northton				5	
Loch Steisevat	3				
Rodel					104
Renish Point					50+
<b>Harris total</b>	28+	50-67	120+	70+	198+

**Table 16** Numbers of pairs of Arctic Terns in colonies on Harris and Lewis in 1969-70 (Operation Seafarer), 1980 (Buxton 1985), 1989-90 (Dix & Cunningham 1991) and 1999 (Stuart Rae pers. comm.).

Ensay	50				2
Suem			40		118
Sleichen			40		104
Sgeir Vuran					26
Killegray			70		
Gilsay			100		
Gousman			120		
Shillay			80		
<b>Sound of Harris total</b>	50+	336	450		250
<b>TOTAL</b>	499-501+	1216-1352	1370+	994+	1625+

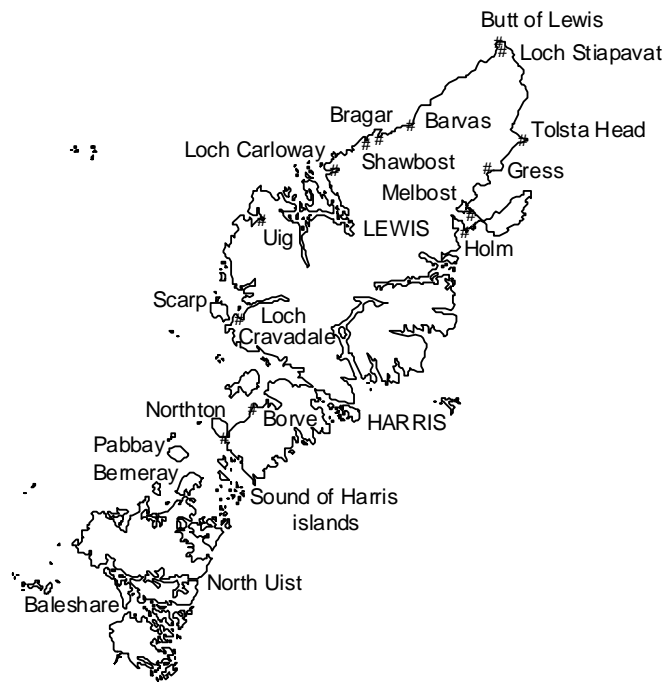
**Table 16 (Cont.)** Numbers of pairs of Arctic Terns in colonies on Harris and Lewis in 1969-70 (Operation Seafarer), 1980 (Buxton 1985), 1989-90 (Dix & Cunningham 1991) and 1999 (Stuart Rae pers. comm.).

Sites are listed according to their order around the coast of Lewis and Harris. The Sound of Harris includes Ensay, Killegray, Sgeir Vuran, the Leverburgh Skerries (including Saghay Beg, Suem and Sleichen), Gilsay, Gousman, Shillay and Little Shillay, but not Pabbay or Berneray. There were a reported 200 pairs of Arctic Terns at Melbost in 1975, 250 in 1976 and 270 in 1978 (Thomas 1982) and also 32 birds at Loch an Tiumpan, 280 at Melbost, 110 at Barvas and 160 at Suem in 1991 (Dix & Cunningham 1992). Note that during Operation Seafarer, birds were sometimes counted in units of individuals not pairs and these data may not be included in the figures above.

	<b>1969</b>	<b>1980</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1999</b>
Melbost & Holm	8		8	5		12
South Harris				15	16	
Ensay, Sound of Harris						3
<b>TOTAL</b>	8+	14-24	8+	20	16+	15+

**Table 17** Numbers of pairs of Little Terns in colonies on Harris and Lewis in 1969 (Operation Seafarer), 1980 (Buxton 1985), 1989-1991 (Dix & Cunningham 1991, 1992) and 1999 (Stuart Rae pers. comm.).

Sites are listed according to their order around the coast of Lewis and Harris.



**Figure 1** Major locations named in the species accounts.