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Moult flock surveys indicate a continued decline in the Shetland Eider population, 1984-92

M. HEUBECK

The number of Eiders in Shetland in late summer 1992 was estimated to be c.7200 birds, based on surveys of moulting areas. This compared with previous estimates of c.10,000 birds in 1989, c.11,800 in 1984 and at least 16,500 in 1977. In the absence of contrary evidence, it is assumed the Shetland Eider population is largely sedentary. Possible reasons for a continued decline in Eider numbers in Shetland between 1984 and 1992 are discussed but remain unclear, although mortality from oil pollution is unlikely to have been a significant factor.

Introduction

Surveys of flocks of moulting Eiders *Somateria mollissima* began in Shetland in the mid-1970s and counts made in 1977 were used to derive a late summer population estimate (including juveniles) of c.15,500 birds (Jones & Kinnear 1979), a figure subsequently considered too low by at least c.1000 birds (Heubeck 1987). Annual surveys during 1980-84 led to a further estimate of 11,500-12,000 birds in 1984, 25-30% lower than the revised 1977 figure (Heubeck 1987). This paper presents the results of further surveys of moult flocks carried out annually during 1988-92.

Methods

These have been described previously (Heubeck 1987). All known moulting areas were surveyed at least once between mid-August and early September from either the land, 10-15m hard-hulled boats or a small helicopter. Birds were either counted singly, estimated in blocks of five or ten depending on flock size and structure, or counted later from photographs. Moult flocks move locally in response to wind and sea conditions and while the geographic coverage of the 1988-92 surveys focussed on where flocks had been found previously,

the length of coastline surveyed gradually increased as boundaries of known moulting areas were extended, to check that birds were not being missed. Additional, largely negative, information came from boat journeys between known moulting areas and, in 1990-92, from observations during separate surveys of harbour porpoises *Phocaena phocaena*. The extent of the coastline surveyed in 1992 and the location of moulting areas is shown in Fig.1.

Results

Counts of Eiders in each moulting area in 1988-92 are compared with the 1977 and 1980-84 results (Table 1). All known moulting sites should be covered in each year's survey as the number of birds moulting in a given area can vary considerably between years, while observations of marked birds have shown that males do not necessarily moult close to where they winter or breed. Of 63 male Eiders caught and wing-tagged in north-east Yell in November 1984, three were later seen in moult flocks: one at North Fetlar (Area 14) in July 1985, one at Scatness (Area 1) in August 1985 and a different bird at Noness (Area 22) in August 1988.

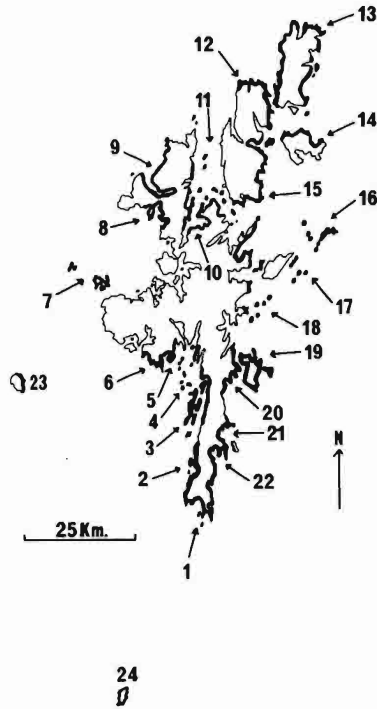


FIGURE 1. Map of Shetland showing the coastline surveyed in 1992 and moulting areas identified in Table 1.

Coverage in 1991 and 1992 was the most extensive to date and helped resolve questions over how regularly some sites are used. Papa Stour and the remote Ve Skerries, difficult to survey by boat, may have long been regular moulting areas (on 11 June 1890 Harvie-Brown found Eiders at the Ve Skerries "abundant, though mostly drakes" (Evans & Buckley 1899)) and it is possible that flocks were overlooked there during fixed-wing aerial surveys in 1980-82. Surveys by helicopter in 1991 and 1992 proved extremely effective, both in terms of coverage, accuracy of counts and quality of photographs taken. The Fitful/St Ninian's Isle area has probably not been used regularly by significant numbers of moulting Eiders and it is now thought that the larger flocks of birds sometimes found there in the

1980s had probably moved north from the Sumburgh area during the moulting period in response to adverse weather. Despite the better coverage and knowledge of local movements of flocks, the total number of Eiders found in 1992 was 40% lower than in 1984, the most thorough of the 1980-84 surveys, and 56% lower than in 1977 when at least seven moulting areas were not covered.

In using these survey results to derive late-summer population estimates, one must take into account known moulting areas not covered by the surveys (including Foula and Fair Isle) and unsurveyed coasts holding scattered birds (mostly females with juveniles) which have not joined moulting concentrations. Jones & Kinnear (1979) cited a figure of c.300 for Foula in deriving

TABLE 1. Counts of moulting Eiders in Shetland, 1977 - 1992. Areas are as shown in Figure 1. Counts in brackets indicate incomplete coverage of the moulting area by 1991/92 standards, those marked with an asterisk indicate coverage of the area by fixed wing aircraft only, the method by which flocks were most likely to have been overlooked. Underlined minimum population estimates are those derived from the most thorough surveys.

AREA	1977	1980	1981	1982	1983	1984	1988	1989	1990	1991	1992
1. Sumburgh	2000	1551	1108	1771	2559	1484	1468	1880	1856	1421	1310
2. Fitful/St Ninian's				(273)	0*	418	333	21	138	47	78
3. Burra/Trondra	(250)	594	172	195	294	235	130	32	115	26	125
4. Scalloway Islands		196	129		70*	(155)	(133)	(91)	35	215	34
5. Reawick									111	21	0
6. Westerwick/Skeld	1800	1345	943	1120	990	1400	565	545	173	310	292
7. Papa Stour/Ve Skerries		(45)*	0*	0*			(345)*	396	(205)	270	436
8. Hillswick Ness	794	946	566	540*	927	650	472	400	224	180	203
9. Ronas/Hevdadale	1400	128	125*	537*	447*	1315	1275	963	427	566	395
10. Sullom Voe				220	170	192	123	91	43	44	165
11. Yell Sound	220	108	185	207	136	15	17	7	76	11	1
12. Gloup Holm, N. Yell	90			(230)	92	130	45*	70	1	11	7
13. North & east Unst		(208)	126*	175*	125*	75	187*	179	247	141	161
14. North Fetlar	243		30	0*	137	28*	4*	46	31	13	27
15. South-east Yell	702	200	465	0*	65	0	0	0	0	0	1
16. Out Skerries	320	823	(476)	742	695*	965	348	489	615	433	398
17. Whalsay Skerries	3336	993	670	654	80*	316	250	420	160	122	10
18. South Nesting Skerries	(310)	430	653	548	308*	475	86	97	180	66	45
19. Bressay/Noss	1630	(433)	1350	(1624)	(1021)	(1415)	(760)	1516	1171	1264	1741
20. Gulberwick	475	500	694	495	747	428	546	506	710	394	245
21. Mail/Leebitton	251	170	323	201	97	59	70	11	12	6	27
22. Noness/Levenwick		(246)	111	186	221	373	527	179	253	279	350
SURVEY TOTAL	13821	8916	8126	9718	8880	10128	7684	8272	6783	5840	6051
22. Foula, mid-July					300			375	c.400	336	356
23. Fair Isle late Aug.			1018	690	680	565	1000	795	551	294	280
KNOWN TOTAL					9860	10693	8684	9447	7833	6470	6687
MINIMUM POPULATION EST.	16500+				10610	<u>11800</u>	9534	<u>10000</u>	<u>8500</u>	<u>7000</u>	<u>7200</u>

their 1977 population estimate, between 3-400 birds have been recorded in mid-July in most recent years along the east coast of the island by Glasgow University staff and a figure of 350 was used in deriving the 1984 and 1988 population estimates (Table 1).

The situation has been less clear at Fair Isle, which lies 43km from both the southern tip of the Shetland Mainland and North Ronaldsay in Orkney. Counts nearest to 31 August, but not always from complete surveys of the island, are given in Table 1 although higher numbers have tended to be recorded in autumn after the moult period. It has been suggested that this increase may be due to Orkney breeding birds stopping at Fair Isle after moulting in Shetland (Jones & Kinnear 1979) and Davis (1965) thought some birds left the island in late autumn. However, hardly any have been seen at any time of year from the ferry crossing to the Shetland Mainland (Dymond 1992) and a lack of sightings during seawatches at the southern tip of Shetland Mainland, Fair Isle or North Ronaldsay gives no indication whether Eiders move to Fair Isle from Shetland or Orkney, but suggests that interchange between the two island groups is minimal. In calculating a 1977 population figure, Jones & Kinnear (1979) estimated a scatter of c.1000 Eiders away from known moulting areas. In view of the overall decline in numbers, this figure has been reduced to c.750 in 1984 and (a probably over-generous) c.500 in 1989-92. The estimate of 7200 Eiders in Shetland in late summer of 1992 was therefore 39% lower than the 1984 population estimate and 56% lower than that of 1977.

Discussion

In the absence of contrary evidence, it is assumed that the Shetland Eider population is sedentary with little or no immigration from surrounding populations. Extensive studies at sea during the mid-1980s found no evidence of regular movement of Eiders between

Shetland and Scandinavia (Tasker *et al* 1987) although a few birds of unknown origin have occasionally been seen from oil installations between Shetland and Norway, especially in October and November (Anderson 1990). There has been just one recovery in Shetland (on Fair Isle) and one in Orkney from the many Eiders ringed in the long-term study at the Ythan Estuary in Aberdeenshire (Buckland *et al.* 1990, Mead & Clark 1990). That Shetland Eiders are significantly smaller than those in north-east Scotland (Table 2) also suggests little inter-mingling with birds from the Scottish mainland, and it has been proposed the north isles Eiders are best included in the Faeroese race *S. m. faeroensis* rather than the nominate race *S. m. mollissima* (Cramp & Simmons 1977).

There can be little doubt that the decline in Eider numbers in moult flocks reflects a decline in the (resident) Shetland population. While no systematic counts have been made, there is anecdotal evidence from throughout Shetland of a decline in numbers of nests and of females with broods. Counts of Eiders in winter also indicated a decline in numbers between the mid-1970s and the mid-1980s, with a further decline by 1991 (Suddaby 1991). Elsewhere, one Orkney source considered there had been "no obvious change in status" there up to 1982 (Booth *et al.* 1984), although another considered Eiders to have "decreased over a longish period" (Meek in Berry 1985). The recent situation is also unclear, with surveys showing numbers of Eiders wintering in Scapa Flow to have declined substantially between 1977/78 and 1988/89 (Christer 1989), but to have increased in the area of Wyre, Rousay and Gairsay Sounds over the same period (Ribbands 1990). Nationally, there has been no suggestion of recent regional declines on the scale observed in Shetland (Marchant *et al.* 1990), although it is questionable whether counts of birds in some regions would have been comprehensive enough to detect anything but gross changes in numbers.

TABLE 2. Measurements (mm) and weights of Eiders caught in winter at the Ythan Estuary, Aberdeenshire and in Shetland. The Ythan birds were caught between October and March 1976/77 and 1977/78, no attempt was made to exclude repeated measurements of retrapped birds and most measurements were taken by S.R. Baillie. The Shetland birds were cannon-netted on 23 November 1984 on the island of Linga off north-east Yell and were measured by R.W. Furness. First-year birds were excluded from all samples.

	YTHAN ESTUARY			SHETLAND			t	Signif.
	Mean	S.D.	n	Mean	S.D.	n		
MALES								
Wing	303.8	6.9	152	291.3	5.4	61	14.04	p<0.001
Bill	55.7	2.8	151	51.9	2.0	61	11.11	p<0.001
Head	129.2	2.7	41	123.9	2.5	61	10.15	p<0.001
Tarsus	54.5	2.2	151	52.7	1.4	61	6.93	p<0.001
Sternum	125.5	5.0	41	123.3	3.1	61	2.50	p<0.05
Weight	2307.2	191.5	181	1983.8	141.2	61	14.06	p<0.001
FEMALES								
Wing	293.3	9.9	129	284.3	7.1	52	6.87	p<0.001
Bill	55.7	2.7	129	48.1	2.4	52	8.00	p<0.001
Head	121.5	3.2	33	117.9	2.7	52	5.47	p<0.001
Tarsus	53.1	2.3	128	50.5	1.4	52	9.14	p<0.001
Sternum	118.3	3.4	32	116.8	3.3	52	2.01	p<0.05
Weight	2042.6	219.4	158	1820.6	107.3	52	9.68	p<0.001

The decrease in the Shetland population between 1977–1984 was attributed to a combination of mortality due to oil pollution in the winter of 1978/79 and an unexplained (but not oil-related) heavy mortality in winter 1979/80 in north-east Shetland (Heubeck 1987), similar in many respects to the unexplained mortality in southern Norway the following winter (Wrånes 1988).

Although oil pollution killed many Eiders in Shetland in 1979 (Heubeck & Richardson 1980), few oiled corpses have been found on systematic beached birds surveys since then (Fig. 2). Of 368 corpses found between January 1980 and December 1992, only 30 were definitely oiled (8.1%) and 10 of those were found on just two of the 156 surveys, April 1986 and March 1991. This incidence of oiling was low compared to the 27% recorded on beached bird surveys elsewhere in the British Isles during the 1970s (Stowe 1982) and values between 45–67% recorded by different schemes on south-eastern North Sea coasts in the late 1970s and throughout the 1980s (Averbeck *et al.* 1992).

Since early 1980, the only instance of abnormally high, unexplained mortality of Eiders was in March–May 1986 when 21 dead birds were found (0.12/km. surveyed), 13 on beaches close to the Sullom Voe Oil Terminal. Although apparently not oiled, plumage samples from three of the Sullom Voe birds were examined by gas chromatography; two showed distinct petroleum-based hydrocarbon residues, the third possible petroleum residues. On 26 March 1986 there had been a suspected discharge into the voe of contaminated ballast water from the tanker *Ariel 5*, which was treated with dispersant. Oily scum spread across the voe and although none of the 318 eiders counted in Sullom Voe that day were clearly oiled, 30–40 were seen preening and splashing and had probably become contaminated by this scum. As well as the three corpses whose plumage was analysed, it is likely that the deaths of some of the 10 others found in Sullom Voe that spring were oil-related. A similar situation occurred near the Flotta Oil Terminal in

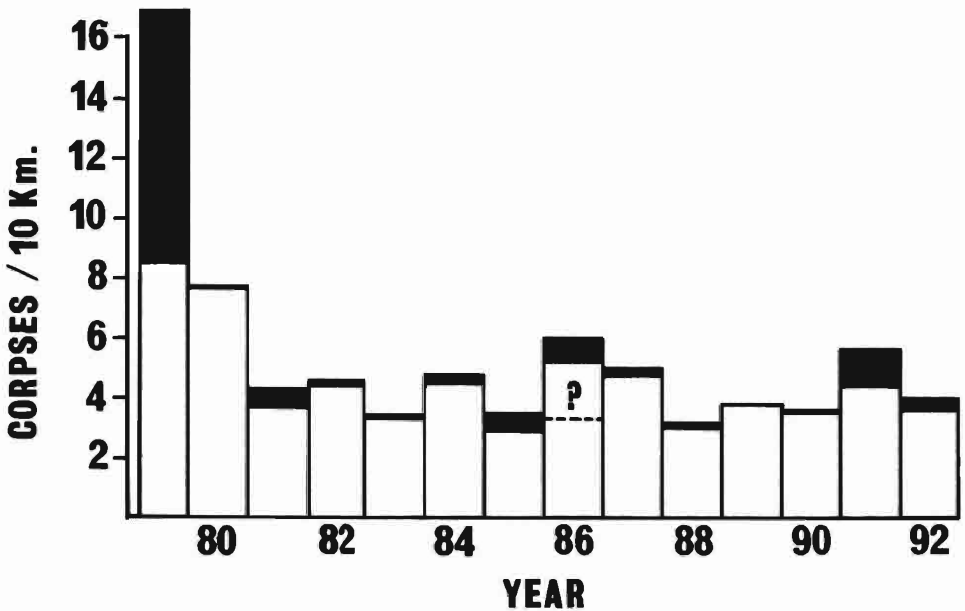


FIGURE 2. The number of Eider corpses found per 10 km. surveyed on Shetland beached bird surveys, 1979-1992. Solid areas = oiled corpses ($n = 451$, 15.5% oiled). ? indicates birds found in Sullom Voe in 1986 which may have been slightly oiled but which were recorded as un-oiled. A period of unexplained, abnormally high mortality between December 1979 and June 1980 led to the relatively high values for un-oiled birds in those years. There was no significant trend in the number of un-oiled corpses found between 1981 and 1992 (Spearman Rank Test, $\rho = -0.084$, $df = 10$). N.B. 1979 = March to December only.

Orkney when abnormal numbers of dead Eiders were found several weeks after a small spillage of crude oil from the tanker *Fanny* on 11 February 1984, most having only lightly or barely noticeably stained plumage (Meek 1985). In this incident, 80% of the corpses found were adult males (as were seven of the eight found in Sullom Voe in April 1986) although in late February there should have been little separation of the sexes as most adult Eiders would have paired. Spring would appear to be a time of relatively higher mortality for male than female Eiders (Table 3). At this time of year males expend greater energy than normal in sexual display and mate-defence while females, feeding at twice the rate of males, accumulate fat deposits prior to egg laying

(Gorman & Milne 1971). Under such circumstances, drakes may succumb more easily than females to slight contamination of their plumage.

With oil pollution apparently having made only a minor contribution and no unexplained mass deaths having occurred, one can only speculate as to the cause(s) of the decline in Eider numbers between 1984 and 1992. Many people in Shetland believe that predation of Eider ducklings by skuas and gulls has increased in recent years but there is no quantitative evidence for this, although predation of other seabirds by Great Skuas *Catharacta skua* increased in the late 1980s (Hamer *et al.* 1991). In Sweden it has been shown that increased disturbance of broods of Eider ducklings by

TABLE 3. Monthly occurrence of unsexed Eiders (corpses/100km surveyed) found dead on Shetland beached bird surveys, March 1979 to December 1992. Birds were reported as either 'male', 'female', 'immature male', 'juvenile/pullus' or unsexed and unaged. Data from December 1979 to June 1980, a period of high, unexplained mortality, are excluded.

	Km.	Male	Female	Imm. male	Juv.	?Sex ?Age	Total
January	631.7	1.90	1.27	0.47			3.64
February	647.2	1.85	1.39	0.15		0.46	3.86
March	685.2	1.90	1.02			0.44	3.36
April	684.0	3.95	1.02			0.58	5.55
May	647.0	2.94	0.93			0.46	4.33
June	638.4	3.76	2.98	0.16	0.31		7.20
July	718.6	1.81	2.50		0.97	0.83	6.12
August	712.1	0.84	1.54		0.56	0.28	3.23
September	628.0	0.64	1.91		0.32	0.48	3.34
October	690.6	0.14	1.59			0.43	2.17
November	710.1	1.13	0.70				1.83
December	615.4	0.65	1.30	0.16		0.16	2.27
Total		143	121	6	15	28	313

boats led to increased predation rates of ducklings by gulls (Åhlund & Götmark 1989). The development of salmon farming in the 1980s certainly led to increased inshore traffic of small boats in many parts of Shetland but again, any effect this may have had on survival of Eider ducklings remains conjecture.

Great Skuas in Shetland occasionally kill adult female Eiders, either when incubating or when flushed from the nest by humans. Between 1969-76 it was estimated that Great Skuas annually killed 4% of adult female Eiders nesting on Foula, based on annual averages of six predated corpses found in the breeding areas and 160 nesting females (Furness 1981). The respective figures for 1989-92 were averages of 7.5 corpses from 117 nesting females, an increase in the percentage taken to 6% (R.W. Furness *in litt.*). Another possible predator of nesting female Eiders are feral ferrets *Mustela vison*, the population of which has increased and spread considerably on the Shetland Mainland in the past 2-3 years. Although they frequently attack domestic poultry, the extent to which ferrets

predate wild birds in Shetland is unknown, apart from one instance in 1992 of a family group killing Puffins *Fratercula arctica* (C. Donald *pers. comm.*). One should be cautious about extrapolating from the Foula example and remember that the cause(s) of the decline in the Shetland Eider population remain speculative. However, for long-lived species such as Eiders which have high annual survival rates (Coulson 1984), a relatively small increase in adult mortality coupled with decreased recruitment to the breeding population could soon lead to substantial population decline.

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Population fluctuations and mortality of Mute Swans on an Orkney loch system in relation to a Canadian Pondweed growth cycle.

E.R.MEEK

*Canadian Pondweed was first noted in the Loch of Harray in 1982. By 1987 it was the most widely distributed plant species in the loch, being especially dense in the northern bays. From early in 1991 there were signs that the amount of pondweed was declining. Breeding numbers of Mute Swans on the Harray/Stenness loch system increased from 36 nests in 1983 to 115 nests in 1990 but dropped sharply to only 13 nests in 1992. A marked mortality of Mute Swans, involving some 250 birds, almost all in their first year, occurred during 1991. Post mortems revealed emaciation and heavy burdens of an internal parasite, *Polymorphus minutus*. Wintering numbers of grazing wildfowl (Mute Swan, Whooper Swan and Wigeon) increased markedly while pondweed growth was at its height but crashed in subsequent years. Numbers of diving ducks (Pochard and Tufted Duck) remained unaffected.*

Introduction

Mute Swans *Cygnus olor* have long been a feature of the Harray and Stenness lochs, a loch system of some 1930ha in the southern part of Orkney's West Mainland (Fig. 1). The loch system shows a gradation from a salinity close to that of sea-water in Stenness to eutrophic freshwater in Harray, a situation unique in Britain (Ratcliffe 1977). In the early 1980s the lochs were known to hold some 50% of Orkney's population of 65 breeding pairs. Both breeding and wintering numbers increased in the late 1980s. The peak breeding numbers were reached in 1990 and wintering numbers in 1990/91. Small mortality incidents had occurred in spring in earlier years (eg. Macdonald *et al.* 1978) but in 1991, dead Mute Swans began to be found around the loch shores in late March and mortality continued throughout the rest of that year. A marked decline in wintering birds was apparent by 1991/92

and in breeding birds in 1992. Public awareness of dead and dying swans during 1991 prompted monitoring of the mortality and veterinary assistance was called upon in an attempt to determine cause of death.

Canadian Pondweed *Elodea canadensis*, an alien water-weed, was first noticed in the northern part of the Loch of Harray in 1982. By 1985 concern began to be expressed for the future well-being of the loch and, as a result, in 1988, Orkney Islands Council commissioned a study of the Loch of Harray by the Aberdeen Centre for Land Use. Their report (Sinclair *et al.* 1992) concluded that the loch was 'mildly enriched' and recommended a number of measures for reducing nutrient input.

The circumstantial evidence for a connection between the Mute Swan population fluctuations and the *Elodea* growth cycle is strong.

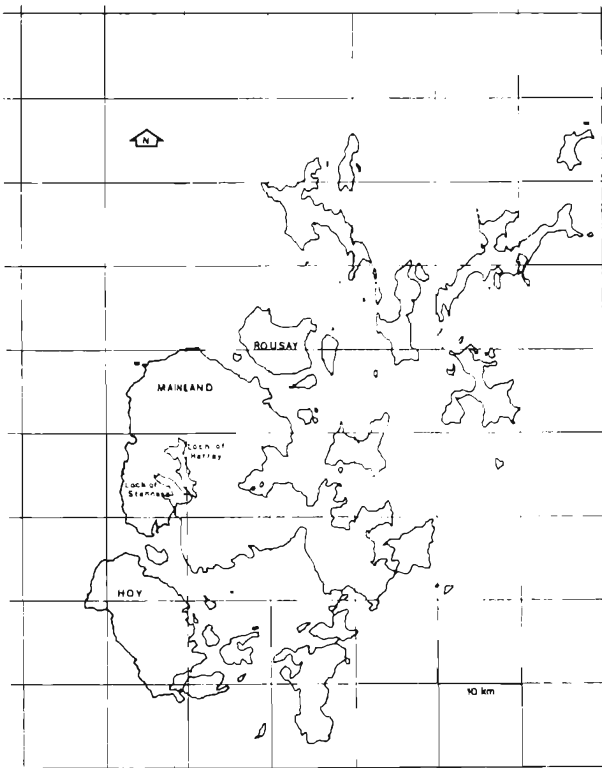


FIGURE 1. Location of the Lochs of Harray and Stromness, Orkney.

Methods

Counts of breeding Mute Swans were carried out from a canoe in 1983 (Reynolds 1985) and on foot in 1990 (Corse 1991). A full count was not possible in 1991 but an assessment of breeding success was undertaken. In 1992 and 1993 further full surveys were carried out on foot followed by further assessments of breeding success.

Wintering numbers of Mute Swans and other wildfowl on both lochs were available from the National Wildfowl Counts organised by the Wildfowl and Wetlands Trust.

Assessment of the numbers of Mute Swans which died during 1991 proved

difficult because of the great length of loch shore and because some corpses were removed by members of the public. A complete count of corpses was carried out on 5 July and again between 15-18 August 1991 and an incomplete one in November 1991.

Post-mortems were carried out on four Mute Swans collected in July, one in November and two in December 1991 with another in January 1992.

Measurements of the abundance of the pondweed were made only in 1987 (Robson 1987) but accounts of its distribution at other times were available from fishermen.

Results

Mute Swan - summer numbers

The numbers of Mute Swans on the Harray/Stenness loch system in the summers of 1983, 1990 and 1992 are detailed in Table 1. The 1983 figures are believed to represent the 'normal' population, numbers having changed little since a previous survey in 1978 (Reynolds 1985). The enormous increase to 115 pairs by 1990 resulted in a breakdown in territoriality on part of the Loch of Harray, the swans nesting colonially on a series of small islands known as the Ling Holms. Fifty-eight nests were found on these four islands, 44 (38 with contents) being concentrated on the largest which was still less than 1ha in area. By 1992 breeding pairs had fallen to just 13 but the number of territorial pairs without nests was high at 33. However, the total population of 318 represented a 54% decrease on the 1990 figure. By 1993 breeding numbers were beginning to show some signs of recovery (22 pairs) but the total population had fallen further to 275.

Breeding success has been monitored since 1991. In that year only two broods (of

b/3 and b/6) were found. Similar searches in 1992 revealed only a single brood (of b/2) on Stenness and none on Harray. There was some improvement in 1993 with four broods (b/1, b/2, b/2 and b/3) on Harray and four (b/2, b/3, b/3 and b/5) on Stenness.

Mute Swan - winter numbers

Peak winter counts of Mute Swans on the Harray and Stenness Lochs are shown in Fig.2. A spectacular increase occurred on the Loch of Harray from 1986/87 with a peak of 1205 in 1990/91 followed by a marked reduction in the two subsequent winters. The Loch of Stenness showed no comparable pattern.

Other wildfowl - wintering numbers

Other grazing wildfowl showed similar patterns in their numbers on the Loch of Harray. Fig.3 shows the maximum counts of Whooper Swans *Cygnus cygnus* on both Harray and Stenness. The peak count on Harray was 1010 in December 1988 with 927 present in 1990/91.

TABLE 1. *Mute Swan numbers on the Lochs of Harray And Stenness, Orkney in the summers of 1983, 1990, 1992 and 1993.*

		Harray	Stenness	Totals	Overall Population
1983	Breeding pairs	14	22	36	160
	Non-breeders		88	88	
1990	Breeding pairs	85	30	115	688
	Territorial pairs (without nests)	9	—	9	
	Non-breeders	400	40	440	
1992	Breeding pairs	6	7	13	318
	Territorial pairs (without nests)	24	9	33	
	Non-breeders	190	36	226	
1993	Breeding pairs	11	11	22	275
	Territorial pairs (without nests)	18		18	
	Non-breeders	148	47	195	

Wigeon *Anas penelope*, too, show a similar pattern (Fig.4). As with Mute Swan, their peak was in 1990/91, with a count of 9200.

In contrast to the grazing wildfowl, the two diving ducks, Tufted Duck *Aythya fuligula* and Pochard *Aythya ferina*, for which the loch system has long been nationally important (Cranswick *et al.* 1992), showed no such clear pattern of increase in the late 1980s (Figs. 5 & 6).

Mute Swan mortality

Dead and dying Mute Swans were first reported in April 1991. Mortality reached a peak during that summer and again in November/December. In all, some 250 Mute Swans are believed to have died during the course of the incident.

All except one of the 50 or so corpses which were critically examined were of birds in their first summer/second winter, i.e. birds which had been reared in the boom season of 1990.

Post-mortems were carried out on eight Mute Swans found dead or dying on the Loch of Harray during the course of the incident (Kirkwood & Cunningham 1991,

J.Kirkwood pers.comm., J.D.Walker pers.comm.). The findings did not point to bacterial or viral disease but the birds were emaciated, anaemic and had heavy parasite burdens. In some of the birds the intestinal parasite was identified as *Polymorphus minutus*, an Acanthocephalan worm.

The spread and subsequent decline of Canadian Pondweed

Canadian Pondweed was first noted in the northern part of the Harray Loch in 1982. However, its subsequent dramatic spread meant that by the time the loch was fully surveyed in 1987 (Robson 1987) it was the most widely distributed plant species in the loch, being particularly well-established in the northern bays where it was growing in extremely dense mono-specific stands.

In the winters of 1988/89, 1989/90 and 1990/91, the main concentrations of the pondweed in the northern bays of the Harray Loch were obvious from the concentrations of Mute Swans, Whooper Swans and Wigeon feeding there. During this period, in contrast to previous winters, Whooper Swans were rarely seen off the loch itself, the weed seemingly providing all the

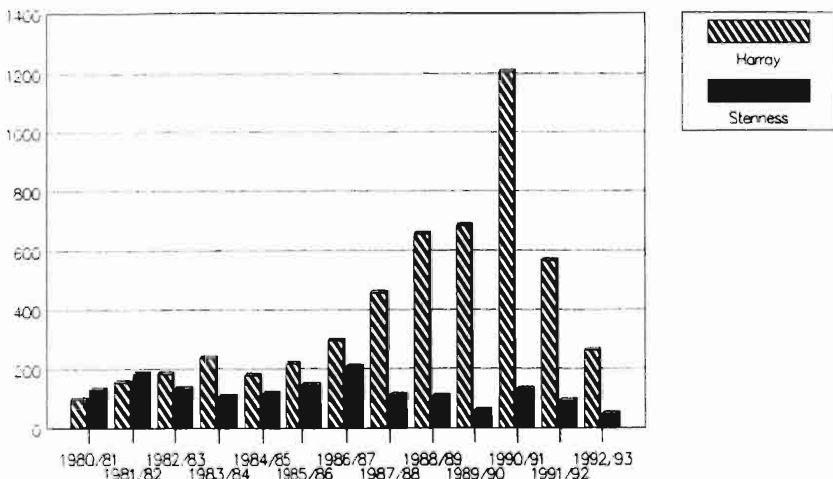


FIGURE 2. Peak winter counts of Mute Swans on Lochs of Harray and Stennes.

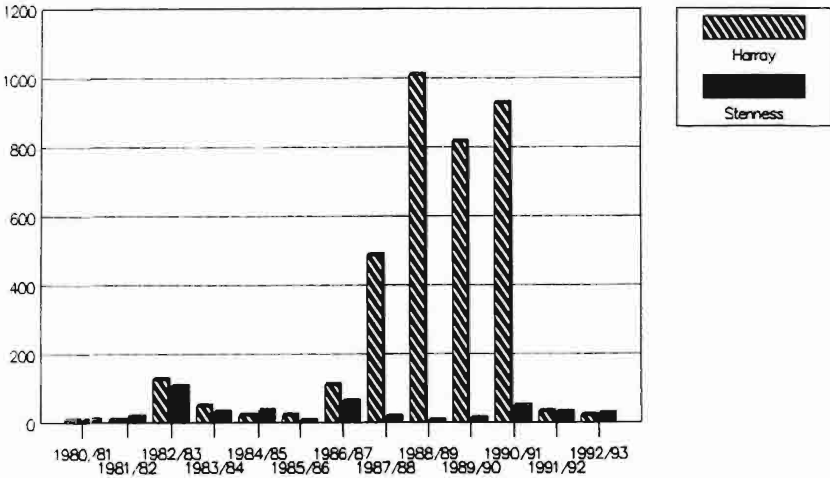


FIGURE 3. Peak winter counts of Whooper Swans on Lochs of Harray and Stenness.

nourishment required without recourse to surrounding fields. In the early spring of 1991, however, Whoopers began leaving the loch to feed in fields near its north-western extremity (pers. obs.), a first indication that perhaps the pondweed was becoming less abundant, an indication confirmed by fishermen later in the spring.

Discussion

It would appear that the breeding and wintering populations of Mute Swans on the loch system closely followed the growth cycle of the Canadian Pondweed as did the wintering populations of the other two main grazing wildfowl at the site, Wigeon and Whooper Swan. The inflated number of

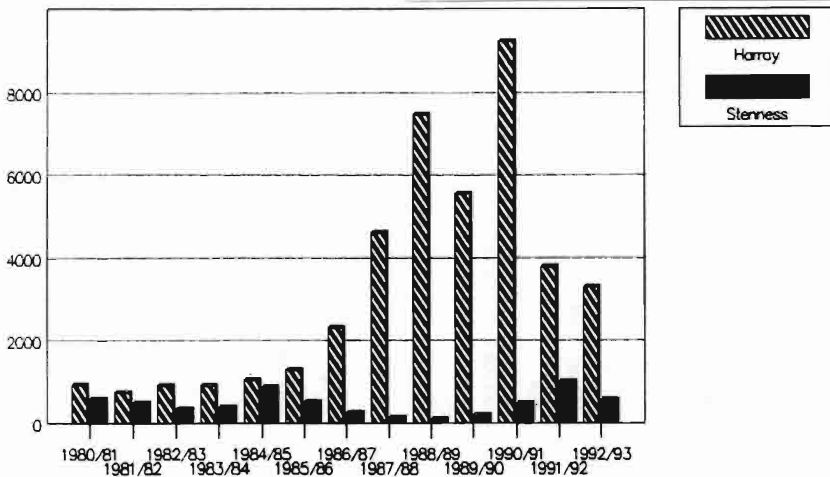


FIGURE 4. Peak winter counts of Wigeon on Lochs of Harray and Stenness.

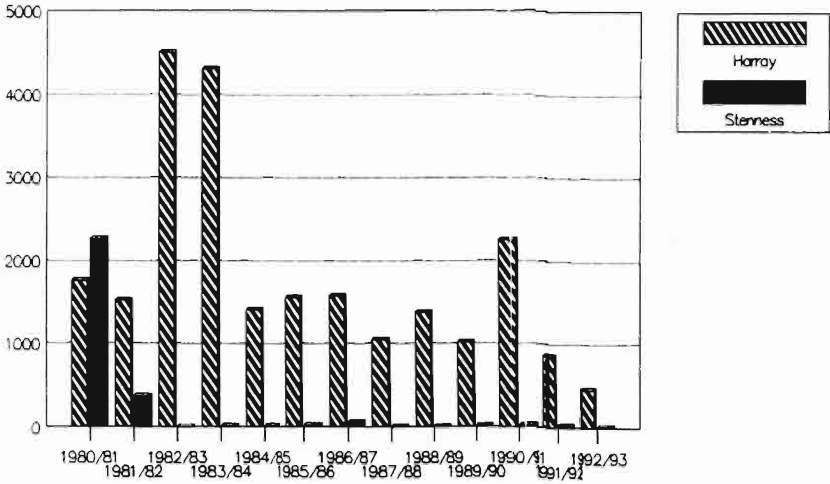


FIGURE 5. Peak winter counts of Pochard on Lochs of Harray and Stenness.

breeding Mute Swan pairs in 1990 and the colonial nesting on the Ling Holms in that season both suggest a super-abundance of food. Colonial nesting is known also from England (Abbotsbury), Denmark and Poland. In the first two of these, the swan families spread out after hatching to feed on abundant

inter-tidal vegetation (Kear 1972), a situation analogous to that on the Harray Loch.

Outside the breeding season, greatly increased Mute Swan numbers as a result of increased availability of *Elodea* is known from elsewhere in Britain (Giles 1992). Direct observations of all three grazing

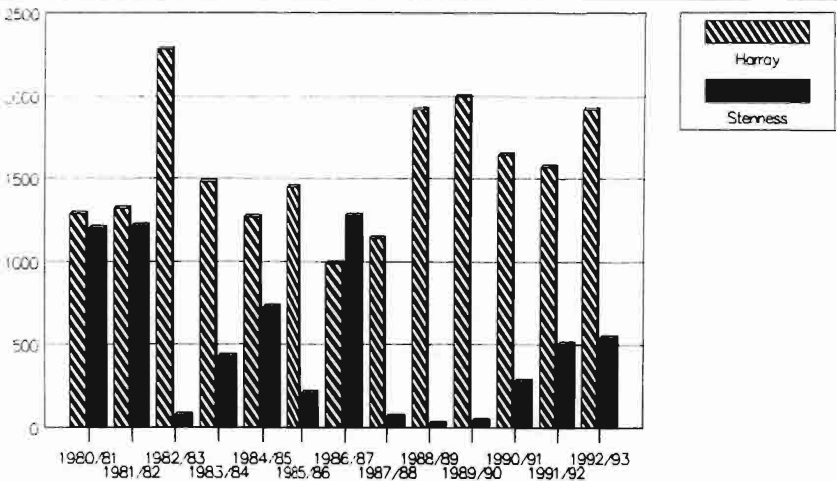


FIGURE 6. Peak winter counts of Tufted Ducks on Lochs of Harray and Stenness.

species in winter on the Harray Loch confirmed their dependence on this pondweed (pers.obs.) During the early 1980s Whooper Swans fed on barley stubbles during the autumn prior to leaving Orkney in mid-winter. With the advent of the pondweed, stubbles were ignored, the Whoopers feeding on the loch throughout the winter. Wigeon behaviour was also of interest. Rather than leaving the loch to graze as normal on surrounding fields, packs of Wigeon could be watched following both Mute and Whooper Swans. As the larger species fed by uprooting pondweed, the Wigeon dabbled in their wake, apparently utilising scraps of weed discarded by the swans.

The decline in wintering numbers of all three grazing wildfowl and the crash in the Mute Swan breeding population coincided closely with observed declines in pondweed abundance.

The large number of deaths amongst the Mute Swan population is a more complex issue. It was initially believed that the birds may simply be dying of starvation. Mute Swans in their first summer are driven out of their natal area by the territorial male (Cramp & Simmons 1977). It is possible that the large numbers of young present in spring 1991 may have been prevented from feeding effectively on what was by then a declining food source by territorial birds.

The question remains as to why, in such a situation, more birds did not leave the area to feed elsewhere. Some birds obviously did; the peak winter count in 1991/92 shows a decline of some 650 birds compared to 1990/91 yet only some 250 corpses were located. The 'missing' 400 birds were not located during National Wildfowl Counts elsewhere within Orkney and must therefore have moved out of the islands presumably to the Scottish mainland although there is no direct evidence of this. It may be that the 250 which remained, only to subsequently die, were never fit enough to move away, pressure on the food resource being too great even in the latter part of 1990.

It is unclear whether the poor condition of the birds allowed the large build up of parasites or vice versa. Mute Swans are known to be among those waterfowl which act as the final host in the complex life cycle of *Polymorphus minutus*, the intermediate host being freshwater shrimps of the genus *Gammarus* (references in Macdonald *et al.* 1978, Sanford 1978). It is perhaps possible that *Gammarus* was particularly numerous in the Loch of Harray in 1991, perhaps as a result of the decomposition of much of the pondweed. Young Mute Swans, already in poor condition, may have ingested large quantities of *Gammarus* and thus become heavily infested with the parasite.

Also germane to this discussion are the factors which allowed the rapid expansion of the Canadian Pondweed. The species is known to thrive in nutrient-enriched (eutrophic) waters. Fears concerning the eutrophication of the Loch of Harray have been expressed since the mid-1960s when phytoplankton blooms began to be reported, in some cases in association with fish mortality. Eutrophication is believed to have been caused by agricultural pollution (fertiliser run-off, slurry and silage effluent) and by sewage from the village of Dounby entering the northern part of the loch. Continuing worries over the impact of agriculture on the loch's condition led to a study by the Aberdeen Centre for Land Use (Sinclair *et al.* 1992). Their report concluded that the Loch of Harray was currently 'mildly enriched' but that if this enrichment continued the potential for algal blooms would also increase with severe consequences for the loch's ecology. The abundant growth of Canadian Pondweed was believed to have been merely due to the plant having found itself a suitable location but concern was expressed that if current dieback of *Elodea* proves to be permanent the nutrients previously assimilated by it would be available to other macrophytes or phytoplankton.

The findings of the report have been met with some scepticism by loch users and

demands have been made for further monitoring. Continuing winter wildfowl counts and surveys of the breeding Mute Swan population are an essential part of such monitoring and will continue.

Acknowledgements

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The Scottish Mute Swan census 1990

A.W. AND L.M. BROWN

The 1990 Mute Swan census recorded 4856 birds in Scotland. This represents an increase of 65% since the 1983 census and is the highest total ever recorded. 58% of the population were non-territorial compared with 50.5% in 1983. Populations based on the old Scottish counties are presented, as are data on habitat preferences and on changes since 1983. It is considered that the increase is due to the population's own productivity combined with a series of relatively mild winters.

Introduction

The 1990 Mute Swan, *Cygnus olor*, census was a repeat of the complete census which took place in 1983 (Ogilvie 1986) and this paper presents the results for Scotland. A full and detailed assessment of the British population will be published separately (Delany & Greenwood in prep.) but the aim of this paper is to provide an analysis of the Scottish results and a comparison with the 1983 census (Brown & Brown 1985).

The stimulus for another British census of the Mute Swan was the need to determine whether or not the decline in the population, which had apparently been halted by 1983 (Ogilvie 1986), was subsequently followed by a population increase. The decline had been attributed, at least in some areas of England, to lead poisoning as a result of birds swallowing discarded anglers' lead weights (Goode 1981). The sale of lead fishing weights in England and Wales was banned in 1987 and it was considered opportune by the then Nature Conservancy Council for a national census to be undertaken in 1990 to determine whether the apparent success of the ban in some areas, as indicated by marked increases in the population in 1988 and 1989 (Delany *et al.* 1992), was reflected at the national level. Lead poisoning of Mute Swans in Scotland as a result of ingested anglers' weights was not considered to be a problem (Brown &

Brown 1985) but in 1983 the population was found to be 10% less than that in 1955/56 when the last full census had occurred (Rawcliffe 1958; Brown & Brown 1985). However, later studies in Ayrshire (Leach 1988), and especially Lothian (Brown & Brown 1984, 1981-89), indicated that the populations were expanding in these areas and a national census provided the opportunity to assess any wider manifestation of this trend.

The objectives of the 1990 survey therefore were to:

- a) Estimate population changes since the 1983 census and describe their geographical pattern, particularly in relation to the ban on the use of lead weights by anglers.
- b) estimate the current sizes of local and national populations, and
- c) Provide a baseline for future monitoring of this species.

The census was carried out, as in 1983, jointly by the Wildfowl and Wetlands Trust, the British Trust for Ornithology and the SOC.

Methods

Using the 10km square of the National Grid as the census unit, the aim was to achieve coverage of as many squares as possible.

The fieldwork techniques were the same as those for the 1978 and 1983 surveys (Ogilvie 1981 & 1986; Brown & Brown 1985) comprising separate censuses of *territorial breeding* and *non-territorial* Mute Swans between 1 April and 31 May. If pairs did not proceed to breed, by building a nest, then they were considered as 'territorial-only.'

As in 1983, regional organisers, based on the BTO regions, were circulated with a list of 10km squares in their region together with instruction sheets and recording forms for their fieldworkers. Whilst some flexibility in recording data was permitted for territorial/breeding pairs, observers were encouraged as before to try and count all non-territorial birds in April, preferably around the middle of the month, to reduce problems of movement and thus double-counting. Observations therefore have been used from as near as possible to mid-April, and all counts in early March and after 15 May have been discounted. The change in numbers which occurs during this period was clearly shown in the returns for sites with a series of counts, thus emphasising the need for attempting non-territorial count co-ordination as far as was practicable.

Whilst full coverage of all 10km squares was the aim it was recognised that in more remote areas and areas with no suitable habitat this might not be possible. In such circumstances it was agreed that observers and regional organisers could provide estimates for squares or part squares. To facilitate population assessment in areas where complete coverage was not possible regional organisers were sent a list of the 10km squares in their region in random order with instructions to cover them in that order. This list acted also as a summary sheet for the actual and estimated counts for each area. This paper concentrates on the actual observations and estimates made by the observers and regional organisers; any further extrapolation of the data for areas not

covered will be discussed by Delany & Greenwood (in prep.).

Results

Coverage

A detailed assessment of coverage will be published separately (Delany & Greenwood in prep.) but for most areas of Scotland coverage is considered to have been thorough (see Appendix) and many regions obtained complete coverage. This resulted in little need for estimates to be made. Problems did arise in some areas, however, with poor coverage or none in the Outer Hebrides (Benbecula and the Uists), Aberdeen, Banff, Kincardine and Argyll, while lack of observers and the nature of the terrain may have resulted in some birds being overlooked in Caithness, Sutherland, Ross and Cromarty and Inverness.

As the data were collected according to the BTO Regions and related District Council boundaries, the data returns have been amended to locate sites within the old counties of Scotland to facilitate ease of comparison with all of the earlier surveys, in particular those for 1955/56 (Rawcliffe 1958) and 1983 (Brown & Brown 1985) when full coverage was attempted. Surveys in 1961 (Eltringham 1963) and 1978 (Ogilvie 1981) were sample surveys with insufficient Scottish data to make meaningful comparisons.

The number of breeding birds, territorial-only birds and non-territorial birds and the population total for each of the former Scottish counties are presented in Table 1, together with the corresponding total figure for each county in 1983 and the percentage change between the censuses. Estimates for additional territorial and non-territorial birds, where supplied by regional organisers, are also shown in Table 1. The data for the Outer Hebrides are based on a 1992 census undertaken by C.J. Spray (pers. comm.) while that for Aberdeen/Banff is an estimate assuming a repeat of the 1983 data. This is examined further in the discussion.

Breeding and territorial-only birds

The totals of 1570 breeding birds and 476 territorial - only birds (Table 1) represent 32.3% and 9.8% respectively of the total population counted (Table 2). These figures indicate a potential breeding population of 1023 pairs which represents a 40.3% increase on the 1983 figure (729 pairs).

Table 3 shows the distribution of breeding and territorial-only birds according to habitat and compares percentages with 1983. Aberdeen/Banff is excluded from these data in the absence of actual count data but the 1992 Outer Hebrides counts have been included.

Freshwater lochs and ponds and sealochs, coastal and brackish water held 86% of breeding birds, in line with the 1983 figure (84.8%). Rivers held only a small percentage (6.5%) of breeding birds, probably reflecting the unsuitability of this habitat in much of Scotland. In Britain in 1983 Ogilvie (1986) showed that rivers and streams held 35.5% of the breeding population, comparable to the 1961 and 1978 surveys, indicating the greater significance of this habitat in England.

The national figures mask regional differences relating to habitat suitability and availability. For example, no breeding pairs occurred on rivers in Sutherland, Caithness and Ross and Cromarty and only 3% in Perthshire compared to 17.8% in Lothian, 25.8% in Kirkcudbright and 42% in the Border counties. Similarly, while 76.7%, 57.5% and 39.5% of breeding birds in Argyll, the Outer Hebrides and Ross and Cromarty respectively nested on sealochs, brackish or coastal waters few pairs occupied such habitats in Eastern and Southern Scotland. In these areas most pairs nested on freshwater lochs and ponds e.g. 60% in Stirling/Clackmannan, 74% in Fife, 60% in Lothian, 91.2% in Ayr, 86.4% in Dumfries and 100% in Wigtown. This is comparable to the situation in 1983 (Brown & Brown 1985). Use of canals was only in Lothian (15.6%) and Dunbarton, Renfrew and Lanark (17.6%) where the expanding

populations are re-occupying this habitat, while there was little use of reservoirs throughout Scotland owing, probably, to the generally high altitude of such sites and the limited feeding due to fluctuating water levels (pers. obs. in Lothian).

Non-territorial birds

The count of 2810 non-territorial birds (Table 1) represents 57.9% of the total population (Table 2) compared with 1488 representing 50.5% in 1983. If territorial only birds are added to this figure then 67.7% of the Mute Swan population in Scotland did not breed (61.7% in 1983).

The distribution of non-breeding birds (excluding territorial-only ones) according to habitat is shown in Table 3 and can be compared to the situation in 1983. Although 77.2% of the population is found on freshwater lochs/ponds and sea lochs, coastal and brackish waters, compared to 84.9% in 1983, the proportion using freshwater lochs has increased and sea lochs declined. Rivers and streams have increased in importance to 20.9% (14.2% in 1983).

As with the breeding population the overall figures mask important regional variations related to the availability and suitability of habitat types. Thus, the proportion of non-territorial birds found on brackish/sea loch habitat was 94.5% in the Outer Hebrides, 72.3% in Ross and Cromarty, 83.8% in Inverness, 90.2% in Angus and 90.0% in Argyll. In contrast freshwater lochs/ponds accounted for 78.5% in Orkney, 97.9% in Caithness, 37% in Lothian, 58.1% in Dunbarton, Renfrew and Lanark and 66.7% in Kirkcudbright. Rivers were of importance in Perth (70.3%), Ayrshire (46.2%), the Border counties (88.0%), Dumfries (83.5%) and Wigtown (46.2%).

Table 4 lists all sites (20) holding flocks of 30 birds and over. These 20 sites held 61.4% of the non-territorial population of the Mute Swan in Scotland (excluding Aberdeen) compared with 36.6% in six flocks of this size in 1983 (Brown & Brown 1985).

TABLE 1 *Number of breeding, territorial and non-breeding Mute Swans and population totals for each Scottish county in 1990 and total population in 1983 with % change.*

County	1990					1983		Total Counted	Total Counted	% ^a Change 83-90
	Breeding Birds	Addit. ¹ Estim.	Territorial Only Birds	Non Breeder	Addit. Estim.	Total Estim.	Total Counted			
SHETLAND	0	0	0	1	0	1	1	0	-	
ORKNEY	326	0	30	454	0	810	810	323	+151	
OUTER HEBRIDES	160	0	86	583	0	829	829	692	+20	
CAITHNESS	46	6	18	94	5	158	169	20	+690	
SUTHERLAND	8	4	0	0	4	8	16	25	-68	
ROSS & CROMARTY	76	0	30	159	2	265	267	96	+176	
INVERNESS	22	4	24	37	4	83	91	67	+24	
NAIRN	8	0	4	0	0	12	12	2	+500	
MORAY	22	0	2	17	23	41	64	22	+86	
ABERDEEN ²	118	0	62	144	0	324	324	324	-	
BANFF	6	0	2	4	0	12	12	12	-	
KINCARDINE ²	8	0	0	0	0	8	8	12	-33	
ANGUS	46	2	4	113	0	163	165	178	-8	
PERTH	66	0	8	165	0	239	239	106	+125	
STIRLING	32	0	6	5	0	43	43	34	+26	
CLACKMANNAN	8	0	2	0	0	10	10	8	+25	
KINROSS	32	0	0	16	0	48	48	16	+200	
FIFE	30	0	18	58	0	106	106	61	+74	
WEST LoTHIAN	30	0	0	42	0	72	72	9	+700	
MID LoTHIAN	24	0	4	50	0	78	78	24	+225	
EAST LoTHIAN	36	0	16	73	0	125	125	107	+17	
AYR	72	0	8	85	0	165	165	82	+101	
ARRAN & BUTE	0	0	0	8	0	8	8	10	-20	
PEEBLES	4	2	4	0	0	8	10	16	-50	
SELKIRK	16	0	4	25	0	45	45	21	+114	
ROXBURGH	36	2	20	139	0	195	197	54	+261	
BERWICK	44	14	26	27	0	97	111	49	+98	
ARGYLL	60	46	30	80	12	170	228	142	+20	
DUMBARTON	30	0	10	58	0	98	98	13	+654	
RENFREW	26	0	6	9	0	41	41	35	+17	
LANARK	46	6	18	112	0	176	182	68	+159	
DUMFRIES	44	0	10	85	0	139	139	73	+90	
KIRKCUDBRIGHT	62	0	12	141	0	215	215	197	+9	
WIGTOWN	26	0	12	26	0	64	64	46	+39	
TOTALS	1570	86	476	2810	50	4856	4992	2944	+65	

1. Estimates of additional birds from regional organisers
2. **1992** data - no coordinated survey in 1990 (see text for explanation)
3. **1983** data - no coordinated survey in 1990 (see text for explanation)
4. No coordinated survey in 1990 but data obtained from coverage by Angus organiser
5. Poor coverage has resulted in estimate including birds recorded in **1983** in squares not covered in 1990
6. Based on actual counts.

TABLE 2 Percentage of non-territorial, territorial-only and breeding Mute Swans in the total counted population in Scotland 1983 and 1990.

YEAR	NUMBER OF BIRDS					
	NON.-TERR.	%	TERR.-ONLY	%	BREEDING	%
1983	1488	50.5	328	11.2	1128	38.3
1990	2810	57.9	476	9.8	1570	32.3

TABLE 3 *Distribution of Mute Swan in Scotland in 1990 according to habitat type and comparison with percentage in 1983¹.*

HABITAT	Breeding		1983		Territorial		1983		Non-terr.		1983	
	Birds	%	%	%	Only	%	%	%	Birds	%	%	
Freshwater Lochs, ponds	960	66.4	58.0	212	51.5	48.8	978	36.7	30.5			
Reservoirs, Flooded pits	66	4.6	3.7	22	5.3	4.2	32	1.2	0.9			
River, Streams	94	6.5	10.4	60	14.6	24.4	555	20.9	14.2			
Canals, Ditches	42	2.9	1.1	6	1.5	0	18	0.7	0			
Sea lochs, Coastal, brackish	284	19.6	26.8	112	27.1	22.6	1079	40.5	54.4			
TOTAL	1446			412			2662					

1. Data refer to actual counts and excludes Aberdeen and Banff which were not covered in the 1990 survey.

2. Includes birds counted in fields adjoining river or estuary.

TABLE 4 *Flocks of more than 30 non-breeding Mute Swans recorded in April 1990¹.*

LOCATION	HABITAT	NUMBER	DATE
West Loch Bee, Uists	Brackish loch	412	April (1992)
Loch of Harray, Orkney	Freshwater loch	382	April
Montrose Basin, Angus	Estuary	74	5 April
R. Teviot, Near Kelso, Roxburgh	River	74	19 April
Milton Loch, Kirkcudbright	Freshwater loch	71	30 April
Easter Rhynd, Perthshire	River	68	19 April
R. Tyne/Estuary, East Lothian	River, estuary, fields	67	14 April
Hogganfield Loch, Glasgow, Lanark	Freshwater loch	64	16 April
R. Annan, Roberthill to Copewood, Dumfriesshire	River, fields	58	12/13 April
Loch Scarmslate, Caithness	Freshwater loch	54	29 April
Loch an Strumore, Uists	Brackish loch	47	April (1992)
R. Leven, Dunbarton	River	45	29 April
R. Tweed, Near Kelso, Roxburgh	River	45	23 April
Loch Eye, Ross-shire	Freshwater loch	43	11 April
R. Ayr, Ayr	River	43	5 April
R. Dee, west of Castle Douglas, Kirkcudbright	River	42	30 April
Linlithgow Loch, West Lothian	Freshwater loch	36	7 April
Pollo, Ross-shire	Estuary	36	14 April
Loch Watten, Caithness	Freshwater loch	33	8 April
R. Forth, west of Stirling, Perthshire	River	31	16 April

1. Aberdeen data not available.

2. Counts nearest the recommended dates of 16/17 April have been taken where more than one count was submitted for a site. Some sites not shown had counts above 30 birds at other dates in April.

3. Cumulative total.

Discussion

It has been stated previously that the results of the 1955/56 complete census of the Mute Swan should be treated with caution (Brown & Brown 1985) owing to differences in coverage and data collection methods. The 1983 census however was the first complete census to use standardised fieldwork techniques and this provides a valuable baseline on which to assess subsequent surveys. The excellent coverage obtained in 1990 (see Appendix) provides a sound basis on which to examine the change in numbers and distribution which have occurred between 1983 and 1990.

The most striking result of the 1990 census is the remarkable 65% increase since 1983 in the total population counted; the figures represent also an increase of 59% over the 1955/56 census. It would appear therefore that the Scottish Mute Swan population now stands at its highest recorded level.

Some of the changes which have occurred within counties are considerable, even for those counties already with large numbers of birds in 1983. The Orkney population increased by 151% between 1983 and 1990 due apparently to excellent feeding (the presence of Canadian Pondweed, *Elodea canadensis*) at the Loch of Harray which resulted in semi-colonial breeding taking place. This increase has now been dramatically reversed with the collapse of the food supply (E. Meck and pers. comm. 1993). The huge increase in Caithness (690%) may be the result of movement of birds from Orkney, but this has not been established. Certainly the results for north Scotland represent a continuation of the expansion of the population there identified in 1983 (Brown & Brown 1985).

It is unfortunate that poor coverage or none was obtained for the Outer Hebrides and Aberdeen/Banff as these two areas held 35% of the total Scottish population in 1983. Fortunately a complete survey of the Outer Hebrides in 1992 by C. J. Spray has shown

changes which mirrored the population trend recorded elsewhere and, although numbers can fluctuate annually, it does not seem unreasonable to include the 1992 figures in the census results. Similarly, given the substantial increases found elsewhere in east Scotland, there is no reason to think that the Aberdeen population might have dropped, although a decline may have occurred at some locations (P. Doyle pers. comm. and see Appendix), so the 1983 figures are considered the best estimate for inclusion. Although mainland Argyll was poorly covered compared to 1983 the birds actually recorded still showed an increase and it seemed most appropriate to include those birds recorded in 1983 in squares not covered in 1990.

The decline in numbers in Central Scotland identified in 1983 (Brown & Brown 1985) has now been completely reversed with Fife up by 74%, Ayr 101%, Lanark 159% and Lothian 96%. The Border counties have shown a 146% increase, while the possible re-distribution of birds between Dumfries and Kirkcudbright in 1983 has now been replaced by increases in both counties, most noticeably by 90% in Dumfries.

Ogilvie (1986) concluded from the 1983 census that the Mute Swan population had the potential to increase but that this varied between parts of the country and that recovery in some areas would be dependent upon the long-term impact of the lead poisoning factor. Given that lead poisoning seems not to have been a serious problem in Scotland for the Mute Swan (Spray & Milne 1988), the increase which has occurred must reflect improved cygnet production and survival or immigration.

Although there has been extensive colour ringing in Northern England, very few English-ringed Mute Swans have been recorded in territory in Scotland. However, non-territorial flocks in Lothian in April invariably include a few birds ringed in

north-east England, while Lothian ringed cygnets have been found to be very mobile (pers. obs.) and have been recorded at sites ranging from Berwick to Middlesbrough (A. Bramhall and J. Coleman pers. comm.). This implies a potential mixing of populations between south-east Scotland and north-east England but does not suggest any significant immigration into Scotland, birds moving from one area to the other probably balancing each other out.

Comparison of the percentage of territorial-only and breeding birds with the non-breeding population (Table 2) has shown that all have increased in numbers between 1983 and 1990. However, as a proportion of the total population the breeding plus territorial-only birds have declined from 49.5% to 42.1% while the non-territorial population has increased from 50.5% to 57.9%. Because there is virtually no immigration into the British population (Ogilvie 1986) this adds to the evidence that the overall increase is due to the population's own productivity. It suggests also that the breeding population may be attaining a maximum capacity as a high population is likely to result in fewer vacant breeding sites; thus non-territorial birds will encounter more difficulty in finding a territory and therefore will remain in the non-breeding population for longer. This will contribute to the increase in the number of non-territorial birds in the total population. This is the situation which appears to be occurring in Lothian where the non-territorial population is now increasing faster than the territorial/ breeding population (Brown & Brown in prep.).

That winter weather can have a significant effect on Mute Swan numbers has been shown previously (Boyd & Ogilvie 1964; Ogilvie 1967). The period 1983 to 1990 did not see any winter comparable in long term severity to that of 1962/63 and this series of mild winters will have had a considerable impact upon Mute Swan survival. In addition, as populations have

increased, winter flocks have expanded with many benefitting from enhanced public feeding e.g. at Linlithgow Loch, St Margaret's Loch and Cramond in Edinburgh (pers. obs.) and Hogganfield Loch in Glasgow (B. Zonfrillo pers. comm.). This is likely to have contributed to survival, while other birds may have made use of winter sown cereals (Delany *et al.* 1992).

Brown & Brown (1984), when assessing the status of the Lothian population of the Mute Swan up to 1982, suggested that the population was unlikely to return to the level attained in the late 1950s and early 1960s, and Leach (1988) came to the same conclusion for Ayrshire, with human disturbance and interference being considered a key factor in this. Changes since then in Lothian (Brown & Brown 1984-91), and the results of this census, show this view to have been very pessimistic. These local studies highlight the value of and need for detailed on-going studies of Mute Swan populations elsewhere in Scotland supported by colour-ringing schemes; these would help to clarify the dynamics of local populations, their possible interrelationships, the differences in productivity between areas, whether one area supported another through movement of surplus birds and what the effect is should a severe winter occur.

The Scottish Mute Swan population is now at its highest ever level with 4856 birds counted in 1990 and 4992 estimated. The previous peak in the British population was considered to have occurred in 1959 (Eltringham 1963) followed by a decline at least in part due to a severe winter (Boyd & Ogilvie 1964). It would seem best that a further national census should take place in the year 2000, supported by continuing local studies in the interim, to determine if the present trend has continued or if the population has declined from a peak.

Acknowledgements

A survey of this nature relies on the efforts of many observers and we wish to record our thanks to them all. The following Regional Organisers are especially thanked for the thorough coverage obtained and for their additional comments: G. Bates, A. T. Bramhall, M. J. H. Cook, C. J. Corse, A. Currie, N. Elkins, J. E. Howie, B. D. Kerr, E. W. E. Maughan, S. F. Newton, M. A. Ogilvie, J. D. Okill, C. Reynolds, G. Sheppard, P. Shimmings, K. Slater, R. L. Swann, J. J. Sweeney, D. Warner, D. S. Whitaker and R. E. Youngman. We thank S. Delany and M. Marquiss for constructive comments on the draft of this paper.

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(Typescript received 29 September 1993)



F I F E N A T U R E

Since 1992, a local Biological Records Centre "Fife Nature" has been established in Fife. Through special surveys and a network of official local recorders, the centre collects, analyses and monitors information on as many biological groups as possible, as well as on habitats and sites of natural history interest within the region. Information is stored electronically and is available for purposes of conservation, planning, research, education and general interest.

A "Survey Pack" is available free by request from "Fife Nature", and the centre also produces provisional atlases, which will eventually lead to a series of fully illustrated books. Available at present are

The Dragonflies of Fife: A Provisional Atlas £2 (incl. p.+p.)

The Butterflies of Fife: A Provisional Atlas (Dec 1993 - Price on inquiry)

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Others planned are *A Fife Flora*, a *Bumble Bee Atlas* and an *Amphibian/Reptile Atlas*.

The centre is also involved with the *Fife Ornithological Atlas Group*, which is currently (1991-95) carrying out surveys leading to a *Fife Breeding Bird Atlas* and *Monthly Distribution Atlas of Birds in Fife*.

Further information is available from Anne Marie Smout, Fife Nature, Department of Economic Development and Planning, Fife House, Glenrothes, Fife KY7 5LT.



WINNING PHOTOGRAPH OF THE SOC PHOTOGRAPHIC COMPETITION 1993



Manx Shearwater Puffinus puffinus (Argyll)

*Mary MacIntyre,
Priormuir, St. Andrews, Fife*



*Reed Warbler Acrocephalus scirpaceus Wormiston, Fife
2 Oct. 1993*

Gerry Owens



A Verditer's Flycatcher *Muscicapa thalassima* appeared at Crail with lots of unusual migrants on 3 Oct. 1993. Where did it come from? Brian Little



Red-breasted Flycatcher *Ficedula parva* at Fife Ness
3 Oct. 1993

D. E. Dickson

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Appendix

Assessment of coverage in each county

Regional organisers were encouraged to obtain whenever possible full coverage of all 10km squares within their area. If this was not possible then partial coverage was permissible with the observer and/or organiser making an estimate of the number of birds likely to have been overlooked. In addition squares could be categorised as 'probable blanks' based on lack of habitat and / or knowledge of the lack of swans in the square from past experience. Birds actually counted and the numbers estimated for each county are shown in Table 1. No estimates have been made apart from those provided by the regional organisers. Regional organisers were asked for comment on the coverage obtained and any trends they were aware of for the Mute Swan population in their area. Where they were given these comments have been noted in the observations below for each county, but for comparison with the 1983 survey (Brown & Brown 1985) coverage has been assessed as good, moderate or poor, with additional comments where appropriate.

Shetland Good. There is no evidence of Mute Swans making any attempt to colonise Shetland, the regional organiser remarking that "you will not be surprised to hear that the Mute Swan survey throughout Shetland came up with nil breeding pairs".

Orkney Good. Full coverage was obtained, the regional organiser remarking on the large increase in the population since 1983 in particular at the Loch of Harray and "indeed on one isle the Mute Swans have given up holding territory and are now nesting in a colony". The organiser attributed this increase to the presence of Canadian pondweed.

Outer Hebrides Good. Poor coverage obtained in 1990 (other than for Lewis and Harris) with the regional organiser able only

to provide his own observations in the Uists and Benbecula. However, a complete survey including aerial counts was undertaken in 1992 by C. J. Spray on behalf of the Wildfowl and Wetlands Trust and these data have been used in this paper.

Caithness Moderate.

Sutherland Moderate. Regional organiser commented that "most of the county is not suitable."

Ross and Cromarty Moderate. Although full coverage was not obtained other than in Easter Ross, the regional organiser was able to make estimates for the western part of the county based on recent breeding atlas data.

Inverness Moderate. Full coverage was obtained in east Inverness-shire but not west Inverness-shire, although the regional organiser commented on much of this area being unsuitable for Mute Swans and inaccessible; the estimate was however considered to be "quite accurate".

Nairn and Moray Good. Regional organiser considered it "highly unlikely that we missed any pairs" and the non-breeding estimate was considered to be reasonably accurate.

Aberdeen and Banff Poor. No co-ordinated survey was undertaken and the 1983 data have been used in the analysis (see text). However P. Doyle (pers. comm.) did consider that by 1991 the number of breeding pairs were well down on past years owing to increased disturbance at many sites (shooting and water sports), parasites (nematode infestation at several sites resulting in death of swans) and lead poisoning.

Angus and Kincardine Moderate. Regional organiser considered coverage of Angus was

not as extensive as he had hoped. Additional data were subsequently obtained from N. K. Atkinson and R. Goater. A co-ordinated survey was not undertaken in Kincardine but data from other observers suggests that most sites were checked.

Perth Good. Regional organiser considered that all known breeding waters and non-breeding areas were covered. It was stated also that Mute Swans were "certainly increasing again in Perthshire with breeding at 'new' sites in several recent years but productivity is rather poor."

Stirling and Clackmannan Moderate to Good. Most breeding pairs probably located but some non-territorial flocks may have been overlooked. Late organisation of this area resulted in excellent work by D. Matthews in obtaining satisfactory coverage.

Fife and Kinross Good. Full coverage was obtained.

West, Mid and East Lothian Good. Full coverage was obtained as part of a census commenced in 1978 which has shown a steadily increasing breeding and non-breeding population.

Ayr Good. Full coverage was obtained.

Arran and Bute Moderate.

Peebles, Selkirk, Roxburgh and Berwick Moderate to Good.

Argyll Poor. Other than Islay, Jura and Colonsay (which were organised separately), the organiser for mainland Argyll considered that the census was a disaster and he obtained additional information from the 1990 Argyll bird report. Further data were obtained from D. Trigg. On this basis it was considered appropriate to use 1983 data for those squares not covered in 1990 (see text).

Dunbarton, Renfrew and Lanark Good. Full coverage was obtained, and the small estimate for Lanark is considered to be accurate.

Dumfries Good. Regional organiser considered that coverage was very good and that "all areas that were likely to hold swans were visited". Reference was made to the considerable increase since 1983 but the organiser did not know what had influenced this increase in numbers. It was concluded that "most of the suitable breeding areas now have at least one pair breeding, and all potential breeding sites may now be occupied."

Kirkcudbright Good. Full coverage was obtained.

Wigtown Good. Regional organiser considered that all squares "received reasonable coverage" and that the number of breeding pairs seemed "about right given the unsuitable habitat over a lot of the area".

Short Notes

Unusual behaviour of Black-necked Grebes

I have regularly observed Black-necked Grebes *Podiceps nigricollis* on a loch in Scotland for a number of years, and in June 1993 I witnessed an unusual behaviour between a pair, which I believe has never been recorded and is not mentioned in Cramp & Simmons (1977. *The Birds of the Western Palearctic*. Oxford, Vol. 1) or in del Hoyo, Elliot & Sargatal (1992. *Handbook of the Birds of the World*. Lynx. Vol. 1).

On 3 June 1993 at 1900 BST, I was half way through a three hour observation by the loch side when a pair of Black-necked Grebes appeared on the east side of the loch. The sun had just broken through after a cloudy day and the wind was light and from the south-east. The water surface was calm and visibility was excellent.

The pair made for a dead alder *Alnus glutinosa* which lay partly submerged in shallow water in front of the reed bed where some Swallows *Hirundo rustica* were roosting in the higher branches and a few Tufted Ducks *Aythya fuligula* were roosting on thicker branches above the water level. The pair of grebes found a niche near the collapsed trunk of the alder and thereafter followed approximately five minutes of personal preening. The female then jumped on to the trunk, walked unsteadily for a short

distance up a gently incline before lying down on her belly and also resting her head on the trunk. She may have been sunbathing, as del Hoyo *et al.* mention that this is common behaviour amongst grebes living in cold parts. Alternatively she may have been using the trunk as a breeding platform and attempting to induce her mate to copulate. The male was close by on the water and began preening his mate on the trunk and also appeared to extract oil from her oil gland which he used on his own feathers. This behaviour went on for eight minutes without copulation attempts before the female slipped back into the water to join her mate. At this point the male chased off a drake Pochard *Aythya ferina* which was trying to secure a roosting spot on the trunk. After successfully evicting the Pochard, the male jumped out of the water onto the trunk and adopted the same posture as his mate had done earlier. The female was close by and began preening her mate for around five minutes before he came back on to the water to join her. The pair stayed in that area for another ten minutes, mainly preening themselves but also performing a brief head shaking courtship ceremony before disappearing into the reed bed close by.

I made these observations through a telescope at a distance of 120 yards.

A. C. Ramage, 158 Wellesley Road, Buckhaven, Leven, Fife KY8 1HX

Eider Ducks eating flatfish

On 6 March 1993, we watched a small group of male and female Eider Duck *Somateria mollissima* in the harbour at Eyemouth. They were with several Cormorants *Phalacrocorax carbo* and diving close to moored fishing vessels. Some of the male Eiders surfaced with flat fish, probably flounders *Platichthys flesus* in their bills. The fish were held head first, banged vigorously several times on the surface of the water and, after much head-shaking and neck-stretching, swallowed. One male appeared with a fish about 13cm wide, which it attempted to swallow. The fish was dropped several times into the water and was then dived for by the Eider. Finally the duck gave up all attempts to eat it. Female Eiders, diving close to the males, did not catch any fish during the 50 minutes we watched the group.

The food of Eiders has been recorded many times at different seasons and habitats. Mussels *Mytilus edulis* form the major part of their varied diet which includes crustaceans, echinoderms, cuttlefish, sea anemones and fish (Cramp & Simmons 1977. *The Birds of the Western Palearctic*. Oxford, Vol. 1.). The identity of fish species is seldom recorded, probably because their remains in Eider stomachs are fragmentary. However, the short-spined scorpion-fish *Myoxocephalus scorpius*, the three-spined stickleback *Gasterotus aculeatus* and the caplin *Mallotus villosa* have been identified in their diet (Salomonsen, F. 1950. *Grønlands Fugle*. Copenhagen pp 121-130; Madsen, F.J. 1954. *Dan.Rev.Game Bird Biol.* 2:157-266; Bardarson, H.R.1986. *Birds of Iceland*. Reykjavik pp108-110). We have not found any reference to flatfish being eaten by Eiders.

B. M. Hobson and E. M. Hobson, Flat 7, Castle Terrace, Edinburgh EH1 2EL

Hen Harriers systematically testing flocks of Ring-necked Pheasants

On 1 January 1983 a 'ringtail' Hen Harrier *Circus cyaneus* was hunting a large area of rushes in west Galloway. It stooped at a cock Pheasant *Phasianus colchicus* on the ground, flushed and chased it for over 100m but did not catch it. The harrier then returned to the same area and systematically flushed and chased individuals one by one from the rest of the flock of two further males and four females. None was killed although after chasing one of the cocks, the harrier hovered above it and flopped on top of it with lowered talons but was shaken off.

On 6 October 1987 in the same area I watched a male Hen Harrier flush three cock

Pheasants, once again systematically chasing each in turn.

Hen Harriers frequently chase individual Pheasants in west Galloway but of 91 observed attacks on them, I have no records of them killing any, nor have prey remains been found in pellets at their communal roosts (*Scott.Birds* 7:24-49; Watson, D. 1977. *The Hen Harrier*. Poyser, Berkhamstead; unpubl. data). Ash (1960. Birds of prey numbers in a Hampshire game preserve. *Brit.Birds* 53:285-300), however, recorded them as carrion prey in winter.

R.C. Dickson, Lismore, New Luce, Newton Stewart DG8 OAJ

Buzzards copulating just before roosting

On 26 March 1993 I saw a female Buzzard *Buteo buteo*, 49 minutes before sunset, sitting on the top of a hawthorn bush on low ground in west Galloway. Six minutes after sunset, the Buzzard stretched her wings and flew east for about 500-600 metres where she met an approaching male Buzzard; both Buzzards circled each other and then flew a short distance west. The female landed on a sloping pasture field and the male circled just above before dropping to mount the female, apparently copulating, slowly flapping his wings for about 10-15 seconds. He flew east and was mobbed by two Carrion Crows *Corvus corone*; meanwhile the female had flown to a large, solitary, deciduous tree nearby. The male returned and swooped up to land beside her; both birds then roosted together in the same tree.

Although it is not unusual for Buzzards to copulate in March, I can find no mention in the literature of Buzzards copulating just before roosting. *BWP* (Vol. 2) states that copulation normally occurs on the nest, and

Tubbs (1974. *The Buzzard*. David & Charles, Newton Abbot) noted, on the comparatively few occasions that he witnessed it, that it had taken place on regularly used perches in their territories. Kestrels *Falco tinnunculus* have been noted copulating before roosting (*Scott. Birds* 14:215) and I have also seen Merlins *Falco columbarius* copulating about an hour before roosting in April 1975 and 1978 on their breeding grounds in Galloway. This behaviour might occur more often in some birds of prey than has been recorded, although some authors state that copulation in some species occurs more often in the mornings (Newton 1986. *The Sparrowhawk*. Poyser, Calton; Village 1990. *The Kestrel*. Poyser, London). In other Buteonine hawks, however, Johnsgard (1990. *Hawks, Eagles and Falcons of North America*. Smithsonian Institution Press, London) mentions that Swainson's hawk *Buteo swainsoni* copulate mainly during morning and evening.

R.C. Dickson, Lismore, New Luce, Newton Stewart DG8 OAJ

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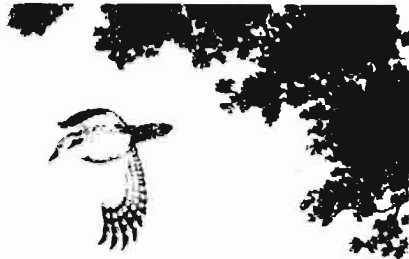
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Comment and Reply

What is the scale of seabird movement across central Scotland?

C.J.HENTY

Large numbers of Kittiwakes move westward into the inner Forth and this has been held to indicate that considerable cross country flights occur. It is argued here that unequivocal evidence only exists for occasional inland movements and there is strong negative evidence against regular flights. Observations are reviewed that suggest a similar picture for other marine Laridae.

In an editorial comment, R.D.Murray (1992, p38) asserted that there was a large passage of Kittiwakes *Rissa tridactyla* between Forth and Clyde with the implication that such movements were quite frequent. This is certainly a departure from the standard published view in both Baxter and Rintoul (1953) and Thom (1986), where inland Kittiwakes are stated to be unusual and usually storm driven. Murray is clearly correct that this view is inadequate: he quotes a 1990 record of 38 Kittiwakes flying high to the east over the Erskine Bridge whilst W.R.Brackenridge noted flocks flying west over Carron Valley Reservoir in October 1985 and 1987 and in December 1984. There are, however, very few such unequivocally inland records and Murray presumably relies on evidence of large and regular movements into the inner Forth off Hound Point (e.g. *Lothian Bird Reports* 1984-91). I wish to argue that the interpretation of such movements is not straightforward and there is in fact a wide range of possible interpretations depending on what assumptions are made on seabird behaviour and the weighting of negative evidence.

The problem is that west of Hound Point there are some 100 square kilometres of wide estuary before the Forth narrows markedly above Kincardine Bridge; thus there is ample space for Hound Point birds to feed. In recent years flocks of up to 500

Kittiwakes have not been unusual in this area and in fact large feeding flocks have been known for a long time - around December 1872 great numbers were in the upper Forth feeding on enormous shoals of *Clupea sprattus* (Harvie-Brown 1906). Such birds could, conceivably, drift back eastwards to the North Sea in a diffuse movement some time later; a night return is possible since Myres (1963) found that departure from breeding colonies continued after dark. The most convincing observations for inland flights were made by G.L.Sandeman (1974, 1975) in October and November: he detected large westerly movements off Edinburgh and followed them to see (a) in 1974, large flocks circling high over the Queensferry bridges and heading west and (b) in 1973, flocks gaining height and heading west over Skinflats. If the latter flight direction was persistent then the birds must have departed inland. Although flocks of Kittiwakes in this locality are often hesitant and not actually seen to depart (D.M.Bryant, W.R.Brackenridge pers. comm.) there can be little doubt that Sandeman's observations support the inland observations that Kittiwakes fly overland in flocks at least occasionally. Several versions of Murray's more generous interpretation might be distinguished: (1) overland flights occur regularly but only involve a small proportion of birds entering the inner Forth.

(2) a significant (say >10%) of such birds leave overland or (3) the majority of them do so.

There are three sets of observational evidence against regular overland flights. First, since Sandeman's notes there has been intensive observation around Grangemouth but no large and unequivocal departures have been recorded. Second, between 1978-1988 a group led by A.D. Wood made frequent and thorough observations at Carron Valley Reservoir but did not report anything to add to the observations already mentioned. Third, in the last 20 years I have made many observations in autumn specifically to look for visible migration on the north and the south sides of the Gargunock Hills and have many records of passerine and goose movement but with no sign at all of seabirds. Admittedly, Kittiwakes over land are often likely to be flying high but the visible migration watches specifically involved scanning the sky; thus for any regular passage to be completely overlooked it would be necessary to assume that almost all of the birds occur at above about 2000m. Such an assumption is certainly conceivable but in my view would need some independent support to carry any conviction. I have in fact had no difficulty in detecting large gulls, probably *Larus fuscus*, with x8 binoculars against well-lit cloud at a range of 5000m. It is worth noting that non-systematic observation by local observers in autumn quite regularly pick up small numbers of Gannets *Sula bassana*, usually juveniles, either flying overland or departing inland. Radar observations made by Evans (1968) of overland departures by waders from the Forth might also have been expected to detect any regular movement of Kittiwakes but no such evidence was obtained, although Professor Evans tells me that high flying flocks would have been within range of his radar. Bourne (1963), reviewing bird migration in north-west Europe, also mentioned Kittiwake movements only at sea. Professor Coulson tells me that the ringing evidence gives no

support to a theory of large scale interchange overland between the west and east coasts.

Occasional inland movements have been noted for other species. In autumn, parties of Common Terns *Sterna hirundo* have twice left to S or W from Grangemouth and a steady movement up river occurred above Alloa on 13 September 1970. The last was accompanied by two Little Gulls *Larus minutus* and one of this species flew inland at Skinflats on 22 August 1991. Sandwich Terns *Sterna sandvicensis* have been noted flying W over Gargunock. However this species illustrates the risks of interpreting isolated observations - twice in August 1991 above Alloa large parties were seen to fly off W gaining height, only to return with loud calling some minutes later. The numbers of skuas *Stercorarius sp.* seen around Grangemouth are only a small percentage of those seen passing W at Hound Point - it is worth noting that a notable proportion also fly E at this site, records from the *Lothian Bird Reports* 1987-1991 show 27% E for Pomarine *S. pomarinus*, 22% for Arctic *S. parasiticus*, 8.5% for Long-tailed *S. longicaudus* and 17.4% for Great Skuas *S. skua*. These facts suggest that most of the skuas eventually return to the North Sea. However, Arctic Skuas have been seen to leave inland from Skinflats at least once. More surprisingly, a party of 18 arrived from the WSW (apparently from inland) on 18 September 1976.

All these records suggest that inland passage through Scotland occurs occasionally in most primarily coastal *Laridae* but there is no strong reason to conclude that it is frequent. A more generous conclusion in the case of the Kittiwake would depend on dismissing the negative evidence detailed above; there are certainly reasons why any of the types of negative evidence might be misleading, but when all are in agreement I assert that to conclude that inland passage is regular or on a large scale would be to go far beyond the existing evidence. Thus I can find no support for any of the three regular

movement options mentioned earlier, although I would agree that the option involving a small part of inner Forth birds should be kept in mind as a possibility. It would be very useful if observations of movement at Hound Point could be relayed immediately to observers who watch in the Grangemouth area so that specific and simultaneous checks for inland departure could be made.

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Reply to Henty

The fate of the seabirds that travel westwards up the Forth at Hound Point in the autumn has interested me ever since the scale of the Hound Point passage first became apparent, in relation to skua movements, in the late 1980s. In the four years between 1988-91 some 2133 skuas were counted moving through Hound Point. Of these 1593 (75%) travelled west while the remaining 540 were seen moving east. Another 100 birds were reported moving in an indeterminate manner, usually circling round in the area immediately east of Hound Point. Even deducting the 540 eastward travellers, as moving west and then returning, this still leaves over 1000 skuas passing through westwards.

Observers at Hound Point have absolutely no doubt that these birds are cross-country travellers from their behaviour as they approach the main observation area. They are reluctant to pass under the Forth Bridges and they typically begin to tower as they approach Hound Point. They spiral upwards and when they reach their preferred altitude, they move off west and south-

westwards parallel to the southern shore of the Forth, passing directly above South Queensferry. This behaviour is typical of bright afternoons when the wind is between south-west and north. The eastwards movements, which Henty suggests are birds returning out of the upper Forth, only occur in dull conditions and easterly winds according to M. Griffin and I.J. Andrews, two of the principal Hound Point devotees. Their interpretation of this behaviour is that, if the birds are unable to see their way clearly westwards in the area where the land narrows at the bridges, they will turn back eastwards down the Forth, presumably to search out another route west to the Atlantic. It is only in clear conditions, perhaps when the towering birds can actually see the Atlantic, that they head westwards. It is noticeable in this regard that most movements occur in the afternoon when it is more likely that the birds will see the sun shining off the ocean surface.

I personally witnessed just such a situation in September 1992 at the summit of Broad Law (834m) in the virtual centre of

southern Scotland. Whilst conducting botanical fieldwork, our party came upon a juvenile Arctic Skua *Stercorarius parasiticus* feeding off emerging crane flies *Tipulidae*. After an hour the bird flew off, spiralled upwards for several hundred metres before flying off westwards towards the point where the sun was reflecting off the Atlantic to the south of Goat Fell on Arran. I have little doubt that this is what occurs at Hound Point. Perhaps people who use Edinburgh Airport and fly above the Forth Bridges in the afternoon might confirm this.

There are remarkably few reports of any skuas from points west of Queensferry, and none of the flocks of skuas, which pass Hound Point on some days. Yet it is known that skuas routinely fly overland across Eurasia south of their breeding range, cross-country to the Caspian Sea and along the flyway between the Baltic Sea and the Gulf of Murmansk. In our case, I suspect the skuas travel across Scotland unseen at high levels, spreading out from the bottleneck at the Forth Bridges, reducing the likelihood of being spotted by observers. Certainly, the Carron Valley and the Gargunnoch Hills seem too far north to be on the flightlines of birds seen at Hound Point.

It seems unlikely that the Hound Point movements are anything new. They were overlooked despite vast numbers of birdwatchers in the area. The spring passage of skuas off the Western and Northern Isles is certainly not a novel phenomenon, but this was also overlooked until recently. What else is waiting to be discovered?

The near certainty that skua movements at Hound Point must have gone on for years before the passage was reported tends to reduce the impact of Henty's negative evidence for Kittiwake *Rissa tridactyla* movements. The Hound Point observers regularly see Kittiwake flocks, often several hundred birds strong, towering like the skuas and passing off westwards. Sandeman's evidence seems to tie in well with the

apparent westwards passage seen more recently at Hound Point. The fact that they are not seen over the areas indicated in Henty's note may simply suggest that they move over parts of Central Scotland which are as yet undiscovered.

The suggestion in the 1990 *Scottish Bird Report* was simply that such movements across Scotland do occur, as hinted at by the quoted 38 Kittiwakes moving east high above the Erskine Bridge in March 1990, while 1600 moved west past Hound Point on 18 October that year. Even a casual glance at the bird reports for Lothian and the Clyde area in recent years shows that these observations are not unique. Respectable numbers of Kittiwakes travelling westwards pass Hound Point each October and small numbers are seen in the Clyde area apparently moving east each March. The movements may well be regular.

The 1991 *SBR* documented Long-tailed Skuas *S. longicaudus* moving inland up the Eden Estuary and the River Dee during the large movement of September. Similarly, numbers of Kittiwake were again seen in Glasgow during March, some passing eastwards. A paper on the regular passage of Little Gulls *Larus minutus* across the Pennines between the Irish Sea and the North Sea (Messenger, D. 1993. Spring passage of Little Gulls across Northern England. *Brit. Birds* 86: 397-06), records a movement that would have been considered fantastic 20 years ago.

When preparing the species accounts for *SBR*, information in local bird reports often makes it possible to see trends or features which are not readily apparent from reading just one or two bird reports. My attempts to draw together the huge amounts of data and present these in a way that will both interest and enlighten the reader, lead me to hint at points which become apparent to me, in the hope that someone will notice and actually prove them. A letter challenging my opinion means at least that someone reads *SBR*.

Research Index

The following is an index of fieldwork and research presently undertaken with specific Scottish interest. The index is updated every year and researchers are either listed alphabetically by the institute where the research is based, or in two cases (SNH & RSPB) by the topics and species researched. If you are doing research in the area and are not listed here, or know of someone who is, please put us right by sending details to the editor.

Aberdeen University

- Cosgrove, P. The importance of conservation zones for bird populations in upland spruce forest. concentration on broadleaf strip, unplanted stream edges, marshes, etc. in otherwise unbroken conifer. Based in Kielder, Northumberland. (PhD study).
- Doyle, P. Factors associated with the persistence of sub-colonies of the Fulmar on Eynhallow, Orkney. (PhD study).
- Dayawansa, N.P. Distribution and feeding ecology of waders and waterfowl on the Ythan estuary, Grampian in relation to algal growth on mudflats. (PhD study).
- Dunnet, G.M. The Fulmar on Eynhallow in Orkney (since 1950) concerned primarily with population dynamics, longevity and, recently, recruitment.
- Dunnet, G.M. & Heubeck, M. Monitoring programme (since 1978) in breeding seabird populations in Shetland, as well as changes in seabird and waterfowl wintering populations in two areas: Yell Sound and Sullom Voe and the Bluemull/Colgrave Sounds area of north-east Scotland.
- Gorman, M.I. & Langsdale, A. Feeding ecology of raptors (Short-eared Owl, Hen Harrier and Kestrel) in Orkney, particularly concerned with the effects of changes in land use.

- Patterson, I.J. & Fuchs, R.M.E. Management of grassland to provide reserves for wild geese: experiments with different mowing, grazing and fertiliser regimes at the RSPB reserve at the Loch of Strathbeg, Grampian.
- Patterson, I.J. & Laing, R. Monitoring of wildfowl and wader numbers on the Ythan estuary, Grampian. Twice-monthly counts throughout the year, with special emphasis on the Eider Duck in the breeding season.

Edinburgh University

- Carter, A. Feeding behaviour and micro-habitat distribution of waders on rocky shores, especially in East Lothian (MPhil study)
- Cresswell, W. Behaviour and ecology of a predator-prey system: Sparrowhawks and Redshanks, concentrated on Tynninghame, East Lothian. (PhD study).
- Deag, J. Studies on communication and social organisation in tits, with field work mainly at Ormiston, East Lothian. (PhD study).
- Hanna, L. Barn Owl populations genetics. (PhD study).
- Lunny, C. Behaviour and ecology of Dippers. (PhD study).
- McAfferty, D. Ecological energetics of Barn Owls. (PhD study).
- Scott, G. Social behaviour and communication in Blue Tits. (PhD study).
- Taylor, I. Long-term study (started 1978) of Barn Owl ecology and conservation. Has been monitoring, since 1980, changes in Lapwing breeding density in relation to agriculture.
- Vickery, J. Behaviour and ecology of Dippers and waders of farmland.

Glasgow University

- Askew, C. Survival rates and ecology of Great Skuas on Handa: comparison of a small and expanding population with the large decreasing one on Foula.
- Austin, G. Seabirds and their food supply.
- Barber, I. Breeding performance of seabirds on Handa in relation to industrial fishing development. (MSc study).
- Bolton, M. Energetic costs of breeding in Storm Petrels.
- Calvo, B. Effects of agricultural land use on the breeding ecology of waders. (PhD study).
- Calvo, B. & Furness, R.W. Endosteal lamellae in bird bones as a means of estimating the age of dead adult birds.
- Cohen, B.L., Wildon, R.H., Furness, R.W. & Willcox, S. Molecular studies of skua DNA to assess the evolutionary history of skuas.
- Crompton, D.W.T. & Huntingford, F.A. *Profilicollis botulus*: an Eider Duck parasite in the Clyde Estuary.
- Ensor, K. Breeding season diets of Great Skuas and gulls in relation to the activities of the whitefish fisheries around Scotland.
- Furness, R.W. Seabird interactions with fish stocks and fisheries, birds as monitors of environmental change, long term monitoring of seabird ecology on Foula, Shetland (since 1971), seabird energetics, body composition and moult.
- Furness, R.W., Hamer, K.C., Klomp, N.I. & Ratcliffe, N. Ecology of Great Skuas on Foula, Shetland: long term studies begun in 1960s.
- Hansell, M.H. A comparative study of nest building behaviour in birds.
- Henny, V. Reproductive strategy in Common Terns.
- Horn, W. Diet selection and foraging economics in breeding terns. (PhD study).
- Houston, D.C. Food quality and breeding performance in Blue Tits.
- Klomp, N.I. & Furness, R.W. Recruitment of immature Great Skuas into breeding colonies (comparative work with Professor E.C. Young, University of Auckland, in southern hemisphere skuas).
- Macedo, E. Effects of fisheries on seabird numbers: an assessment of net mortality and fishery-induced changes in food availability. (MSc study).
- Madders, M. Hen Harrier ecology, especially their use of forestry plantations (PhD study).
- Metcalfe, N.B. Social behaviour and ecology of flocking birds: reproductive ecology of Pied Flycatchers.
- Monaghan, P. Population ecology of gulls.
- Monaghan, P., Burns, M. & Walton, P. Reproductive strategies in Black Guillemots.
- Monaghan, P., Burns, M., Uttley, J.D., Walton, P. & Austin, G. Effect of prey availability on reproductive and foraging strategies in Shetland seabirds.
- Monteiro, L. Heavy metal accumulation by petrels and shearwaters. (PhD study).
- Muda, F. Nest material stealing in Shags. (PhD study).
- Phillips, R. Population ecology of Arctic Skuas in relation to climate and variations in numbers and reproductive success of the species they rob of fish. (PhD study).
- Ramsay, S. Nutritional factors in egg production in tits.
- Ratcliffe, N. Reproductive effort of Great Skuas of known ages from 4-30 years old: a test of predictions of life history theory. (PhD study).
- Selman, R. The role of female body condition on egg production in birds. (PhD study).
- Smith, R.D. Dispersal and behaviour of over-wintering Snow Buntings. (PhD study).
- Solomon, S.E. Comparative study of the ultrastructure of eggshell formation in birds.

- Stewart, R.M. Uptake, storage and excretion of cadmium and lead by birds and an assessment of birds as monitors of cadmium and lead pollution. (PhD study).
- Thomson, D.I. Energetics and ecology of Kittiwakes. (PhD study).
- Thompson, D.R. & Furness, R.W. Analysis of stable isotope ratios of nitrogen, carbon and other elements in feathers of seabirds as a means of assessing their trophic relationships in the marine ecosystems and changes in diet of the last 150 years.
- Walsh, P.M. Feeding ecology and mercury burdens of Gannets. (PhD study).
- Williams, J. Birds as possible carriers of Lyme disease. (PhD study).
- Zonfrillo, B. Breeding ecology of seabirds on Ailsa Craig. (PhD study).

Institute of Terrestrial Ecology, Banchory.

- Bacon, P.J. & Palmer, S.C.F. (Oxford). Investigation and modelling of habitat utilisation by Red Grouse.
- Harris, M.P. & Nuttall, P. The importance of tick-borne diseases on seabird populations.
- Harris, M.P., Halley, D. (St. Andrews) & Wernham, C. (Stirling). Long-term studies of numbers, survival, productivity and for some species, recruitment and body condition, of seabirds on the Isle of May in relation to food availability and environmental conditions.
- Marquiss, M., Carss, D. & Alexander, G. Does Goosander and Red-breasted Merganser predation have an impact on salmon populations.
- Moss, R., Parr, R. & Trenholm, I. Population regulation in Red Grouse. Roles of behaviour, dispersal and predator in determining population size.
- Moss, R., Ficozzi, N. & Catt, D.C. Studies of habitat requirements, dispersal, numbers and distribution of Capercaillie; particularly the use made by Capercaillie of commercial woodland.

- Parr, R. A study of population size and productivity of moorland waders and Red Grouse in relation to afforestation.
- Wanless, S., Harris, M.P. & Hector, J.A.L. Reproductive and foraging energetics of Shags with particular emphasis on the influence of food availability and feeding habitat.

Joint Nature Conservation Committee: Seabirds Team, Aberdeen.

- Tasker, M.L. Head of Seabird Team.
- Walsh, P. Seabirds Colony Register - collates counts of seabirds at colonies throughout the U.K.
- JNCC Seabirds at Sea Team (SAST). Studies the distribution of seabirds in the offshore waters around Britain throughout the year. Staff: A. Webb (leader), C. Stone (marine biologist), D. Halley (ornithologist).

The Royal Society for the Protection of Birds

The RSPB undertakes extensive research into all aspects of birdlife: their ecology, distribution, status and conservation. The following projects are of particular Scottish interest and names of the RSPB research staff involved are given in brackets. Further details are available from Ian Bainbridge at RSPB SHQ. In addition to this list, regular bird monitoring is undertaken on almost all the RSPB's reserves in Scotland. There are also numerous projects on many aspects of the ecology and management of the reserves, including ornithological, botanical, hydrological and entomological projects, which are too numerous to list here.

Species research

- Factors affecting breeding success of Black-throated Divers. Studies of lochs, fish, invertebrates and diver productivity. (1992-95, D. Jackson, M. Hancock, R. Summers).

- Individual bird calls. With University of Nottingham. Investigation of individual bird identification using calls; including Black-throated Diver, Corncrake, Bittern. (1990-93, G. Gilbert and P. MacGregor Nottingham University, K. Smith).
- Factors affecting breeding success of Slavonian Grebes. Studies of lochs, fish, invertebrates and grebe productivity. (1992-94, R. Summers, R. Mavor).
- Surveying methods for Storm and Leach's Petrels. Development of methods for surveying and monitoring these species, using transects, endoscopy etc., on Shetland and elsewhere. (1990-95, D. Suddaby, P. Ellis, J. Sears).
- Barnacle Goose feeding ecology. With Durham University. Investigation of reseeded, grazing and fertiliser management on grassland use by Barnacle Geese at Loch Gruinart. (1992-95, J. Welstead & P. Evans Durham University, S. Percival Sunderland University, I. Bainbridge, D. Beaumont, Loch Gruinart Reserve staff).
- Goose grazing management experiments. With Aberdeen University. Studies on the effects of grazing, mowing and fertiliser regimes on grey goose use of Loch of Strathbeg. (1991-95, R. Fuchs & I.J. Patterson Aberdeen University, D. Beaumont, I. Bainbridge, Strathbeg Reserve staff).
- Moray Firth seaduck and wader studies. Regular surveys of Moray Firth seaduck populations, and co-ordination of BoEE counts, 1985 onward. (1977-95, R. Evans, J. Stenning).
- Sea Eagle population studies. With SNH and JNCC. Monitoring and demographic modelling of Sea Eagle populations. (1984 ongoing, RSPB Regional staff, R. Green).
- Golden Eagle home range use. Investigation of use of habitat by radio-tagged eagles; relating breeding success and habitat to prey abundance, land use and topography. (1991-95, M. McGrady, J. Grant, I. Bainbridge).
- Golden Eagle project, Galloway. With SNH, Forest Enterprise and Dumfries & Galloway RSG. Studies of the home ranges, prey and carrion densities and habitat use of eagles in Dumfries and Galloway. (1992-94, C. Park, C. Rollie).
- Red Kite monitoring. Joint project, with JNCC managing English re-introduction. Monitoring of breeding success and dispersal of the Scottish Red Kite population. (1989, ongoing, D. Orr-Ewing, R. Evans).
- Effect of forestry on Hen Harriers. Contract to Glasgow University. Studies of breeding and feeding use of forestry and other land by harriers. (1991-94, M. Madders & D. Houston Glasgow University, I. Bainbridge).
- Hen Harrier ecology. Studies on the population biology and dispersal of Hen Harriers. (1990-95, B. Etheridge, J. Craig, R. Summers).
- Merlin survey. Repeat of 1983-84 national Merlin survey to give population size, trends and baseline for future studies. (1993-94, G. Rebecca, I. Bainbridge).
- Relationships between raptor and grouse populations. Joint project with ITE, GC, SNH, JNCC. Relationships between harriers, Peregrines and grouse populations. (1991-97?, ITE and GC staff, I. Bainbridge).
- Black Grouse and land use. Analysis of Perthshire Black Grouse survey to investigate relationships between grouse density and distribution with land use. (1993-94, R. Green).
- Breeding success and habitat selection in Capercaillie. Work on Abernethy reserve, examining the effects of habitat, predators and other factors on Capercaillie productivity and survival. (1991-95, R. Summers, R. Proctor, Abernethy Reserve staff).
- Survey and monitoring of Capercaillie populations. Joint project with ITE, GC,

- SNH, FC. Estimation of population size and habitat use. (1991-94, R. Summers, I Bainbridge).
- Corncrake ecology. Studies of Corncrake breeding biology to assist in land management for Corncrake conservation. (1992-95, G. Tyler, R. Green, C. Self, E. Brindley).
- Corncrake survey. Joint project with IWC. Repeat of 1988 national survey, 1991 part survey to give population size, trends and habitat changes. (1993, R. Green).
- Corncrake tape-luring. Experimental tape-luring to attract Corncrakes to suitable habitat. Loch Gruinart. (1991-94, M. Peacock, G. Hirons).
- Red-necked Phalarope ecology. Identification of habitat and management requirements. (1992-95, M. O'Brien, I. Bainbridge).
- Montane bird monitoring, Abernethy. Collaborating with SNH. Development of monitoring methods for breeding Dotterel and Snow Buntings. (1992-95, A. Amplett, I. Bainbridge, D. Beaumont).
- Lowlands breeding waders in Scotland. Joint project with SOC. To determine the numbers and distribution of lowland breeding waders in Scotland, set up a baseline for future studies, identify key sites for waders. (1992-94, M. O'Brien, I. Bainbridge).
- Low tide counts. Contract to BTO. Low tide counts of distribution of waterfowl wintering on estuaries. (1992 ongoing, J. Evans BTO, J. Sears).
- Roseate Tern. A study to monitor the breeding range and productivity of the east Atlantic population, identify its wintering range, and determine threats to the species. (1988-94, A. del Nevo).
- Seabird monitoring. Monitoring of seabirds at RSPB reserves and other sites; particularly tern monitoring. Contribution to joint seabird monitoring project with JNCC and SOTEAG. (ongoing, J. Sears).
- Seabird monitoring, east Caithness. Census plot counts and productivity studies at five colonies in east Caithness. (1980-93, R. Evans).
- Orkney and Shetland seabird studies. Monitoring numbers, breeding success and body condition of Arctic Terns and skuas in relation to food availability. (1990 ongoing, D. Suddaby, C. Orsman, P. Ellis, E. Meek, J. Sears).
- Winter pinewoods bird survey. Crested Tit, Crossbill and Capercaillie population distribution and habitat studies. (1992-95, R. Summers, A. MacLennan, G. Rebecca).
- Scottish Crossbill identification. With Dundee Institute of Technology. Studies on Crossbill DNA to determine species distinction and aid future field identification. (1992-94, R. Summers).
- Habitat and legislative research.**
- Estuaries inventory. Development of a database on the 57 most important estuaries in the UK, identifying land use, developments, bird numbers and areas used. Includes Solway, Clyde, Forth and Moray Firth. (1990-95, K. Peck, J. Sears).
- Reedbed inventory. Development of a full national inventory of reedbeds, with vegetation surveys, monitoring of reedbed condition. (1993-94, K. Smith, M. Painter).
- Upland futures. Review of the likely effects of upland land use change on birds. (1992-93, R. Green, N. Harding).
- Review of licensed bird killing. Examination of the level of killing of birds under licence in the UK, how the licensing system operates. Concentrating on sawbills, Cormorants and geese. (1993-94, S. Murray, P. Newbery).
- inshore fisheries study. Review of inshore (net) fisheries in Scotland and Northern Ireland and the effects of incidental bird kills in them. (1992-93, S. Murray, N. Harrison).

Shetland sandeels survey. Contribution to SOAFD survey of sandeels numbers and distribution around Shetland, in connection with the Braer incident. (1993-95, SOAFD staff, J. Sears).

Beached Bird Survey. Organisation and analysis of annual beached bird survey. (1991 ongoing, RSPB Regional staff, I. Sim, J. Sears).

St Andrews University

Gil, D. Field studies of Treecreeper song. (PhD study 1993-96: topic to be decided).

Graves, J.A. & Ortega-Ruano, J. Mating and reproductive success in Shags on the Isle of May.

Slater, P.J.B. Field and laboratory studies on the development and organisation of bird vocalisations.

Scottish Association for Marine Science (formerly Scottish Marine Biological Association), Dunstaffnage Marine Laboratory, PO Box 3, Oban, Argyll PA34 4AD

Craik, J.C.A. Factors affecting breeding success of Common Terns and Arctic Terns in western Scotland, especially predation by mink and otter. Effects of such predation on smaller gull species (Common and Black-headed) are also receiving study.

Scottish Natural Heritage

SNH is involved in a wide range of work on birds. Much of this is currently contracted out to other organisations, and some is managed on its behalf by the Joint Nature Conservation Committee (JNCC). Names of individual workers are not attached to the following list, although the key organisations involved are given, as is the appropriate contact person in SNH or JNCC. The first contact points for further information on these projects and other

aspects of SNH's work on birds are Greg Mudge (agricultural/lowland birds) and Philip Whitfield (upland/peatland birds) at 2/5 Anderson Place, Edinburgh, EH6 5NP. Tel 031 554 9797. Other contact persons are also at this address, unless otherwise specified.

International site designations: survey, review and assessment of bird numbers and distributions with respect to Special Protection Areas and Ramsar sites. JNCC. (G.P. Mudge, D.P. Whitfield, C. Galbraith JNCC).

Services in ornithology. Including the Birds of the Estuaries Enquiry (WEBS); national bird ringing scheme; integrated population monitoring; monitoring birds of prey; monitoring of wetland birds, special surveys; habitat management research. JNCC/ British Trust for Ornithology. (G.P. Mudge, C. Galbraith JNCC).

Monitoring of rare British breeding birds. JNCC/Rare Breeding Birds Panel. (G.P. Mudge, D. Stroud JNCC).

Conservation of vulnerable and dispersed species. Measures to protect birds outside protected areas in line with UK responsibilities under the EC Birds directive. JNCC. (C. Galbraith JNCC).

Services in wildfowl research, including the National Waterfowl Count scheme (WEBS). JNCC/Wildfowl and Wetlands Trust. (G.P.Mudge, D. Stroud JNCC).

Conservation plans for migratory waterfowl under the Bonn Convention and Ramsar Convention. JNCC/International Waterfowl and Wetland Research Bureau. (D. Stroud JNCC).

Effect of commercial dredging on wintering birds on the Solway. British Trust for Ornithology. (M. Hughes, SNH Dalbeattie).

Meteorological Office reports related to statutory shootings bans on waterfowl during severe winter weather. JNCC/Meteorological Office. (D. Stroud JNCC).

- Moorland bird surveys; techniques and ecology. (D.P. Whitfield, A. Brown English Nature).
- Moorland changes and influences on birds in the Northern Isles. (A. MacDonald, D.B.A. Thompson).
- Population ecology and conservation of montane birds, notably Dotterel, Ptarmigan and Snow Bunting. (D.P. Whitfield, D.B.A. Thompson, with R. Smith & S. Rae).
- Review of bird-habitat relationship and consequence of habitat loss. (J.B. Reid, D.B.A. Thompson).
- Atlas study of central Highland breeding birds. (J.B. Reid).
- Seabirds at sea programme, phase 4. JNCC (A. Webb JNCC).
- Seabird colony register. Maintenance of a database of counts of seabird colonies. JNCC/Seabird Group. (M. L. Tasker JNCC).
- Seabird monitoring programme, Annual monitoring of breeding success at seabird colonies. JNCC/RSPB/SOTEAG (M.L. Tasker JNCC).
- Survey of breeding seabirds of Sanda and associated islands. (D. Hunt SNH Kilmory).
- Seabird studies, Hermaness. Contract to Dr. T. Martin. (P. Harvey SNH Shetland).
- Sule Skerry - collation of bird data. (P. Harvey SNH Shetland).
- Slavonian Grebe biology. Contribution to RSPB study. (N. Buxton SNH Inverness).
- Grey geese - movements and habitat usage of wintering grey geese in the Moray Firth area. (N. Buxton SNH Inverness).
- Grey geese - monitoring of numbers, distributions and habitat usage in Scotland. Wildfowl and Wetlands Trust. (G.P. Mudge).
- Greenland White-fronted Geese on Islay. An investigation of flock structure, field usage and roost occupancy. Wildfowl and Wetlands Trust. (R. MacDonald SNH Islay).
- Barnacle Geese - an investigation of the seasonal patterns of distribution and effectiveness of appropriate grazing and scaring techniques. (M. Hughes SNH Dalbeattie).
- Eider survey, Sands of Forvie. Aberdeen University. (P. Harvey SNH Shetland).
- Wildfowl and wader counts on the Ythan Estuary. Aberdeen University. (M. Ferguson SNH Aberdeen).
- Comparative feeding ecology of predatory birds. Glasgow University. (D.B.A. Thompson, C. Galbraith JNCC).
- Re-introduction of Sea Eagles. Release of chicks from Norway and monitoring of the re-introduced population. Joint project with RSPB. (G.P. Mudge).
- National survey of Golden Eagles. To write up the results of the 1992-93 survey. Joint project with RSPB and the Scottish Raptor Study Groups. (D.P. Whitfield).
- Golden Eagle - assessment of potential prey in Dumfries and Galloway, in conjunction with RSPB and Forestry Commission. (M. Hughs SNH Dalbeattie).
- Red Kite re-introduction: national and international co-ordination. JNCC/RSPB. (G.P. Mudge, C. Galbraith JNCC).
- Effects of predators on Red Grouse and moorland waders in southern Scotland. Institute of Terrestrial Ecology. (P. Reynolds).
- Past ecology of Ptarmigan in south Scotland. (D.P. Whitfield).
- Capercaillie - status and habitat needs. Joint contract with RSPB to the Institute of Terrestrial Ecology. (G.P. Mudge).
- Peatland waders - habitat use, feeding ecology and movements. Durham University. (D.P. Whitfield, D.B.A. Thompson).
- The impact of afforestation on moorland breeding birds, Glen Dye. Institute of Terrestrial Ecology. (D. Bale SNH Aberdeen).
- Survey of breeding waders on Oronsay. (R. MacDonald SNH Islay).

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- Philopatry, fidelity, mating/social systems and conservation in waders. (D.P. Whitfield, D.B.A. Thompson).
- Effect of weed mats on the distribution and feeding ecology of waders at the Ythan Estuary. Aberdeen University. (M. Ferguson SNH Aberdeen).
- Long term study of Greenshanks in north-west Scotland. (D.B.A. Thompson).
- Population trends of gulls and other seabirds on the Isle of May. Institute of Terrestrial Ecology. (G.P. Mudge).
- Co-existence of moorland passerines. A study of the effects of heather/bracken patchiness on the inter-relationship of breeding Meadow Pipits, Skylarks and Whinchats. University of York. (D.B.A. Thompson).
- A review of Chough data in parts of south-west Scotland. (I. Langford SNH Dalbeattie).
- Ecology and conservation of Pied Flycatchers in north-west England. NERC/SNH Studentship. Leicester University. (D.B.A. Thompson).
- Ecology of Corn Buntings on the Outer Isles. Leicester University. (D.B.A. Thompson).
- Stirling University**
- Alves, M-A. Behavioural ecology of Sand Martins. (PhD study).
- Bell, M. Wildfowl counts, Breeding wader surveys, Raptor monitoring.
- Bryan, S. Energetics of laying in birds. (PhD study).
- Bryant, D. Energy requirements of wild birds. Populations and ecology of estuarine birds (especially Forth). Hirundine and Dipper breeding ecology.
- Calladine, J. Breeding ecology of Larus gulls on the Isle of May (with ITE Banchory - PhD study).
- Jalil, S.A. Effects of land use changes on waterfowl populations. A study based on freshwater lochs in central Scotland. (PhD study).
- Johnstone, I. Territorial behaviour in Robins and Dippers. (PhD study).
- Hashim, R. Ecology and energy requirements of Great Tits in summer and winter. (PhD study).
- Logie, J. Population ecology of Dippers in central Scotland. (PhD study).
- Wernham, C. Breeding ecology of Puffins. (with ITE Banchory - PhD study).
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Items of Scottish Interest

Most of the following papers and reports on birds in Scotland are available in the Waterston Library at 21 Regent Terrace for reference, and include all that have come to notice in the period March-September 1993. The librarian would be glad to learn of anything that has been missed, and to receive reprints or copies of papers on any aspect of ornithology or natural history. Bird reports marked with an asterisk are available from the SOC at the prices quoted, but please add 50p per order for postage and packing.

Scientific papers.

- Aebischer, N.J. 1993. Immediate and delayed effects of a gale in late spring on the breeding of the Shag. *Ibis* 135: 225-232.
- Andrew, D.G. 1993. House Martins taking over Barn Swallow's nest. *Brit. Birds* 86: 184-185. An occurrence in East Lothian.
- Ap Rheinallt, T. 1993. Notes on some little-known Arran birds. *Arran Naturalist* 16: 3-10.
- Aspinall, S. 1993. Avoiding double-counting in a Gull colony. *Seabird Group Newsletter*. 64: 4-5.
- Avery, M.I., Burges, D., Dymond, N.J., Mellor, M. & Ellis, P.M. 1993. The status of Arctic Terns in Orkney and Shetland in 1989. *Seabird* 15: 17-23.
- Bailey, R.S., Furness, R.W., Gauld, J.A. & Kunzlik, P.A. 1991. Recent changes in the population of the Sandeel *Ammodytes marinus* at Shetland in relation to estimates of seabird predation. *Int. Counc. Explor. Sea Mar. Sci. Symp.* 193: 209-216.
- Belaoussoff, S. 1993. Northern Gannet and Common Guillemot nesting in Rockall. *Brit. Birds* 86: 321.
- Bibby, C.J. & Etheridge, B. 1993. Status of the Hen Harrier in Scotland in 1988-89. *Bird Study* 40: 1-11.
- Bourne, W.R.P. 1993. The story of the Great Auk *Pinguinis impennis*. *Archives of Nat. Hist.* 20: 257-278.
- Brown, A.F. & Stillman, R.A. 1993. Bird-habitat associations in the eastern Highlands of Scotland. *J. Appl. Ecol.* 20: 31-42.
- Cairngorms Working Party. 1992. Common sense and sustainability- a partnership for the Cairngorms. 180pp + 7 maps. A report to the Secretary of State for Scotland.
- Carss, D.N. 1993. Cormorants at cage fish farms in Argyll, western Scotland. *Seabird*. 15: 60-67.
- Craik, J.C.A. 1992. Exceptional mortality of Auks, Terns, and Kittiwakes in western Scotland in July 1985. *Sula* 6: 125-138.
- Cranswick, P.A. 1992. Distribution of Pink-footed and Greylag Geese in south-east Scotland, especially in relation to disturbance. A report by Wildfowl and Wetlands Trust, Slimbridge to NCC Scotland. 116pp.
- Cranswick, P.A., Kirby, J.S. & Waters, R.J. 1993. *Wildfowl and Wader Counts* 1991-92: 109pp.
- Donnelly, P.J. 1993. Yellow-browed Bunting in Orkney. *Brit. Birds* 86: 411-414.
- Dougall, T.W. Breeding passerine communities of five duneland habitats in northeast Fife. *Scot. Nat.* 102: 1990: 53-67. Reprint recently received.
- Dowie, M.I. 1993. Blackpoll Warbler in Shetland. *Brit. Birds* 86: 206-209. An occurrence on Fair Isle.
- Forrest, G.J. 1993. Wintering Chiffchaff feeding on peanuts. *Brit. Birds* 86: 186187.
- Fox, A.D. & Meek, E.R. 1993. History of the Northern Pintail breeding in Britain and Ireland. *Brit. Birds* 86: 151-162. The main Scottish sites are in Orkney and Tiree.
- Furness, R.W. 1992. Implications of changes in net mesh size, fishing effort and minimum landing size regulations in the North Sea for seabird populations. Joint Nature Conserv. Comm. Report No 133: 75pp.
- Galbraith, H., Murray, S., Duncan, K., Smith, R., Whitfield, D.P. & Thompson D.B.A. 1993. Diet and habitat use of the Dotterel *Charadrius morinellus* in Scotland. *Ibis* 135: 148-155.
- Gilburn, A.S. & Kirby, J.S. (1992). Regional patterns of wildfowl distribution on British wetlands. Part 1. Scotland and northern England. Joint Nature Conserv. Council. Report No 138: 57pp. A report from the Wildfowl and Wetlands Trust to the JNCC, Peterborough.

- Greenstreet, S.P.R., Morgan, R.I.G., Barnett, S. & Redhead, I. 1993. Variation in numbers of Shags *Phalacrocorax aristotelis* and Common Seals *Phoca vitulina* near the mouth of an Atlantic salmon river at the time of the smolt run. *J. Anim. Ecol.* 62: 565-576. A study in south Kintyre.
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- Hamer, K.C., Monaghan, P., Uttley, J.D., Walton, P. & Burns, M.D. 1993. The influence of food supply on the breeding ecology of Kittiwakes *Rissa tridactyla* in Shetland. *Ibis* 135: 255-263.
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- Harris, M.P. & Wanless, S. 1993. The diet of Shags *Phalacrocorax aristotelis* during the chick-rearing period assessed by three methods. *Bird Study* 40: 411-414.
- Harrop, H. 1993. Massed Skua passage off Shetland. *Seabird Group Newsl.* 64: 8-9.
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- Knox, A.G. 1993. Daurian Redstart in Scotland: captive origin and the British List. *Brit. Birds* 86: 359-366.
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- Mudge, G.P. & Talbot, T.R. 1993. The breeding biology and causes of nest failure of Scottish Black-throated Divers *Gavia arctica*. *Ibis* 135: 113-120.
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- Ormerod, S.J., Rundle, S.D., Lloyd, E.C. & Douglas, A.A. 1993. The influence of riparian management on the habitat structure and macroinvertebrate communities of upland streams draining plantation forests. *J. Appl. Ecol.* 30: 13-24. A survey of 66 mainly upland streams in Scotland and Wales.
- Pennington, M.G. 1993. Apparent egg-dumping by Common Gulls. *Brit. Birds* 86: 182. An occurrence in Orkney.
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- Sim, I., Suddaby, D. & Avery, M. 1993. Body weights of incubating Arctic Terns in Orkney and Shetland in 1990 and 1991. *Seabird* 15: 24-29.
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- Tomlinson, D. 1993. Oystercatcher chick probably killed by rival adult. *Brit. Birds* 86: 223-224. An occurrence in Aberdeenshire.
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- Williams, J.M. & Slater, P.J.B. 1993. Does Chaffinch song vary with the habitat in which it is sung? *Ibis* 135: 202-208. A study in Scotland.
- Zonfrillo, B. 1993. Low-flying aircraft and seabirds on Ailsa Craig. *Seabird Group Newsl.* 64: 7-8.
- Ayrshire Bird Report for 1992.** Angus Hogg (ed) 1993. 56pp. *£2.75. Includes a 40-page systematic list and four short articles.
- Borders Bird Report No 13 for 1991.** R.D. Murray (ed) 1993. *£3.50.
- Canna Report No 15 for 1991 and 1992.** R.L. Swann (ed) 1993. 19pp. Another in the long series of long-term ornithological studies on Canna.
- Clyde Bird Report for 1990.** Iain P. Gibson (ed) 1992. 75pp. *£3.25.
- Fair Isle Bird Observatory Report for 1992.** Paul Harvey & David Parkin (eds) 1993. 84pp. Includes a 26 page systematic list and short articles on many aspects of life and natural history on the island.
- Fife Bird Report for 1992.** D.E. Dickson (ed) 1993. *£3.50. Includes a 46 page systematic list, reports on a Mute Swan census, and on work on the Fife Bird Atlas. Also three rarity reports.
- Isle of May Bird Observatory Report for 1992.** Ian Darling (ed) 1993 / 56pp. *£3.00. Includes "Memories of Isle of May characters" by J.H.B. Munro.
- Moray & Nairn Bird Report for 1992.** Martin Cook (ed) 1993. 64pp. *£2.75. Mainly a 47 page systematic list, but with short notes on Pomarine Skuas and Mute Swans.
- Orkney Bird Report for 1992.** C. Booth, M. Cuthbert & E. Meek (eds) 1993. 70pp. *£3.00. Includes a systematic list, and short reports on the Skua populations of Orkney, a rarity report, a North Ronaldsay Bird Observatory Report, and cetacean records.
- Perthshire (Central/Southwest) Peregrines and Ravens in 1992.** P. Stirling-Aird 1993. 3pp. An unpublished report in a long-running series.
- Scottish Bird Report for 1991.** R.D. Murray (ed) 1993. 76pp. *£5.00
- Shetland Bird Report for 1992.** K. Osborn (ed) 1993. 120pp. This is an exceptional bird report from this fascinating part of Scotland. It has 8 pages of colour plates of rarities, 38 pages of special reports, and a 65-page systematic list.
- St. Abbs Head NNR Seabird Report for 1992.** K.I. Rideout, R.R. Elliott & W. Hepburn 1993. 18pp. An unpublished report in a long-running series.

Bird Reports.

Arran Birds: Report for 1992. T. ap Rheinallt (ed) for Isle of Arran NHS, 1993. 28pp.

William G. Harper.

European Journals in the Waterston Library

The following selection of articles appeared in European journals received in the Waterston Library between April and August 1993, thus following on the list published in Vol. 17 No. 1. Articles are arranged in species order; square brackets indicate that the article is in the original language, other articles being in English. The reference, abbreviated for reasons of space, indicates merely the journal, its number and its year of publication. Journals quoted are as follows:

Netherlands: *Ardea*, *Limosa*, *Dutch Birding*.
 France: *L'Oiseau*
 Switzerland: *Der Ornithologische Beobachter*,
Nos Oiseaux, *Ornis*
 Belgium: *Aves*, *Mergus*, *Le Gerfaut*
 Germany: *Limicola*, *Vogelwelt*, *Vogelwarte*,
Ökologie der Vögel, *Seevögel*,
Corax, *Ornithologischer*
Anzeiger
 Italy: *Rivista Italiana di Ornithologia*
 Spain: *Butlletí del Grup Català*
d'Anellament (in Catalan)
 Iceland: *Bliki*
 Norway: *Cinclus*, *Vår Fuglefauna*
 Sweden: *Vår Fågelvärld*
 Finland: *Suomen Riista*, *Linnut*
 (formerly *Lintumies*), *Ornis*
Fennica

General

Väisänen, R.A. & Hildén, O. [Bird feeding stations have led to increase in seed-eating birds in Finland]. *Linnut* 3/93.
 Gaßmann, H. & Glück, E. [Nest-site selection and breeding success of hedgerow birds]. *Vogelwelt* 4/93.

Divers to Ducks

Anker-Nilssen, T. & Anker-Nilssen, P.G. Breeding of Leach's Petrel in the Røst archipelago, N Norway. *Cinclus* 2/93.

Schneider, U. [Second pair of Gannets attempt breeding on Heligoland]. *Seevögel* 2/93.
 Brugière, D. & Duval, J. [Wintering of Cormorant in the Allier and Central Loire valleys]. *Nos Oiseaux* 431/93.
 Jakobsen, J. [Premature autumn migration of wildfowl caused by shooting pressure?]. *Vår Fuglefauna* supplement 1/93.
 Mooij, J.H. Development and management of wintering geese in the Lower Rhine area of N Rhine-Westphalia. *Vogelwarte* 1/93.
 Vangeluwe, D. & Stassin, P. [Wintering of Red-breasted Goose in the Western Dobruja and a review of the status of the species in winter]. *Le Gerfaut* 1-2/91.

Birds of Prey

Helbig, J. *et al.* [High density of wintering Hen Harriers and Buzzards in area of Dummer Lake]. *Vogelwarte* 3/92.
 Seys, J. [Hen Harrier roost counts in winters of 1990-1 and 1991-2]. *Mergus* 4/92.
 Sachtelben, J. [Hunting strategy and use of habitat by Buzzard and Kestrel: the avoidance of competition]. *Orn. Anzeiger* 1/93.
 Sommani, E. [Variations in hunting technique by Peregrines]. *Riv. It. di Orn.* 1-2/92.

Grouse to Cranes

Milonoff, M. *et al.* [Large size a risk factor for Capercaillie chicks]. *Suomen Riista* 39/93.
 van den Berg, A.B. *et al.* [Sandhill Crane at Paesens-Moddergat Sep 91] (i.e. the Shetland bird). *Dutch Birding* 1/93.

Waders to Auks

Meltofte, H. [Wader migration through Denmark]. (special 180pp issue covering all migratory waders in Denmark). *Dansk Orn. For. Tidsskr.* 1-2/93.

- Klemp, S. [Population trends of Lapwing in Schleswig-Holstein]. *Corax* 2/93.
- Pulliaainen, E. & Saari, L. [Breeding biology of Golden Plover in E. Finnish Lapland]. *Orn. Fenn* 1/93.
- Jacob, J.-P. & Fouarge, J.-P. [Development of population and habitats of Little Ringed Plover in Wallonia and Brussels region]. *Aves* 3-4/92.
- Schmidt, C. & Barthel, P.H. [Plumages of Little Stint and their variations]. *Limicola* 3/93.
- Peterson, Æ. [Kittiwake colonies on Snæfellsnes peninsula]. *Bliki* 13/93.
- Mlody, B. & Becker, P.H. [The development of body mass and mortality in Common Tern chicks under unfavourable environmental conditions]. *Vogelwarte* 2/91.
- Noordhuis, R. *et al.* [Food shortage for Common Terns at Zeewolde in 1991?]. *Limosa* 2/93.
- Lyngs, P. Colony interchange in Baltic Guillemots. *Dansk Orn. For. Tidsskr.* 3-4/93.

Pigeons to Woodpeckers

- Schlapfer, A. [The immigrant from the East: the Collared Dove]. *Ornis* 4/93.
- Chantler, P. Identification of W Palearctic Swift. *Dutch Birding* 3/93*.
- Laine, T. [Hybridisation of Great Spotted and White-backed Woodpeckers]. *Linnut* 2/93.
- Nilsson, S.G. *et al.* [Lesser Spotted Woodpecker: why it is disappearing from Sweden?]. *Var Fagelvärld* 3/93.

Passerines

- Serra, L. Ageing criteria and moult conditions in Yellow Wagtail during spring migration. *Riv. It. di Orn.* 3-4/91.
- Weber, S & Hegelbach, J. [Differences in use of habitat by breeding Grey and White Wagtails]. *Orn. Beob.* 1/93.
- Dubois, P.J. & Yésou, P. [Review of the status of the British race of Pied Wagtail in Western France]. *L'Oiseau* 1/93.
- Paulsen, B.E. [Breeding distribution and biology of the British race of Yellow Wagtail in SW Norway]. *Cinclus* 2/93.
- Järvinen, A. Redstart and Pied Flycatcher nesting in same box. *Orn. Fenn.* 2/93.
- Busche, J. [Migration of Ring Ouzel in Schleswig-Holstein - a contribution to loop migration theory]. *Vogelwarte* 1/93.
- Bradshaw, C. & Dowdall, J. Identification of Catharus thrushes. *Dutch Birding* 2/93.
- Slagsvold, T. Sex recognition and breast-stripe size in Great Tits. *Ardea* 1/93.
- Kooiker, G. [Nest-sites of Magpies and Rooks on electricity pylons]. *Ök. der Vög.* 2/92.
- Motis, A. Mixed breeding pairs of European and Spotless Starling in NE Spain. *But. del Grup Català* 9/92.
- Gatter, W. [Exploratory behaviour, migration and the evolution of migratory habits in the Common Crossbill]. *Vogelwelt* 2/93.
- Biber, O. [Availability and use of hedges and shrubs as nest sites by Yellowhammers in an intensively farmed area of Switzerland]. *Orn. Beob.* 2/93.
- * copies of this special issue available for NLG 10 from Dutch Birding Association, Postbus 75611, 1070 AP Amsterdam.

Advice to Contributors

Authors should bear in mind that only a small proportion of the *Scottish Birds* readership is science-trained, and should aim to present their material concisely, interestingly and clearly. Unfamiliar technical terms and symbols should be avoided wherever possible and if deemed essential should be explained. Supporting statistics should be kept to a minimum. All papers and Short Notes are accepted on the understanding that they have not been offered for publication elsewhere and that they will be subject to editing. Papers will be acknowledged on receipt and will be reviewed by at least two members of the editorial panel and in some cases also by an independent referee before being accepted. They will normally be published in order of acceptance of fully revised manuscripts. The editors will be happy to advise authors on the preparation of papers.

Reference should be made to recent issues of *Scottish Birds* for guidance on style of presentation, use of capitals, form of references, etc. Papers should be typed on one side of the paper only, double-spaced and with wide margins; **two copies** are required and the author should also retain one. Headings should NOT be underlined,

nor typed entirely in capitals. Scientific names in italics should follow the first text reference to each species and should follow Voous' List of Recent Holarctic Bird Species' as given in the *The British Birds' List of Birds of the Western Palearctic* (1984). Only single quotation marks should be used throughout, and numbers one to ten should be written out whereas 11 and above should be written as numerals. Dates should be written:..... on 5 August 1991..... but on the 5th (if the name of the month does not follow). Please note that papers shorter than 700 words will be treated as Short Notes where all references should be incorporated into the text, and not listed at the end, as in full articles.

Tables, maps and diagrams should be designed to fit either a single column or the full page width. Tables should be self-explanatory and headings should be kept as simple as possible, with footnotes used to provide extra details where necessary. Each table should be on a separate sheet. Maps and diagrams should be in Indian ink and be camera ready, but drawn so as to permit reduction to half their original size.

For details of writing Research Progress Reports, please contact the editor in advance.



NEOTROPICAL BIRD CLUB

Neotropical bird club launched

A club has been launched to promote the study and conservation of the birds of the Neotropics (South America, Central America and the Caribbean). It is currently seeking founder members to help reach the launch budget of £2000, which is required to get the club running and to publish the two first issues of its intended journal 'Continga'. Founder members will be asked to pay a minimum of £25, and will be formally acknowledged in the first issue of 'Continga', planned for January 1994. 'Continga' will provide a colourful and much needed forum for exchange of information on the avifauna of this extremely rich and diverse area, and will contain papers and features on the birds and their conservation as well as news of recent observations and discoveries (at present, new species are still being discovered at the rate of more than two a year). It is hoped that in due course the club will be able to provide direct funding and support for practical conservation programmes.

*For further details and membership forms,
please contact:*

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