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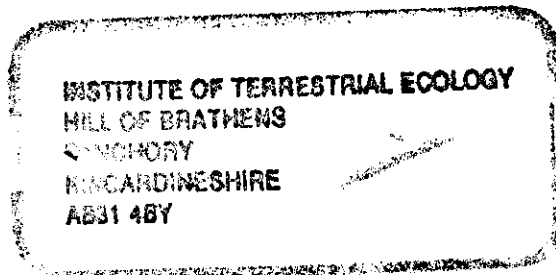
JNCC Report No. 251

**Isle of May
seabird studies in 1995**

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Annual Report to Joint Nature Conservation Committee

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Report title: Isle of May seabird studies in 1995

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Contractor: Institute of Terrestrial Ecology (NERC)

Restrictions: None, but those wishing to quote are advised to contact the contractor as some results will be updated in the light of future research.

Comments: The Isle of May is one of JNCC's Seabird Monitoring Programme key sites, and JNCC continued to fund aspects of ITE's work there in 1995 (in particular monitoring of breeding success, adult survival and food of a range of species). SNH carried out monitoring of the numbers of some species; these will be reported separately.

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Summary

1. Shag numbers increased by about 100 pairs after the dramatic decline in 1994. The first eggs were laid on 13 March (the earliest recorded in 35 years) and laying continued until late July. Some pairs relaid after fledging young. Nesting success (0.84 young per incubating pair) was higher than in 1993 (0.21) and 1994 (0.68).
2. Most pairs of kittiwakes which were present bred and the clutch-size was larger than in 1994. As in other recent years, many eggs did not hatch and numbers of small chicks died. Few chicks were neglected and there was no evidence of serious food shortage. Breeding success was poor (0.40 fledged per nest), but still an improvement over that of 1993 (0.07) and 1994 (0.16). Few pairs appeared to be prospecting.
3. Puffins and guillemots both had a good season with outputs of 0.84 and 0.81 young fledged per pair respectively. Razorbill success was lower, due to losses at the egg stage; the reason for this was obscure. Fulmar success (0.48) was normal.
4. Adult survival of most species remained high. The survival of adult puffins in both 1993-4 and 1994-5 was 93% which was higher than that in other recent years. It is unclear whether the rather low estimate for kittiwakes was real or due to birds moving. The monitoring of survival of adult shags was reinstated.
5. Sandeels predominated in the diet of young shag, kittiwake and puffin, although in biomass terms clupeids made up half the food of young puffins. Virtually all non-sandeels were sprats. There was no evidence that young of any species were short of food.

2. Background

The Joint Nature Conservation Committee (JNCC) has a responsibility to advise on certain aspects of the condition of the natural marine environment. Seabirds are one of the more important components of this environment, and Britain has internationally important populations of several species. JNCC has designed a programme that will allow the numbers of selected species of seabirds to be monitored at several colonies. In addition, selected colonies have been targeted for more detailed monitoring of reproductive performance and annual survival rates. These selected colonies are geographically spread in order to give as full a coverage as possible of British waters. The Isle of May NNR is a very suitable site in eastern Britain.

The Institute of Terrestrial Ecology (ITE) has had a long-term interest in seabirds on the Isle of May. Since 1986, ITE has received NCC/JNCC support for a more formalised seabird monitoring programme. Long-term studies on numbers, breeding success, adult survival, chick growth and chick food are underway on up to eight species. Due to the long period of immaturity and high annual survival rates of seabirds, it is essential that continuity of these long-term studies is maintained. As part of its Seabird Monitoring Programme, JNCC has a contract with ITE to:

- (a) ensure that the breeding success of fulmar *Fulmarus glacialis*, shag *Phalacrocorax aristotelis*, kittiwake *Rissa tridactyla*, common tern *Sterna hirundo*, arctic tern *S. paradisaea*, guillemot *Uria aalge*, razorbill *Alca torda* and puffin *Fratercula arctica* is monitored;
- (b) monitor adult survival of kittiwake, guillemot, razorbill and puffin. Shag was included up to March 1994, was excluded for the 1994 season but was reinstated in May 1995;
- (c) assess food of young shags, kittiwakes, guillemots, razorbills and puffins;
- (d) undertake special studies on species agreed between the nominated officer and the contractor.

An annual assessment of the feeding frequency of guillemot and puffin chicks was included up to and including 1994.

The Natural Environment Research Council (NERC) also supply funds for the seabird studies on the Isle of May.

3. Methods

3.1 Breeding success

The standardised methods used involved minimal disturbance of birds and are described in detail by Harris (1989) and in the newly published *Seabird monitoring handbook for Britain and Ireland* (Walsh *et al.* 1995).

Fulmar: The positions of apparently incubating birds were marked on photographs on 31 May, and 3 and 6 June. At sites where birds appeared to be incubating on all three visits, or where an egg was seen, breeding was assumed to have occurred. These sites were checked again on 10 July, and on 12 August (by N. Harding) when those with a large chick were assumed to indicate successful breeding.

Shag: The positions of nests in thirteen areas were marked on photographs and the state and contents of these nests were checked approximately weekly from early April until August. Large young present on 12-13 August were assumed to have survived to fledge and those nests with eggs to have failed.

Kittiwake: The position of nests in fifteen areas were marked on photographs and the presence or absence of an incubating bird, or the number of young present at each, were checked on 31 May, 10 June and on 17 July - three days after the first young on the island had fledged. Checks were repeated on 25 July by when very few small chicks were still alive. It was assumed that these late chicks did not fledge.

Guillemot, razorbill: Daily checks of the state of breeding of numbered nest-sites in five study plots were made from permanent hides.

Puffin: In each of four areas, samples of 50 burrows where an egg could be felt on 1 and 2 May (when earlier checks indicated that most pairs had laid) were staked and re-checked on 3-9 July (when chicks were near fledging). All large young were assumed to have fledged, as were young from empty burrows where there were many droppings, moulted down and feather sheaths.

Common and arctic terns: In 1995, Scottish Natural Heritage took over responsibility for monitoring tern numbers and productivity.

3.2 Adult survival rates

For all species, adult survival rates were based on sightings of individually colour-ringed birds. The areas in which birds were originally marked were checked regularly throughout the season and adjacent areas were also searched from time to time in an attempt to pick up birds which had moved. Searches were made for birds which had moved out of the study areas. These latter searches are extremely time consuming, and superficially unrewarding, but they are essential if accurate estimates of survival are to be obtained. Observations on the survival of adult puffins are now concentrated at Little Hole (where most burrows are individually numbered).

3.3 Food of chicks

Food regurgitated by adults feeding young and by young of kittiwake and shag, and loads of fish dropped by adult puffins caught in mist-nets, were collected, weighed and the fish identified and, where possible, measured (total length to tip of tail). Where necessary, fish otoliths were extracted and examined. Records were kept of fish brought to young guillemots and razorbills and uneaten fish were collected from breeding ledges.

4 Results

4.1 Breeding success

Species accounts are given in Tables 1-4 and a comparison with recent years' results is shown in Table 5.

Fulmar: Breeding success was 0.48 young per incubating pair. On 12 August dead large chicks were seen at the Cleaver (2), Cornerstone (1) and Greengates (3). These were all areas open to the sun and, given the unprecedented high temperatures in July and August, the chicks may have died of heat stress or dehydration.

Shag: A brood of young 4-5 days old was found in the Island Wreck on 23 April which indicated the first egg would have been laid on 13 March. This is the earliest date recorded since records began in the early 1960s. Some pairs laid again after the first brood had fledged and eggs continued to be laid until late July.

A total of 131 pairs laid (or were apparently incubating) in the study plots. These fledged a total of 110 young - or 0.84 per nest. Breeding success was particularly high at Pilgrim's Haven (S) where 12 pairs reared 19 young (1.58 per nest) and low at the colony at the North Horn Viewpoint (31 nests, 5 young, 0.16 young per nest). Very few trace nests were built.

Kittiwake: This was a much better breeding season than those of 1993 or 1994 (Tables 3 and 5) with an overall breeding success of 0.40 chicks fledged per completed nest. However, output was still much lower than at the start of the study in 1986 (Figure 1).

Breeding was rather late - the first egg was not seen until 16 May - and many pairs failed at the hatching period when (a) many eggs failed to hatch, and (b) dead young were seen in many nests. Chicks were only infrequently neglected (3% of broods of one and 14% of broods of two - Table 11) and there was no evidence that adults were having difficulty in feeding large chicks. A total of 101 completed nests were checked on 8 June; 12 were empty, 18 had one egg, 62 had two eggs and nine had three eggs. No broods of three large chicks were seen anywhere on the island. It is now obvious that brood neglect is not a good indicator of breeding success (Figures 2 and 3).

Despite the slightly improved breeding output, Isle of May kittiwakes are still producing far fewer young than those at most other British North Sea colonies. Very few prospecting pairs (as judged by the low incidence of birds building 'trace' nests late in the season) were seen.

Guillemot: Laying commenced very early, a chick hatched by 23 May indicated the first egg had been laid about 19 April. Far more pairs than usual laid in April but then laying slowed down so that overall the period over which first eggs were laid (19 April-29 June) was very extended. The first young left on the night 13/14 June. Breeding success (0.81 young leaving per pair laying) was normal (Tables 4 and 5).

Razorbill: Breeding success (0.62 young leaving per pair laying) was the lowest since 1982. Most (77%) losses occurred at the egg-stage and survival to fledging of chicks which hatched remained high (90%).

Puffin: The timing of breeding was normal with the first chick fledging on the night 4/5 July. The overall success rate (0.84 chicks fledged per egg laid) was also normal (Tables 4 and 5) but there was considerable variation between areas. Success was highest at Lady's Bed (where all 43 burrows

followed fledged a chick) and lowest on Rona (33/47). The very dry spring and summer resulted in extremely poor vegetation growth in many colonies and severe soil erosion is starting to occur.

4.2 Adult survival

Not every adult alive is seen each year and thus the survival rates between 1994 and 1995 of 72.7% for kittiwake, 95.6% for guillemot, 92.6% for razorbill and 93.0% for puffin must be minimum estimates. Sample sizes are given in Table 6.

Guillemot survival on the Isle of May in recent years has been as high as ever recorded (Harris & Wanless 1995). The wreck of seabirds in February 1994 wreck had no obvious effect on guillemot survival (Harris & Wanless, in press a).

Many adult puffins have been ringed at marked burrows at Little Hole since 1994. An analysis of past data showed no significant difference between the survival of these and those resident elsewhere. Therefore observations have been concentrated on birds breeding in this area. A detailed analysis of the survival of Isle of May puffins using state-of-the-art modelling by Dr. S. Freeman and Prof. B. Morgan of the University of Kent should be completed in 1996.

Coincidental with the recent poor breeding seasons, there has been a marked increase in mobility of adult kittiwakes with breeding adults moving to breed outside the study areas. Now 10% of the colour-ringed adults breed outwith these areas. This has necessitated a large increase in effort to obtain an accurate estimate of survival. Excluding records of birds which now breed outwith the study areas increased the survival estimate to 77.3% (102/132). It is not yet clear whether the rather lower resighting rate of kittiwake in 1995 was real or due to more birds having moved.

During 1995, 16 kittiwakes, 6 puffins and 13 guillemots (including 5 breeders) were colour-ringed.

4.3 Food of young

The 16 samples from shags were composed mainly of sandeels 10-13 cm long (Table 7). Other items recorded were sprat, herring, a large cod (20 cm, calculated weight 180-200 g), a red gurnard and a crab claw.

Sandeels were the commonest food (97% by number) of young kittiwakes (Table 7). Most sandeels in kittiwake regurgitates were 0-group fish 6-10 cm long. Sandeels contributed 86% by weight of the kittiwake regurgitations. Other food included whiting (4 - which might have come from fishing boats), sprat, herring, eel-pout (1 otolith), goby (1 otolith), 7 cm long green polychaete, planktonic crustacea (1 load) and larger crustacea (1 shrimp, 1 crab-claw).

Of 478 fish delivered to young guillemots, 322 (67%) were sandeels - mostly 12-14 cm long (Table 8). Clupeidae made up 20% of the diet by weight. The bulk of the clupeids were sprats 7-9 cm long. The average weight of a fish (calculated from lengths) was 6.8 g. The apparent reliance on sandeels is a reversal of the long-term trend of clupeids making up an increasing proportion of the diet.

Most razorbill loads were made up of either several small or a single large (? 10 cm) sandeel.

By number, sandeels made up 72% of the diet of young puffins (Table 10) but the proportion in biomass terms was reduced to 50% as the other main food fish - sprat - was much heavier. Many of the small clupeidae were small and difficult to identify but extraction of otoliths indicated that the bulk were sprat. Only a single herring otolith was identified among 100 examined. All the rockling came from loads collected at the very end of the season.

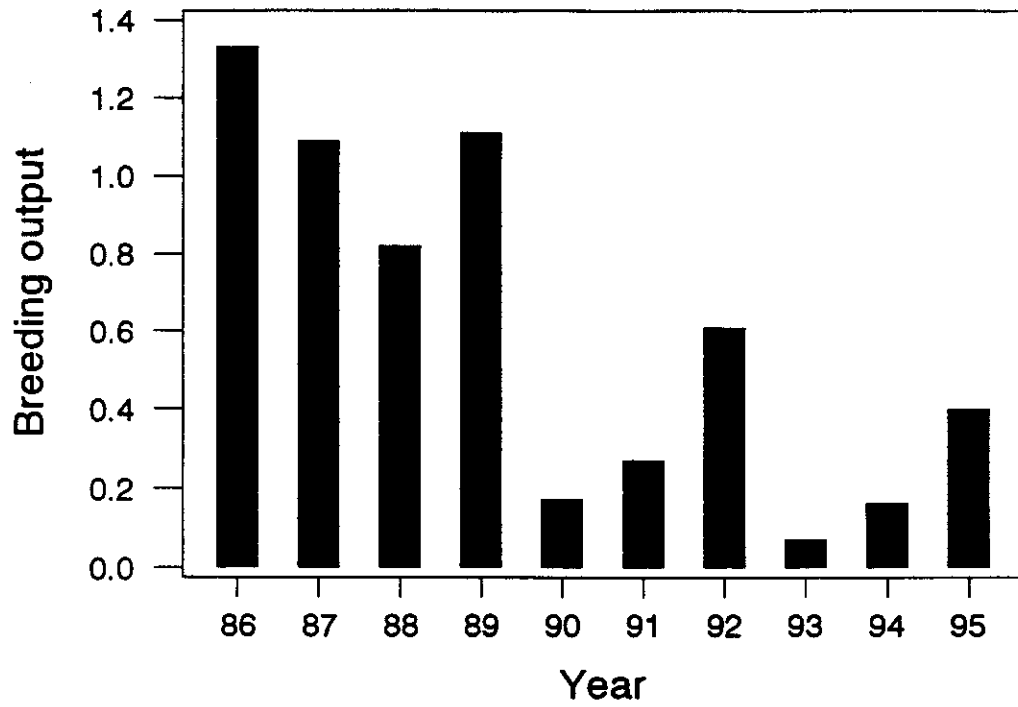


Figure 1. Breeding output of kittiwakes on the Isle of May in 1986-95

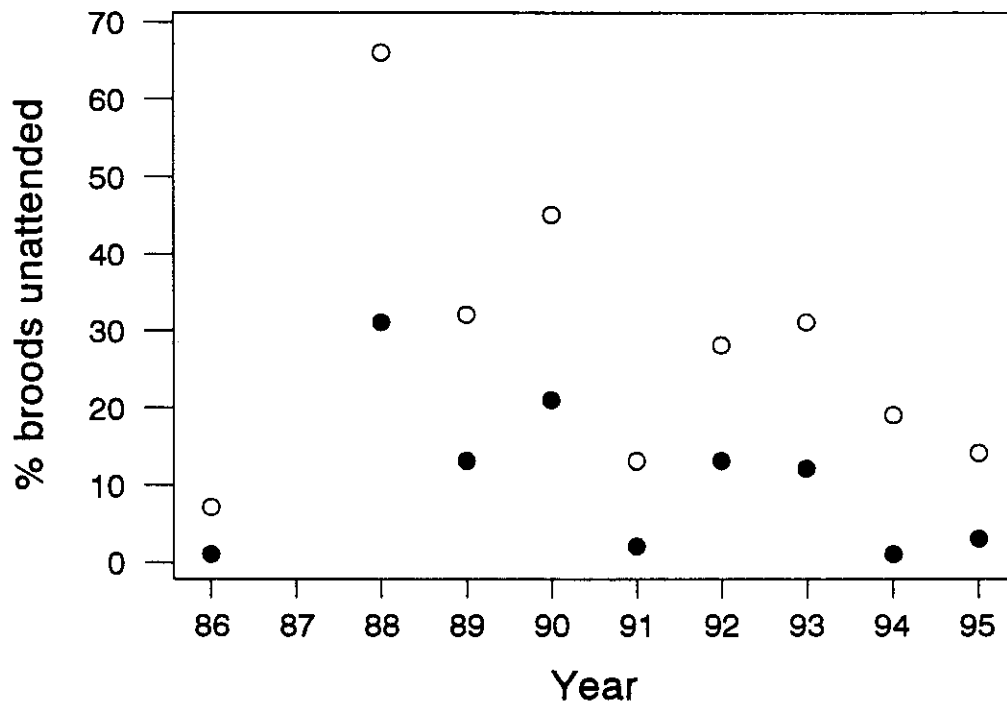


Figure 2. The percentage of kittiwake broods left unattended at the Isle of May in 1986-95. Solid circles are broods of one chick, open circles are broods of two chicks.

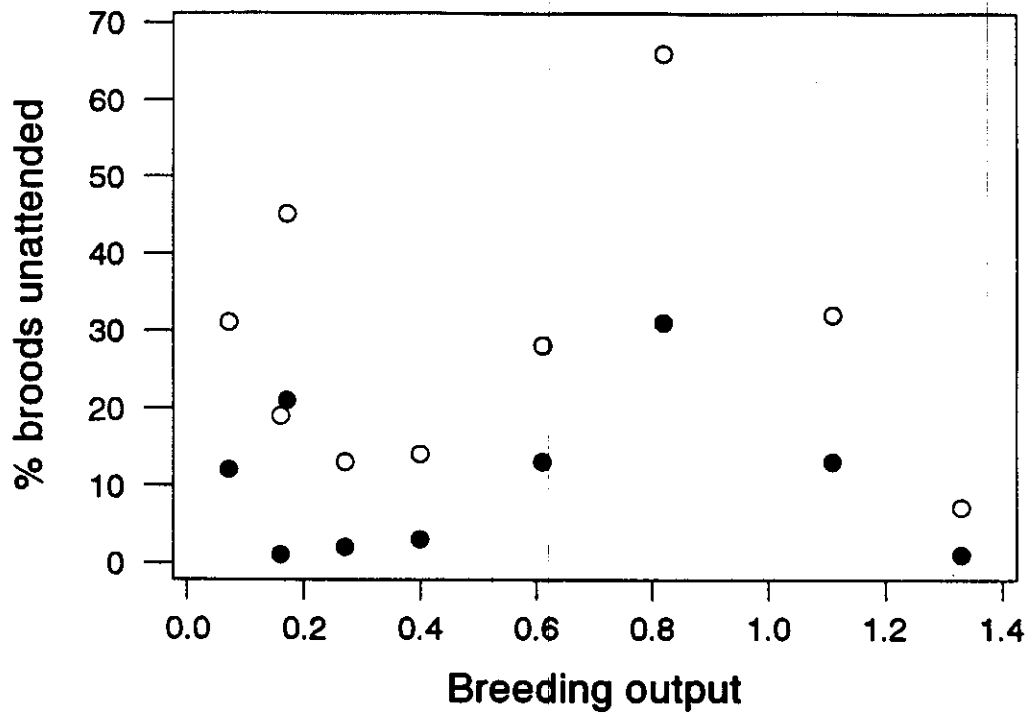


Figure 3. The percentage of kittiwake broods left unattended at the Isle of May in 1986-95, in relation to breeding output.

5. The future

5.1 During the 1970s and for most of the 1980s, conditions must have been very favourable for seabirds in the North Sea since populations of most species, excluding terns, increased greatly. Since the late 1980s, monitoring has shown drops in numbers, and to a lesser extent, breeding success, of several species. The reasons for these changes are not clear but, at least for guillemots, change started in the north and gradually moved south. Population declines started significantly earlier and were fastest in northern colonies.

5.2 Long-term studies, partly funded under JNCC's Integrated Seabird Monitoring Programme, in the Firth of Forth have shown a much lower survival of adult puffins in the 1980s and early 1990s and adult shags in 1994, low recruitment of some cohorts of young guillemots, poor breeding and non breeding of kittiwakes, delayed (and irregular) breeding of shags, reduction in the intake of young guillemots and sporadic food shortage in several species. Again, neither the ultimate or the proximate factor causing these changes have been determined.

5.3 In 1991, several Danish fishing vessels were trawling for sandeels at the Marr and Cockenzie Banks to the northeast of the Isle of May. Many more were reported to be fishing there in 1992, and in 1993 the reported catch was 90,000 tonnes. Fewer boats fished the area in 1994, apparently because sandeels were available closer to Denmark. A fish-processing factory using "industrial species" (i.e. sandeels) is due to start operation at Grangemouth in 1995. In 1995, Danish vessels were fishing in the entrance to the Firth of Forth early in the season but then moved elsewhere. Some Scottish vessels have been reported fishing for sandeels off eastern Scotland in 1995 and landing their catches in Denmark. There is, as yet, no direct evidence that such fishing has an adverse effect on the availability of food for seabirds. Whether or not such a fishery continues to develop it is imperative that the monitoring of seabird breeding, numbers and recruitment as well as the food of seabirds on the Isle of May continues so that we can determine the factors controlling the numbers of seabirds in the North Sea.

6. Acknowledgements

Kate Thompson and Nigel Harding, Scottish Natural Heritage summer wardens, assisted with the work when I was absent from the island. A. Russell, S. Russell, K. Ferry, S. Wanless and T. Barton and others helped collect fish and regurgitates and with the feeding watches. S. Wanless and M.L. Tasker improved this report with their criticisms.

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Table 1. Fledging success of fulmars on the Isle of May in 1995.

Area	Incubating birds	No. probably hatched	Young fledged
1. Cleaver	12	10	5
2. Pilgrim's Haven	2	1	1
3. Cornerstone	8	6	2
4. Loch (S)	43	39	26
5. Greengates	26	21	6
6. Horse Hole	11	9	6
7. Rona	0	0	0
8. Tarbet	16	14	12
9. Low Light	5	5	2
10. Colm's Hole	3	3	0
Total	126	108	60

Mean 0.48 fledged/pair

Notes: Incubating birds were those sitting tight on three checks or where an egg was seen. Chicks present on 12 August were assumed to have fledged. The final check was made by N. Harding.

Table 2. Fledging success of shags on the Isle of May in 1995.

Area	Total incubated	Young fledged			Other nests	Total young fledged	Mean young fledged per incubated nest
		1	2	3			
1. Maidens	9	1	2	0	0	3	0.33
2. Chatterstones	4	0	1	1	0	5	1.25
3. Pilgrim's Haven (S)	12	2	1	5	0	19	1.58
4. Colony A	2	0	1	0	0	2	1.00
5. Mill Door (N)	11	3	4	1	1	14	1.27
6. Mill Door (S)	10	2	2	1	0	9	0.90
7. Bishop Cove	2	0	0	0	1	0	0
8. Horse Hole	20	6	5	3	1	25	1.25
9. North Horn	31	1	2	0	1	5	0.16
10. Tarbet	9	2	2	2	0	12	1.33
11. Low Light	15	1	2	2	0	11	0.73
12. Colm's Hole (N)	5	0	1	1	0	5	1.00
13. Colm's Hole (S)	1	0	0	0	0	0	0.84
Total	131					110	

Notes: Plot 7 had no nests in 1995.

On the last check on 13 August there were still 4 incubating pairs which are assumed to have failed.

Table 3. Fledging success of kittiwakes on the Isle of May in 1995.

Area	Completed nests	Trace nests	Fledged young/ completed nest			Total young produced	Fledging success	
			0	1	2		per completed nest	all pairs (incl. trace)
1. Cleaver	42	1	22	16	4	24	0.57	0.56
2. Pilgrim's Haven	33	2	20	12	1	14	0.42	0.40
3. South Face	32	0	26	5	1	7	0.22	0.22
4. Colony 4	121	4	80	40	1	42	0.35	0.34
5. Cornerstone	76	3	37	34	5	44	0.58	0.56
6. Loch (S)	65	6	39	26	0	26	0.40	0.37
7. Loch (N)	103	0	57	37	9	55	0.53	0.53
8. Greengates	83	1	67	14	2	18	0.22	0.21
9. Bishop's Cove	57	0	31	22	4	30	0.53	0.53
10. Horse Hole	6	0	3	3	0	3	0.50	0.50
11. Iron Bridge	47	0	24	20	3	26	0.55	0.55
12. Rona	32	4	20	11	1	13	0.41	0.36
13. Tarbet	118	2	91	26	1	28	0.24	0.23
14. Low Light	34	2	32	2	0	2	0.06	0.06
15. Colm's Hole	25	0	17	7	1	9	0.36	0.36
						Mean	0.40	0.39
						SE	0.04	0.04

Note: No broods of three were fledged anywhere on the island.

Table 4. Breeding success of auks on the Isle of May in 1995.

Species	Area	Pairs laying	Young hatched	Young 'fledged'	Young leaving/pair
Guillemot	Dense	275	237	220	0.80
	Hide/White	91	69	69	0.76
	Colony 4	224	1931	182	0.80
	South	45	40	40	0.89
	Cornerstone	170	142	135	0.79
	Mean ± S.E.				0.81±0.02
Razorbill	Hide/White	21	17	16	0.76
	Colony 4	40	32	29	0.72
	South	17	9	6	0.35
	Cornerstone	65	47	43	0.66
	Mean ± S.E.				0.62±0.09
Puffin	Lady's Bed	43	?	43	1.00
	Kirkhaven	45	?	38	0.84
	Burrian	45	?	36	0.80
	Rona	47	?	33	0.70
	Mean ± S.E.				0.84±0.06

Table 5. Breeding success (young reared per pair breeding) of some seabirds on the Isle of May 1989-95.

Species	1988	1989	1990	1991
Fulmar	0.31 (64)	0.54 (93)	0.24 (66)	0.42 (100)
Shag	0.61 (221)	1.09 (234)	0.30 (154)	1.06 (187)
Kittiwake	0.82 (1278)	1.11 (1327)	0.17 (1095)	0.27 (1172)
Guillemot	0.85 (732)	0.85 (757)	0.78 (748)	0.81 (754)
Razorbill	0.70 (98)	0.74 (97)	0.76 (100)	0.72 (104)
Puffin	0.89 (157)	0.88 (164)	0.66 (176)	0.78 (153)
	1992	1993	1994	1995
Fulmar	0.47 (129)	0.44 (121)	0.47 (122)	0.48 (126)
Shag	0.87 (181)	0.21 (80)	0.68 (74)	0.84 (131)
Kittiwake	0.61 (1062)	0.07 (1034)	0.16 (861)	0.40 (874)
Guillemot	0.85 (745)	0.76 (797)	0.79 (775)	0.81 (805)
Razorbill	0.86 (105)	0.72 (119)	0.69 (134)	0.62 (143)
Puffin	0.87 (184)	0.69 (182)	0.85 (189)	0.84 (180)

Notes: The number of pairs followed is given in brackets. Details of methods, etc. can be found in this and previous reports to JNCC.

Table 6. Annual survival of adult seabirds on the Isle of May 1987-95.

Species	No. seen in 1994	No. alive in 1995	% Survival			
			1994-95	1993-94	1992-93	1991-92
Kittiwake	143	104	72.7	79.5	80.8	80.7
Guillemot	407	389	95.6	95.0	95.0	93.3
Razorbill	54	50	92.6	84.5	91.5	89.8
Puffin	199	185	93.0	93.1	84.0	86.8

Species	% Survival			
	1990-91	1989-90	1988-89	1987-88
Kittiwake	84.2	78.7	90.9	86.0
Guillemot	91.0	94.9	92.4	91.5
Razorbill	79.6	75.0	90.5	88.1
Puffin	71.4	63.3	85.2	76.1

Notes: (1) Only birds which had definitely bred in 1994 or earlier are included.

(2) Directly comparable figures for adult survival in earlier seasons are given. These have not been corrected for missing birds seen in later years, and so are serious under-estimates of survival.

These figures should not be used for population dynamics calculations without consultation with M.P. Harris.

(3) Details of earlier estimates are given in previous reports to NCC/JNCC.

Table 7. Food fed to young kittiwakes and shags on the Isle of May in 1995.

	Kittiwake	Shag
No. of regurgitations	47	16
Range of dates	12 June - 12 July	31 May - 10 July
Total weight (g)	741	537
% regurgitations with sandeels	91	88
with Gadidae	6	6
with Clupeidae	13	6
% (by weight) of sandeels in sample	86	85
% (by numbers) of sandeels in sample	97	89
Lengths (cm) of majority of sandeels	6-10 (0-group)	10-13
Non-sandeel remains identified	Sprat (6-8 cm; 9 otoliths) Herring (10 cm, 1) Whiting (4 fish, 15 cm) Gobiidae (1) Eel-pout (? , 1), Planktonic crustacea (1 load) 'Shrimp' (1), crab (1) Polychaete (1)	Sprat (10 otoliths - 10 cm) Herring (1 otolith - 10 cm) Cod (20 cm) Red gurnard (1) Crab claw

Notes: (1) Samples collected from chicks and adults with chicks.

(2) Counts and lengths of fish in kittiwake samples were based on otoliths in the regurgitations.

Table 8. Food of young guillemots on the Isle of May in 1995.

	minute/ larval	Number of sandeels			Number of Clupeidae			Number of Gadidae
		small	medium	large	small	medium	large	
Length (cm)	?	12	14	16	7	9	11.5	15
All-day watches								
11 June	1	46	120	28	10	17	0	0
28 June	0	7	18	2	13	33	3	0
Other days								
1 June - 7 July	4	52	44	5	28	40	5	2
Total	5	105	182	35	51	90	8	2

Note: Lengths were based on visual estimates against the bird's bill checked by samples of dropped fish collected from the breeding ledges.

Table 9. Food of young razorbills on the Isle of May in 1995. Number of loads of various types of food.

	Single sandeel			Several sandeels			Clupeidae	Small fish
	large	medium	small	large	medium	small		
All-day watches								
11 June	8	0	0	0	0	2	0	1
28 June	3	2	0	0	1	4	1	1
Others								
5 June - 16 July	1	1	0	0	1	2	4	1
Total	12	3	0	0	2	8	5*	3

Note: * Includes 3 single large sprats.

Table 10. Food of young puffins on the Isle of May 18 June to 13 July 1995.

	Sample size	Mean	S.E.
a) Load weight (g)	95	9.7	0.4
b) Fish/load	95	6.4	0.5
c) Numbers and lengths of fish (mm)			
Sandeels <i>Ammodytes</i> sp.	423	69.8	1.1
Sprat* <i>Sprattus sprattus</i>	44	84.2	1.7
Clupeidae*	94	68.8	0.5
Rockling sp.	23	31.0	0.9

Note: * All but one of 100 otoliths extracted came from sprat.

Table 11. Proportions of kittiwake broods of one and two chicks which had no adults present during daily checks in the middle of the day.

Year	% Unattended broods of	
	One young	Two young
1986	1	7
1988	31	66
1989	13	32
1990	21	45
1991	2	13
1992	13	28
1993	12	31
1994	1	19
1995	3	14

Note: Figures are based on 50-100 broods in the same areas each year. These are means of daily checks made between the dates the first neglected chick was noted and the start of fledging in the areas. In 1994, the counts were made 27 June - 17 July. (Details of methods are given in Wanless & Harris 1989).

Table 12. Percentage of sandeels (by weight) in the diet of young seabirds on the Isle of May, 1986 - 95.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Shag	97	100	98	100	95	100	97	99	86	85
Kittiwake	98	95	94	95	86	50	61	63	81	86
Guillemot	90	81	41	74	24	74	53	17	19	78
Puffin	83	77	85	89	96	87	86	46	57	50

- Notes: (1) Dates and sample sizes can be found in the contract report for respective years.
 (2) Sandeels also made up the bulk of the food of young razorbills in most years but it is extremely difficult to assess the proportions in terms of biomass.