BRUCE CAMPBELL'S ISLANDS REVISITED: CHANGES IN THE SEABIRDS OF LOCH SUNART AFTER HALF A CENTURY

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In 1950 and 1998, counts were made of nine bird species breeding on 31 small islands in Lochs Sunart and Teacuis, sealochs that are typical of many in western Scotland. During this 48-year period, some species that were once characteristic breeding birds of islands in sealochs decreased greatly or disappeared; these included Common Eider, Common Gull, Common Tern and Black Guillemot. Numbers of Heron and Oystercatcher changed very little. Herring Gull and Great Black-backed Gull numbers both increased greatly; in recent years these increases took place at a single island at the mouth of Loch Sunart where they bred successfully. The increase in Herring Gull numbers was contrary to a wider regional trend in the period 1989-98. Records from the two lochs of seabird numbers, breeding success and causes of failure during 1990-98 suggest that two quite separate influences were at work. Excess feed from six large salmon farms may have played an important part in the local increase of large gulls, and the arrival and spread of American Mink caused the breeding failures of terns and Common Gulls that accompanied their declines. The decreases reflect changes during 1987-98 over a larger area of west Scotland, where five gull and tern species each declined by c. 40-50% following widespread annual breeding failures that are known to have been caused by mink.

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INTRODUCTION

From Kintyre northwards, the coastline of west Scotland is dissected by numerous sealochs, firths and sounds. Breeding seabirds and seaducks are absent from most of the mainland coast but nest at high densities on many small islands. The principal breeding species of the islands in these enclosed areas of sea are Black-headed Gull *Larus ridibundus*, Common Gull *L. canus*, Herring Gull *L. argentatus*, Lesser Black-backed Gull *L. fuscus**, Great Black-backed Gull *L. marinus*, Common Tern *Sterna hirundo* and Arctic Tern *S. paradisaea*, with smaller numbers of Shag *Phalacrocorax aristotelis*, Oystercatcher *Haematopus ostralegus*, Common Eider *Somateria mollissima*, Red-breasted Merganser *Mergus serrator* and Black Guillemot *Cepphus grylle*. Individual colonies tend to be small, with

* Known as *Larus graelsii* on the Dutch list

totals of all species almost always under 1000 pairs and usually under 200 pairs. However, the small islands are numerous and together such colonies may hold

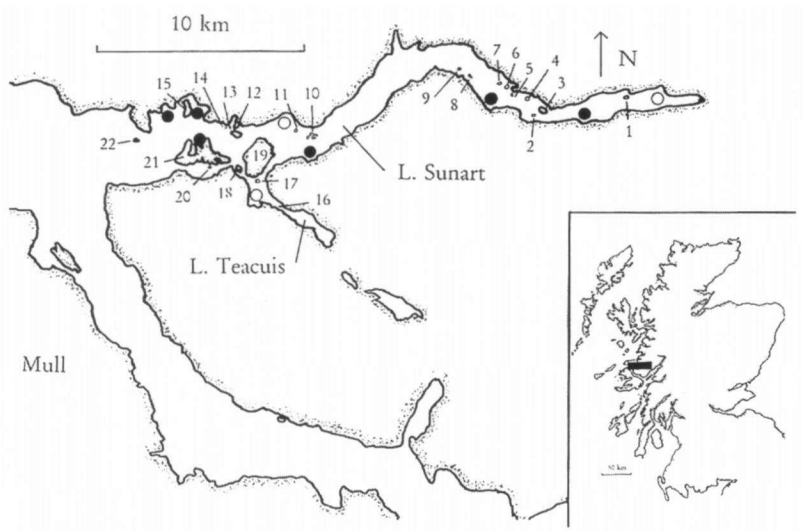

Figure 1. Map of Loch Sunart and Loch Teacuis. Fish farms active on 20 July 1998 are denoted by large dots and former sites, now fallow, as large circles. There are 22 islands or groups (a total of 33 islands): 1. Eilean a'Mhuirich (Strontian); 2. Glas Eilean (Laudale); 3. Eilean Mor (Laudale); 4. Eilean an t'Sionnaich; 5. Sgeir Mhali; 6. Garbh Eilean; 7. Eilean a'Chuilinn; 8. Eilean mo Shlinneag; 9. Sgeir an t'Seangain; 10. Dun Ghallain (4 islets); 11. Eilean nam Gillean; 12. Eilean an Fheidh; 13. Risga (1 large, 2 very small islets); 14. Glenborrodale islets (5 islets); 15. Eilean Mor (Glenmore); 16. Caolas Rahuaidh (3 islets) Loch Teacuis (Teacuis Narrows); 17. Eilean nan Gabhar, Loch Teacuis; 18. Eilean nan Eildean, Loch Teacuis; 19. Carna; 20. Eilean na Droma Buidhe; 21. Oronsay; and 22. Sligneach Mor.

significant totals. For example, in 1987, one-eighth of the Common Terns of the British Isles bred along this coast between Mallaig and West Loch Tarbert, a linear distance of only 130 km (Craik, unpublished records).

Because such colonies are numerous, and sometimes inaccessible, survey coverage in north-west Scotland was incomplete in both of the national seabird surveys to date, Operation Seafarer in 1969-70 (Cramp *et al.* 1974) and the Seabird Colony Register census of 1985-87 (Lloyd *et al.* 1991). Many islands that held *Larus* gull colonies in 1998 were not visited in one or both of these surveys. Thus,

it is difficult to obtain reliable regional totals from these surveys against which to monitor subsequent changes.

However, in 1950 and 1952 Bruce Campbell counted seabirds breeding in Loch Sunart and its smaller offshoot Loch Teacuis. Together these two sealochs hold 33 islands or islets in 22 groups (Fig. 1). He wrote two popular accounts of the area and its birdlife (Campbell 1966, 1979). Some years before his death in 1993 (Perrins 1993), Campbell sent Craik his unpublished typewritten records. This typescript shows that in 1950-52 he visited every one of the small islands in these sealochs and recorded the numbers and species of all the breeding birds that he encountered. This therefore allows us to identify with confidence any changes that have occurred in the interim of almost half a century. To make the most of this opportunity, Craik repeated his survey in 1998.

In the mid-twentieth century, American Mink *Mustela vison* ("mink" hereafter) were bred in captivity on fur farms over much of Britain. Some that escaped bred in the wild and gave rise to the feral population that now lives along the coasts and rivers of much of Britain (Dunstone 1993). The approximate timing of the spread of mink in this part of west Scotland was reported by Craik (1995). The main spread in the Sunart-Teacuis area seems to have taken place in about 1985-90.

METHODS

Early visits Campbell visited the islands on 21-22 May 1950 and on 9 and 11 June 1952. He made less extensive visits in 1921, 1926 and on 28 May 1968, 31 May 1971 and 14-15 June 1982. The account below has been compiled from the 1950 records, supplemented where necessary by 1952 records. For example, his 1950 visit was too early for tern clutches, so tern counts are reported for 1952; all the Common Gull colonies were counted in 1950 except Eilean na Droma Buidhe, which was noted as occupied in 1950 but counted in 1952. His records from the other years are not used below unless they give useful insights into long-term changes. In order to obtain breeding numbers Campbell usually counted clutches and empty nests, but sometimes made estimates from adult numbers. For simplicity these have not normally been distinguished below. (In 1950, for example, he made 14 island counts of clutches/nests and five of adults for gulls, and 13 and four respectively for Oystercatchers). Black Guillemots were counted as adults on the sea when the counter was ashore, and separately as clutches/nests. All 33 islands were visited except the two largest, Carna and Oronsay, which are essentially mainland in character.

Recent visits On 7 and 8 June 1998, the 31 islands were searched for nests as thoroughly as possible, using the presence of adult birds as a guide to nesting areas.

Breeding species were identified and their clutches and well-formed empty nests were counted. Sometimes these had already been depredated. The predator species was identified whenever possible by searching the entire island for eggshell or cached eggs. In deep cover (dense vegetation, or cavities in or under rocks) eggshell was often found bearing 1 mm diameter holes, circular or nearly so; these were sometimes in pairs *c.* 10 mm apart, caused by left and right canine teeth applied equally, but more usually there was a single hole, sometimes with a slight mark 10 mm away, caused by unequal application of canine teeth on a curved shell. The presence on islands of hidden eggshell with such single or paired holes was taken as diagnostic of predation by mink, since no similar predator was likely to reach these islands.

Predation by European Otter *Lutra lutra* ("otter") on young seabirds is often revealed by an absence of plucking, by discarded groups of unplucked, unchewed wings, head and legs (one group per chick) and by faeces recognisable by their sweet smell, placed in several prominent positions and consisting of down, feathers and bones. Mink faeces are less easy to find, often deposited in large quantities in a single unobtrusive site, under cover or in a gully, depression or den mouth. Predation by gulls or crows *Corvus* spp. of eggs is usually recognisable by small triangular holes left by the bill tip, often on both sides of the egg. Predation by gulls of chicks, if eaten whole, is sometimes recognised by pellets in the vicinity; or, if not eaten whole, by the twisted, wrenched appearance of the uneaten carcass, some of the feathered skin often being turned inside out over the carcass. Predation by raptors (not detected in this study) is indicated by intense plucking and by "V"-marks in the carina (the "keel" of the sternum). Care should be taken to distinguish such "V"-marks from the superficially similar comb-like appearance of the carina of adult gulls found in mink dens. The numerous fine parallel rips and tears in the carina are caused by repeated dragging and scraping by mink canines. There was no evidence of rats *Rattus* spp. or cats *Felis* spp. on these islands.

A second visit was made to each island on 20 July 1998 to measure breeding success of gulls and terns. Numbers fledged were estimated as the number of large chicks (Walsh *et al.* 1995) or, just after fledging, as the number of flying young settled on the sea and on intertidal rocks (Craik 2000). Whole-colony breeding failure was indicated by absence of adults and young, and confirmed by absence of signs, such as trampled vegetation, faeces or pellets indicative of recent breeding activity. Where such failure was encountered, prey remains were sought as outlined above.

During 1990-98, annual counts were made on the islands Sligneach Mor and Eilean nan Gabhar, respectively the main Herring Gull and Common Tern colonies. In some of these years, a Common Gull colony on the islets at Caolas Rahuaidh (Teacuis narrows) was also surveyed. Occasional pre-1998 observations or records at other islands are also indicated below.

RESULTS

In 1950-52 the two lochs held a rich fauna of breeding seabirds and shorebirds, scattered between the many small islands. By far the most numerous were Common Terns and Common Gulls, with smaller numbers of Herring and Lesser Black-backed Gulls, Oystercatchers and Black Guillemots (Table 1).

Table 1. Numbers of breeding pairs on islands in Lochs Sunart and Teacuis 1950/52 and 1998.

	1950/52	1998
Grey Heron	16	15
Eider	14	0
Oystercatcher	24	22
Common Gull	150	20
Lesser Black-backed Gull	88	1
Herring Gull	64	223
Great Black-backed Gull	3	23
Common Tern	330	2
Black Guillemot*	18	0

*Numbers of Black Guillemots are individual adults

In 1998, except for one colony, the islands held few breeding seabirds. The exception was the island of Sligneach Mor, at the mouth of Loch Sunart, which held a healthy, medium-sized colony of Herring and Great Black-backed Gulls from which many young fledged. Much smaller numbers of a variety of species, mainly Common Gulls and Oystercatchers, were found distributed among other islands. Already on the first visit (7-8 June), most of the Common Gulls and some of the Oystercatchers had empty nests with nearby eggshell indicating predation, often by mink. No other predators were identified in 1998. No Common Gulls fledged anywhere and, apart from at Sligneach Mor, Herring Gulls fledged only two young at one site.

Total breeding numbers of each species in 1950/52 and in 1998 are given in Table 1 and Appendices I-II. Between these two counts, five species had declined greatly in numbers or had been extirpated (Eider, Common Gull, Lesser Black-backed Gull, Common Tern and Black Guillemot). Herring Gulls and Great Black-backed Gulls had increased considerably, but in 1998 both were almost entirely confined to Sligneach Mor. Numbers of Grey Herons *Ardea cinerea* and Oystercatchers showed little change.

Common Gull Survey counts of Common Gulls are presented in Appendix I. In 1950 at least 150 pairs Common Gulls bred on 13 islands. The largest colony, with

52 pairs, was at Glas Eilean and the second largest, with 38 pairs, was at Dun Ghallain. In 1998 there were 20 pairs on seven islands, an 87% decrease, the largest colony being only seven pairs at Sgeir an t'Seangain; there were none at Glas Eilean and one pair at Dun Ghallain.

In 1998 all 20 pairs of Common Gulls failed to fledge young. No small chicks were seen on 7-8 June, when some would have been expected. Thirteen nests and territories were empty (the adults still present) and seven held eggs (three with 3 eggs, one with 2 eggs and three with 1 egg); the small eggs and clutches suggested that some were replacements. Shells at six of the seven islands indicated egg predation and at five of these mink were identified as the predator. In July there was no evidence of young anywhere and most territories were deserted.

From 1990-98, small numbers of Common Gulls (less than ten pairs annually) breeding with terns on Eilean nan Gabhar failed almost annually, as did the terns (Table 4) and probably for the same reason. The colony of Common Gulls at Teacuis narrows declined from 34 pairs in 1987 and 23 pairs in 1989 to 2-3 pairs in 1994-98, and produced few or no fledged young after 1990.

Lesser Black-backed Gull Survey counts of Lesser Black-backed Gulls are presented in Appendix I. In 1950, Campbell recorded at least 88 pairs of Lesser Black-backs breeding at two sites, "50+" pairs at Risga and 38 clutches at Garbh Eilean. In 1982 he reported "tens" and "low tens" of pairs respectively at these two sites. In 1998 the species was absent from both sites. A single pair attempted to breed at Eilean na Droma Buidhe but failed to fledge young; shells of Common Gull and Common Tern there suggested mink predation.

Herring Gull Survey counts of Herring Gulls are presented in Appendix I. In 1950, 64 pairs of Herring Gulls were breeding at three sites in the Lochs. The largest colony, with 41 pairs, was on Sligneach Mor, and there were 15 pairs at Risga and eight at Garbh Eilean. In 1998 there were 223 pairs at five sites, a 3.5 fold increase; almost all of these (216 or 97%) were at Sligneach Mor.

In 1982 Campbell recorded "low tens" of pairs at Garbh Eilean, "tens" at Risga, and "some tens" of pairs at Sligneach Mor. Craik found the latter two sites occupied by similar numbers in 1983-87, although clutches were not counted. In the early 1990s Risga had been abandoned and Garbh Eilean was reduced to very few pairs, and both remained so up to and including 1998. After this decline, breeding numbers increased greatly on Sligneach Mor (Table 2).

In 1998 Sligneach Mor was almost the only colony where young of any seabird species fledged, with 323 of the Lochs' total of 325 young Herring Gulls (99%). Observations during ringing expeditions suggested a very similar pattern in 1994-97.

Table 2. Herring Gulls breeding at Sligneach Mor, Loch Sunart, 1950-98.

Year	No. pairs	No. fledged
1950	41	?
1952	40-60	?
1982	"some tens"	?
1990	50	Some
1991	67	2
1992	75	Some
1993	87	>50
1994	115	>50
1995	128	100
1996	142	150
1997	151	190
1998	216	323

Table 3. Great Black-backed Gulls breeding at Sligneach Mor, Loch Sunart, 1989-98.

Year	No. pairs	No. fledged
1989	present	Some
1990	5	Some
1991	5	0
1992	5-7	Some
1993	4+	Some
1994	7	8
1995	8	10
1996	11	10-15
1997	16	10-15
1998	22	20

Great Black-backed Gull Survey counts of Great Black-backed Gulls are presented in Appendix I. In 1950, Campbell found only three pairs of Great Black-backs, with single pairs at Sligneach Mor, Risga and Eilean a'Chuilinn. In 1998 there were 23 pairs in total, 22 on Sligneach Mor and one on Eilean mo Shlinneag. As with the Herring Gull, the increase of this species at Sligneach Mor occurred mainly from 1994-98 (Table 3). In 1998, Sligneach Mor was the only colony where Great Black-backed young fledged (20 young).

Thus, the rapid increase in numbers of both these large gull species from 1994-98 took place at one site, where they bred successfully almost annually. Their high productivity there contrasted strongly with the mink-related failure of terns and Common Gulls elsewhere in Sunart-Teacuis, and also with several similar

colonies of Herring Gulls elsewhere in west Scotland that failed in 1997 and 1998 because of mink predation on eggs and young (Craik 1998). The landowner at Ardslignish, the headland adjacent to Sligneach Mor, controlled mink on the mainland with specially trained dogs in 1996-97 and reported the area mink-free in 1998 (E. Macdonald, pers. comm.), which may account for the recent breeding success of large gulls there.

The increase in large gulls is also probably related to the development of fish farming in the Lochs. Farming of salmon and trout in cages in sealochs of the Scottish west coast began around 1970. The industry expanded greatly over the next two decades and by 1990 most sealochs were occupied to capacity. Fish farm cage sites in Lochs Sunart and Teacuis in July 1998 are shown in Fig. 1 but no figures are available on the annual production of these.

Common Tern Survey counts of Common Terns are presented in Appendix I. Campbell recorded terns breeding at Eilean nan Gabhar on a visit in 1921. His visit in 1950 was too early (22 May) for terns to have started breeding, although on that date he recorded 42 adults at the two small island sites in Loch Teacuis (Eilean nan Gabhar and the islets at Teacuis Narrows). In June 1952, in his first comprehensive count of terns, he recorded a total in Lochs Sunart and Teacuis of *c.* 330 pairs at ten sites. These were all or mostly Common Terns, but a few Arctic Terns may have been included. In 1952, at least seven sites held colonies of ten or more pairs and the largest colony, with 107 clutches and "150+ pairs", was at Sligneach Mor. In 1982, he counted 61 pairs (55 clutches and six nests) at Eilean nan Gabhar.

In 1998, only two pairs of Common Terns attempted to breed at Lochs Sunart and Teacuis, one at Eilean nan Gabhar and one at Eilean na Droma Buidhe. Both were unsuccessful, and mink was identified as egg predators at both sites.

In 1987-98 Common Terns bred in significant numbers (more than ten pairs) at only two sites: Eilean nan Gabhar and at Sligneach Mor. Single or a few pairs may have bred elsewhere in some years. Breeding at Eilean nan Gabhar was successful only in two of the nine years 1990-98 (Table 4); egg predation by mink accompanied breeding failure in most years. End-of-season predation of large tern chicks here by otter was identified in 1992. Causes of failures of terns at Sligneach Mor (Table 5) could not be identified, although predation of tern chicks by large gulls was recorded in 1987. Terns ceased to breed there after 1993 when Herring Gull numbers increased and occupied most of the two tern areas.

Grey Heron Survey counts of Grey Herons are presented in Appendix II. In 1950, Campbell counted 16 nests (of which 13 held eggs or young) at Eilean nan Eildean. In June 1998, Craik saw none there but recorded 15 nests at Eilean a'Chuilinn. Breeding success was not measured in 1998 since most of the nests were out of reach.

Table 4. Common Terns breeding at Eilean nan Gabhar, Loch Teacuis, 1990-98.

Year	No. pairs	No. fledged young	Notes
1990	27	34	No mammalian predation
1991	83	0	Mink
1992	74	80	One mink was killed 150 m away
1993	31	0	Mink
1994	0	0	
1995	12	0	Mink
1996	35	0	Mink suspected
1997	5	0	Mink
1998	1	0	Mink

Table 5. Common Terns breeding at Sligneach Mor, Loch Sunart, 1952-98.

Year	No. pairs	No. fledged young	Notes
1952	150	?	
1987	129	?	plus 1 pair Arctic Terns
1988	28	0	
1989	41	0	
1990	27	0	
1991	0	0	
1992	56	47	
1993	158	0-2	
1994-98	0	0	excluded by increased number of Herring Gulls

Common Eider Survey counts of Eiders are presented in Appendix II. Although not ideal, census methods used for Eider in 1998 followed those used in 1950/1952 in order that comparisons could be made. In contrast to some Scottish sealochs, such as Loch Fyne and Loch Etive, Lochs Sunart and Teacuis have never held large numbers of breeding Eiders. In 1950, Campbell recorded 14 clutches or broods at seven sites. On 15 June 1982 he counted a total of seven females and one nest in addition to (uncounted) "ducks and ducklings" in Glenborrodale Bay.

In 1998 no nests, clutches, broods or adults were seen. The dates of 7-8 June are slightly late for finding clutches of this species, but ducks with broods should have been obvious on the water. However, counts were restricted to islands and would have missed birds that nested on the shore of the mainland.

Oystercatcher Survey counts of Oystercatchers are presented in Appendix II. In sealochs such as Lochs Sunart and Teacuis, Oystercatchers breed both along the

mainland shore and on islands, whereas all, or nearly all, the gulls and terns breed on islands. This study was confined to islands so included all the gulls and terns but only a small proportion of the Oystercatcher population of the Lochs.

Oystercatchers were the most widespread of all the species surveyed. In 1950 there were 24 pairs on 19 islands and in 1998 there were 22 pairs on 14 islands. Of this 1998 total, two pairs had young on 20 July, the outcome of four pairs was unknown, and 16 pairs were considered (from the behaviour of the adults) to have failed. Of these 16, mink were identified from eggshells as the cause of failure of six pairs, while the cause of failure of the other ten was unknown (mink not excluded). Thus, no more than two of 18 pairs (11%) were successful.

Black Guillemot Survey counts of Black Guillemots are presented in Appendix II. Black Guillemot nests are difficult to count, and Campbell mainly reported counts of both adults and clutches. As a boy in 1926, he found a chick in a nest crevice at Eilean a'Chuillin in Loch Sunart. He found Black Guillemots breeding in the same crevice in 1950 and again in 1982. In 1950 he recorded eight adults and six clutches at Risga, the species' stronghold in the Lochs, and adults were present at Garbh Eilean. In 1952, 16 adults and four clutches were found at Risga, but other sites were not visited. In 1982, Campbell recorded 13 adults and, with less searching than in 1952, two clutches, distributed between these three sites.

In June 1998, no Black Guillemots were seen at any of Campbell's sites or at any other islands in the Lochs, although small numbers may have bred undetected on the mainland shore.

Ideally, this species should be censused earlier in the year (Walsh *et al.* 1995) but the absence of adults in early June 1998, when onshore searches were made of all these small islets, certainly indicated either that none bred or that the breeders had failed. No eggshells were found, suggesting that none had attempted to breed.

DISCUSSION

Reliable quantitative records of breeding seabirds from as early as 1950 are rare, particularly in west Scotland, an area where seabirds are still under-recorded at the beginning of the twenty-first century. Loch Sunart and Loch Teacuis are typical of the many sealochs of west Scotland, so the long-term changes described above are likely to be representative of a larger part of the coast.

Breeding numbers of Herring Gulls and Great Black-backed Gulls in both lochs increased mainly between 1994 and 1998, while Common Eiders, Common Gulls, Common Terns and Black Guillemots either greatly decreased or became extinct between 1950 and 1998. Campbell's counts of 18 Black Guillemots in 1950 and 13 in 1982 (Appendix II) suggest that this species decline occurred mainly after 1982. Several factors may have caused these changes.

In a larger area of west Scotland, between Mallaig (57° 00' N 5° 50' W) and Machrihanish (55° 25' N 5° 42' W), including Lochs Sunart and Teacuis, Herring Gull numbers decreased by *c.* 37% between 1989 and 1998 (from *c.* 10143 pairs at 73 colonies to 6,388 pairs at 44 colonies). This decline was caused by widespread annual whole-colony breeding failures caused by mink predation of eggs and chicks (Craik 1998). Thus the large increase of Herring Gulls breeding in Lochs Sunart and Teacuis took place against this wider regional decrease.

The perennial supply of food pellets at fish farms provides a source of food for large gulls that is probably substantial (Furness 1996). This, together with the successful breeding almost every year at Sligneach Mor, is a likely reason for the local increase in their breeding numbers. However there are no regular counts from Sligneach Mor before 1990, so any changes then remain undetected.

It is tempting to argue that the species' declines in Lochs Sunart and Teacuis may have been caused by large gulls preying on the eggs and young of the other species and/or taking over their breeding sites. However, there is little evidence for this. In 1998, almost all the Great Black-backs and Herring Gulls (96% and 97% respectively) bred on Sligneach Mor, 6 km from the tern colony at Eilean nan Gabhar and 16 km from the largest of the extant Common Gull colonies. Predation by large gulls was not detected at tern and Common Gull colonies (except of young terns at Sligneach Mor in 1987). Also with the exception of Sligneach Mor, where Herring Gulls increased to occupy areas formerly occupied by terns, all the former breeding sites of terns and Common Gulls remained uncolonised by other species. Thus, there was probably little competition between species for breeding sites.

There is clear evidence that mink predation of eggs was often the cause of repeated whole-colony breeding failures of terns between 1990 and 1998 (Table 4), and of the failure in 1998 of most, possibly all, the Common Gulls and at least some of the Oystercatchers. Between 1965 and 1994, mink increased in this area from being scarce and thinly distributed to become common and widespread along shores and rivers (Craik 1995). Much of this increase in Loch Sunart occurred after 1985. From 1987-98, mink were responsible for decreases of *c.* 40-60% in tern and gull numbers in a west Scotland study area that included Lochs Sunart and Teacuis (Craik 1997, 1998). Mink predation of eggs and young is therefore the most plausible explanation of the declines of terns and Common Gulls in Lochs Sunart and Teacuis since 1990. Caution should be exercised, however, in applying this recent evidence to the whole period since 1950.

Breeding success of Eiders, Lesser Black-backed Gulls and Black Guillemots was not measured, so the reasons for their declines cannot be supported by direct evidence. However, mink predation of incubating adults has been recognised as a cause of the disappearance of Black Guillemots from several other areas in west Scotland in the early 1990s (Craik 1993). Also, between 1990 and

1998, at Eilean nan Coinean-Eilean Fraoich in the Sound of Jura, an important mixed seabird colony with *c.* 200 pairs of Lesser Black-backed Gulls plus similar numbers of Shags and Herring Gulls and smaller numbers of Black Guillemots, was extirpated (except for a small number of Herring Gulls). This coincided with well-documented annual whole-colony breeding failures caused by mink (Craik 1998 and unpublished results). The declines in Loch Sunart at the same time as mink-related declines of these species and terns and Common Gulls elsewhere are therefore likely to have been due to mink predation.

Why were Herons and Oystercatchers, numbers of which changed little between 1950 and 1998, apparently unaffected? Herons breed in trees and, although mink are able to climb trees (Lariviere 1996), this behaviour is not common. In 1998, the breeding success of Oystercatchers in the Lochs was reduced by mink but some pairs did succeed in raising young. In contrast to the colonial habit of gulls and terns, Oystercatchers always breed singly and, for that reason, their eggs and chicks may be less vulnerable to mink. Having found one clutch or brood, a mink would be less likely to find the offspring of neighbouring pairs. Consequently, surplus killing by mink, stimulated by a high density of helpless prey (Kruuk 1972), would not be elicited. Moreover, Oystercatchers are abundant in this and in other habitats and many breed inland, far from water and probably also from mink. Only those Oystercatchers breeding on islands were monitored in this work. Oystercatcher populations as a whole may be sufficiently robust to withstand the extra predation pressure that prevails in mink habitats.

Campbell's records alert us to what almost certainly must have happened in sealochs throughout much of west Scotland where early seabird counts were never made. While not all the losses in Lochs Sunart and Teacuis since 1950 can be proved to have been caused by mink, there is little evidence that other factors have greatly affected this group of species. Within the years 1988-98, other areas in west Scotland (Lochs nan Ceall, Don, Creran, Crinan, Sween, Caolisport and the Sound of Luing) have also lost all or most breeding seabirds, all after mink-related whole-colony breeding failures, in most cases recorded in successive years. Terns and Common Gulls still breed in some other areas where there is local annual control of mink such as Lochs Ailort, Leven, Etive, Feochan, Melfort, Craignish, West Loch Tarbert and the Sound of Mull (Craik 1998).

SAMENVATTING

DE EILANDEN VAN BRUCE CAMPBELL OPNIEUW BEZOCHT: VERANDERINGEN IN DE ZEEVOGELPOPULATIE VAN LOCH SUNART NA EEN HALVE EEUW

In 1950 en 1998 werden tellingen uitgevoerd van de aantallen broedparen van negen soorten zeevogels op 31 kleine eilandjes in de Lochs Sunart en Teacuis, zeearmen die karakteristiek zijn voor talloze andere in West-Schotland. In de loop van deze 48 jaren zijn verscheidene soorten die ooit karakteristiek waren voor dit kustgebied, sterk afgenomen of zelfs vrijwel geheel verdwenen, waaronder de Eider Somateria

mollissima, *de Stormmeeuw* Larus canus, *het Visdiefje* Sterna hirundo *en de Zwarte Zeekoet* Cephus grylle. *Het aantal Blauwe Reigers* Ardea cinerea *en Scholeksters* Haematopus ostralegus *is daarentegen nauwelijks veranderd. Zilver-* Larus argentatus *en Grote Mantelmeeuw* L. marinus *zijn toegenomen, maar de laatste jaren is die toename beperkt gebleven tot één eilandje in de monding van Loch Sunart. De toename van Zilvermeeuw stond in schril contrast met de overheersende trends in de rest van deze regio in de jaren 1989-98. De aantalsontwikkelingen, het broedsucces en de oorzaken van mislukte broedsels in de jaren 1990-98 doen vermoeden dat twee factoren een rol spelen. Bij de grote meeuwen lijkt gemorst voedsel in een zestal grote zalmkwekerijen te hebben bijgedragen aan een relatief ruim voedselaanbod. Bij met name Stormmeeuwen en sterns heeft de komst en vervolgens de sterke uitbreiding van de Amerikaanse Nerts* Mustela vison *tot veel nestplunderingen geleid, hetgeen in veel gebieden populatieafnames tot gevolg heeft gehad. De resultaten zijn representatief voor de ontwikkelingen in een veel groter deel van de Schotse westkust, waar vijf soorten meeuwen en sterns met 40-50% zijn afgenomen na jaren met een slechte reproductie veroorzaakt door de Amerikaanse Nerts.*

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Next page: Appendix I. Number of pairs of Common Gull, Lesser Black-backed Gull, Herring Gull, Great Black-backed Gull and Common Tern counted in islands of Lochs Sunart and Teacuis, 1950/52-98. Figures in brackets indicate number of young fledged. Island numbers refer to those in Fig. 1.

Appendix II. Counts of Black Guillemot (individual adults), Eider (nests, clutches or broods), Heron (active nests) and Oystercatcher (pairs) in islands of Lochs Sunart and Teacuis, 1950/52-98.

Appendix I	Common Gull		L Bl-b Gull		Herring Gull		Gr Bl-b Gull		Common Tern	
Island	1950/52	1998	1950	1998	1950	1998	1950	1998	1952	1998
1. Eilean a'Mhuirich									30-40	0(0)
2. Glas Eilean	52	0 (0)							present	0(0)
4. Eilean an t'Sionnaich	15	1 (0)							35	0(0)
5. Sgeir Mhali										
6. Garbh Eilean			38	0 (0)	8	4 (2)				
7. Eilean a'Chuilinn	10	0 (0)			0	1 (0)	1	0 (0)		
8. Eilean mo Shlinneag							0	1 (0)		
9. Sgeir an t'Seangain	1	7 (0)								
10. Dun Ghallain	38	1 (0)							25-30	0(0)
11. Eilean nam Gillean	1	0 (0)								
12. Eilean an Fheidh										
13. Risga	5	0 (0)	50+	0 (0)	15	0 (0)	1	0 (0)	4	0(0)
14. Glenborrodale islets	Present	5 (0)			0	1 (0)			25	0(0)
15. Eilean Mor										
16. Caolas Rahuaidh	2	3 (0)			0	1 (0)			10	0(0)
17. Eilean nan Gabhar	Several	1 (0)							1	1 (0)
18. Eilean nan Eildean	Several	0 (0)								
20. Eilean na Droma Buidhe	20	2 (0)	0	1 (0)					35	1 (0)
22. Sligneach Mor	6	0 (0)			41	216 (323)	1	22 (20)	150	0(0)
Total	150+	20 (0)	88+	1 (0)	64	223 (325)	3	23 (20)	315-330	2 (0)

Appendix II	Black Guillemot			Eider		Heron		Oystercatcher	
Island	1950/52	1982	1998	1950	1998	1950	1998	1950/52	1998
1. Eilean a'Mhuirich								1	1 (0)
2. Glas Eilean				3	0			1	2 (?)
4. Eilean an t'Sionnaich				1	0			1	1 (?)
5. Sgeir Mhali								1	0 (0)
6. Garbh Eilean	present	6	0	3	0			2	2 (0)
7. Eilean a'Chuilinn	2*	1*	0			0	15	1	0 (0)
8. Eilean mo Shlinneag								1	1 (0)
9. Sgeir an t'Seangain				1	0			1	1 (0)
10. Dun Ghallain								3	3 (1+)
11. Eilean nam Gillean								1	1 (0)
12. Eilean an Fheidh								1	? (?)
13. Risga	16	6	0	4	0			2	1 (0)
14. Glenborrodale islets								1	4 (2)
15. Eilean Mor								1	? (?)
16. Caolas Rahuaidh								1	2 (0)
17. Eilean nan Gabhar				1	0			1	1 (0)
18. Eilean nan Eildean				1	0	16	0	2	? (?)
20. Eilean na Droma Buidhe								1	1 (0)
22. Sligneach Mor								1	1 (?)
Total	18+	13	0	14	0	16	15	24	22 (3+)

* Eggs in 1950 and 1982 were in same rock cavern as chick in 1926.