

INSTITUTE OF TERRESTRIAL ECOLOGY
HILL OF BRATHENS
BANCHORY
KINCARDINESHIRE
AB31 4BY

INSTITUTE OF TERRESTRIAL ECOLOGY
(NATURAL ENVIRONMENT RESEARCH COUNCIL)
BP EXPLORATION/NERC CONTRACT 22262
ITE PROJECT T08051h5

RESEARCH ON PUFFINS ON THE ISLE OF MAY
IN 1991 AND 1992
M P HARRIS

Progress Report

Hill of Brathens
Banchory Research Station
Banchory
Kincardineshire
AB31 4BY

January 1993

This Report is an official document prepared under contract between BP Exploration and the Natural Environment Research Council. It should not be quoted without the permission of both the Institute of Terrestrial Ecology and BP Exploration.



CONTENTS

	Page	
1	SUMMARY	
2	INTRODUCTION	1
3	METHODS	
	3.1 Population counts	2
	3.2 Breeding success	2
	3.3 Weights of chicks	3
	3.4 Food and feeding of chicks	3
	3.5 Proportion of immatures in the population	3
	3.6 Moulting of adults	4
	3.7 Adult survival	4
	3.8 Mate and site fidelity	
4	RESULTS AND COMPARISON WITH PAST DATA	
	4.1 Population	5
	4.2 Breeding	6
	4.3 Weights of chicks	6
	4.4 Food and feeding of chicks	6
	4.5 Proportion of immatures in the population	7
	4.6 Moulting of adults	7
	4.7 Adult survival	7
	4.8 Mate and site fidelity	8
	4.9 Immature survival	9
5	ACKNOWLEDGEMENTS	11
6	PUBLICATIONS	12

TABLES

1. Count of occupied burrows in April 1992
2. Counts of occupied burrows in monitoring plots in 1973-92
3. Breeding success of puffins in 1991 and 1992
4. Food and feeding of young puffins in 1991
5. Food and feeding of young puffins in 1992
6. Proportion of immature puffins in 1991 and 1992
7. Annual proportions of immature puffins each July 1976-92
8. Proportions of puffins with traces of winter plumage, 1973-92
9. Details of colour-ringed puffins on the Isle of May
10. Pairings in marked burrows at Little Hide, 1990-92

APPENDIX 1: North Sea Puffins (NERC News)
APPENDIX 2: Auks on the Move (BTO News)

1 SUMMARY

1. Fieldwork was carried out on the Isle of May in March-July 1991 and 1992.
2. A complete count of occupied burrows gave a total population of about 20 000 pairs. This, and annual monitoring counts, indicate that the Isle of May population is stable.
3. Breeding in both years was normal and nesting success was very high.
4. There has been a significant decline in the weights of chicks over the last 20 years. This continues.
5. Chicks were fed mainly on small sandeels, augmented in 1992 with small saithe. The long-term trend of reduced energy intake by chicks continued.
6. About 10% of the birds present in July were immature. This compared with up to 37% when the population was increasing.
7. Adult survival over the 1990-91 winter was only 75%, and although that over 1991-92 was higher (87%). This gives cause for concern.
8. Initial results from a new study involving individually marked birds and permanently numbered burrows suggested that the divorce rate (at 10%) was higher than expected. The chances of a pair divorcing did not depend on whether or not they raised a chick the year before.
9. Pairs usually retained the same burrow from one year to the next.
10. Birds individually colour-ringed as chicks are starting to return to the colony.



Adult puffin with a single large sandeel.

2 INTRODUCTION

In the late 1960s it was noted that the numbers of puffins *Fratercula arctica* in Britain had declined and in 1973 the Natural Environment Research Council instigated a nationwide study into the status of the puffin and the reasons for its decline. The Isle of May, Firth of Forth was chosen as a study site as the puffin population there was one of the few that was expanding rapidly. At the end of that project, it was concluded that the decline in numbers, in western Britain has been due to natural, probably oceanographic, causes and that numbers had stabilised by the mid-1970s. In the early 1980s work on the Isle of May seabirds broadened as the Institute of Terrestrial Ecology initiated a multi-species study of this seabird community. Work on puffins continued but at a much lower intensity than previously.

In 1987 it was realized that puffin numbers on the Isle of May had stopped increasing, the adult survival rate appeared to have declined and there were fewer immature present than there once had been. This coincided with the finding that very few immature guillemots *Uria aalge* were recruiting into the Isle of May population and reports that seabirds slightly further north, e.g. Shetland, were experiencing breeding failures.

In early 1989, the World Wide Fund for Nature commissioned ITE to reassess the status and fortunes of puffins on the Isle of May. This review confirmed that the rapid increase of puffin numbers on the Isle of May had stopped and showed an urgent need for up-to-date information on Isle of May puffins.

The summer of 1991 saw the start of a new research initiative into the biology of the puffins in the Firth of Forth funded by BP Exploration and NERC/ITE. The aims were to:-

1. Continue the long-term study of the puffin as only such studies can produce the information essential to understanding the population dynamics, and hence implement effective conservation, of long-lived seabirds
2. Survey the puffin population on the Isle of May and monitor changes in numbers
3. If numbers were declining, determine whether this was due to decreased adult survival, and/or to insufficient recruitment of young birds
4. Monitor the breeding output, and food and feeding of chicks
5. Determine the proportion of immatures in the population
6. Initiate a new study on the behaviour and breeding of individually marked immature and adult puffins

3 METHODS

Fieldwork was carried out from late March until July in 1991 and 1992. The methods used were developed in the 1970s and are well documented in my published papers. Only the bare outlines are given here. All results are directly comparable between years.

3.1 Population counts

The Isle of May is a relatively flat island and puffins breed in burrows dug wherever there is soil. The population unit is the "occupied" burrow - that is one showing signs of occupation such as fresh digging or droppings in or in front of the entrance. Burrows are easily counted in the early spring when the birds are cleaning out the nest chambers, before young rabbits are born (as the activities of these can cause problems), and the vegetation has not started to grow.

3.1.1 Whole population counts

These are extremely time consuming to make as all areas must be carefully searched by lines of people walking in line-abreast delimiting areas counted with bamboo canes. A total count is made every 3-5 years. The most recent was 25-29 April 1992.

A check of the efficiency of counting was made by marking all burrows counted in each of four delimited areas. The next day a minute (hands-and-knees) search was made of each area to check the numbers of burrows which had been classified as occupied which were (a) occupied or (b) unoccupied, and also occupied burrows which had been overlooked.

3.1.2 Monitoring counts

The numbers of burrows in 13 large permanently staked plots or quadrats were counted during the last few days of April in 1991 and 1992. Burrows in seven of these plots (Figure 1) have been counted annually each late April since 1973 and the total of burrows in these plots is used as an annual index of the size of the population. The other plots were positioned in later years to document future changes in low-density and recently colonized areas.

3.2 Breeding success

Breeding success was monitored in four separate parts of the island without removing

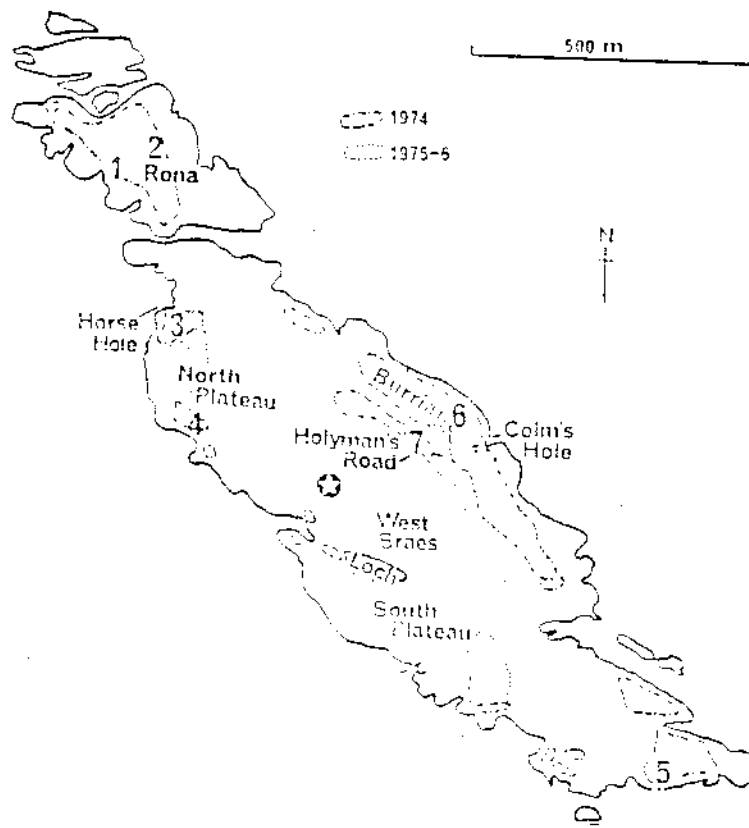


Figure 1. The Isle of May puffin colony. In 1992, puffins nested throughout the island. Numbers indicate the monitoring plots.

adults or handling eggs by (a) feeling down marked burrows with a short stick to determine the presence or absence of an egg on 1-3 May in both 1991 and 1991 when most birds had laid and, (b) rechecking those burrows where there had been an egg on 29-30 June 1991 and 3-5 July 1992 just prior to the main fledging time for the presence or absence of a large chick. The clutch size is always one egg, hence breeding success is easily determined.

3.3 Weights of chicks

Chicks in a series of about 30 burrows dispersed across the main colony were weighed every 4 days until near fledging when weighings were made daily. Peak weight attained (usually 7-10 days prior to fledging) and fledging weight were taken as indices of growth.

3.4 Food and feeding of chicks

Adult puffins carry loads of fish held in the bill back to their chicks. Food samples were obtained by mist-netting adults during June and July and collecting, counting, weighing, identifying and measuring (total length) the fish in loads dropped by these birds. Nets were moved frequently so as to minimize disturbance. Annual mean values of the energy values of fish loads were calculated using length-weight and length-energy values relevant to the fish species in the area.

On several days each summer, the numbers of loads of fish taken to numbered burrows in front of a permanent hide were recorded by C. Wernham and a team of helpers taking 2 hr watches to cover all the hours of daylight.

3.5 Proportion of immatures

Puffins can confidently be assigned to one of three age groups based on the development of the beak; (a) adults which have probably bred (more than 2 bill grooves), (b) immatures (less than 2 grooves) and (c) intermediates (2 grooves which are probably sexually mature but may not have bred).

Tests in previous years showed that such categorisation can be made safely using a high-powered telescope mounted on a stout tripod. Large samples of birds were so aged on days when large numbers of puffins were ashore during the first half of July.

3.6 Moulting of adults

The states of plumage (to record the presence of unmoulted dark winter face feathers) of samples of adults were recorded in early April 1991 and 1992.

3.7 Adult survival

Estimates of the annual over-winter survival came from resightings of breeding puffins colour-ringed in previous years. Such estimates are minimal (as some surviving adults will have been overlooked). The figure for 1991-92 must, therefore, be treated with caution.

3.8 Mate and nest-site fidelity

A series of burrows in front of one of the main study hides was permanently staked in 1990 and as many as possible of the adults were colour-ringed by C. Wernham as part of her Ph.D. work. The subsequent occupants of these burrows and the pairings of these birds, and their breeding success are now followed annually.

For convenience Tables are grouped together at the end of the text, although data are compared with these from past years in the Results section. Synthesis of the results is delayed until the contract's final report.

4 RESULTS AND COMPARISONS WITH PAST DATA

4.1 Population

4.1.1 Counts of Isle of May population

The 1992 burrow count was 20,106. This compared with 18,628 in 1989 and 3064 in 1975 (Table 1). Although there had been an apparent increase since 1989 the mean rate of 2.5% p.a. was low compared to 8% p.a. 1984-89 and 17% p.a. 1975-84.

The checks of assessment of our estimates of which burrows were occupied were:

Area	Classified as occupied		Classified as unoccupied	
	Correct	Wrong	Correct	Wrong
Rona	42	5	11	2
Burrian	33	6	10	2
Lady's Bed	34	5	10	1
Horse Hole	33	4	9	4
Total	142	20	40	9

Thus, the total count of 20,100 could be interpreted as 18700 burrow-owning pairs. Probably there has been little change in numbers since 1989.

4.1.2 Monitoring counts

The 1991 monitoring count was very slightly (1.4%) down on the 1990 count and the 1992 count was again lower (by 4% of the 1991 count) (Table 2). The population is now stable which contrasts vividly with the 19% p.a. increase during the 1970s and 1980s (Figure 2).

The monitoring plots were delimited in 1972 and, given the seven-fold increase in the numbers of burrows counted in them between 1973 and 1989, it is possible that there is now no room for more burrows. It is difficult to be objective about whether an area can or cannot hold any more puffin burrows, but superficially there appears to be room for more burrows in all plots.

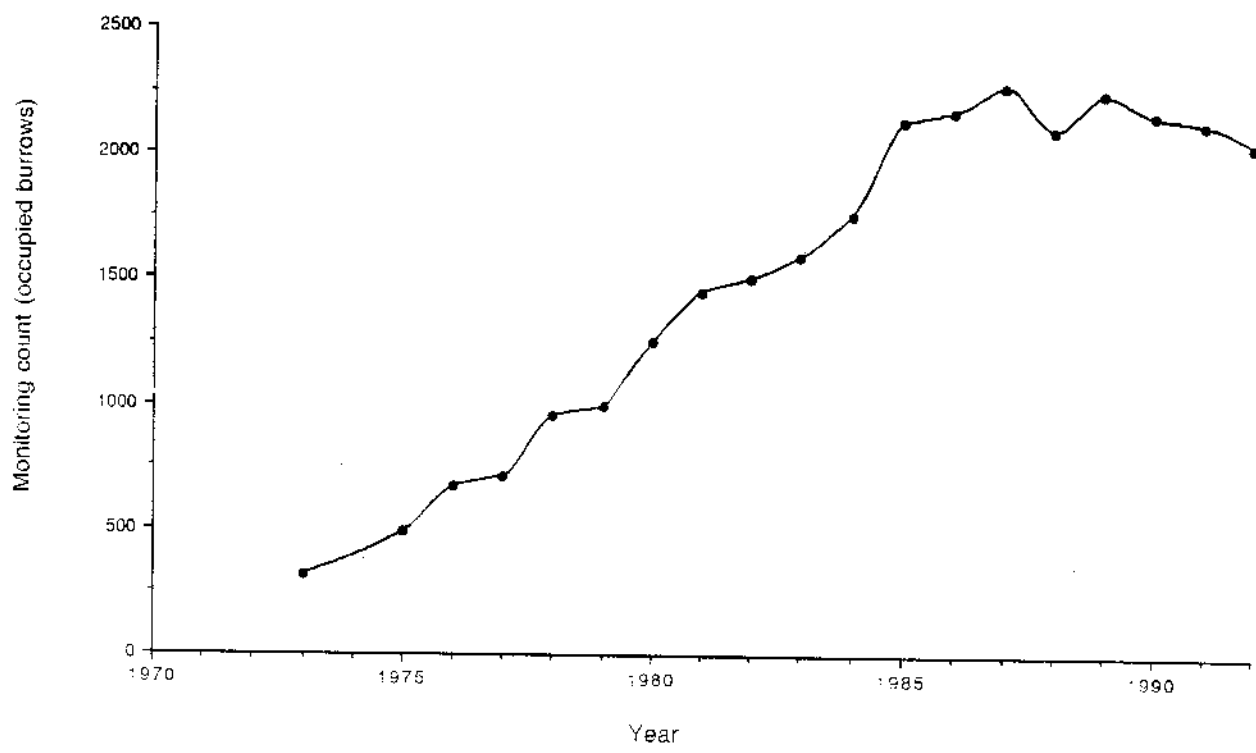


Figure 2. Annual counts of occupied puffin burrows in monitoring plots on the Isle of May 1973-92.

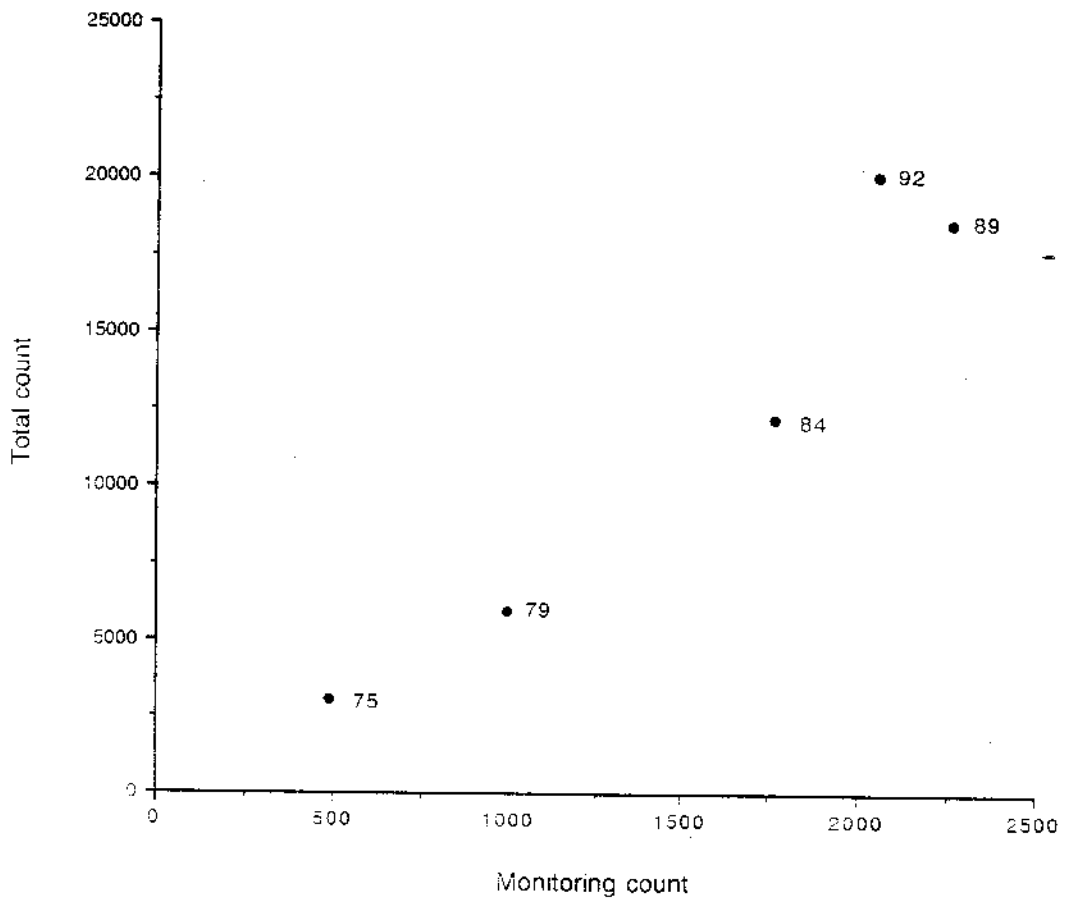


Figure 3. The relationship between total population counts and monitoring counts for the five years when both counts were made.



Adult puffin with load of small fish for its chick.

There was highly significant correlation ($r = 0.96$, $n = 5$, $P < 0.01$) between the total island counts and the monitoring count for the five years when a total and monitoring count had been made (Figure 3) which suggests that the quadrats were representative of the whole colony.

4.2 Breeding

4.2.1 Timing

The first fish seen being carried by an adult to a burrow in 1991 and 1992 were in 21 May and 17 May, respectively. Given an incubation period of 41 days, these dates indicate that the first eggs would have been laid about 6 April and 10 April, respectively.

4.2.2 Success

Breeding successes in 1990 and 1991 were 0.78 and 0.87 young fledged per burrow, respectively (Table 3). These maintained the typically high breeding success of Isle of May puffins (Figure 4).

4.3 Weights of chicks

In 1991, the mean peak weight of 22 young was 315.4 g (SE 5.7) and the fledging weight of 22 was 271.4 g (SE 5.8). In 1992 the corresponding figures for 35 and 33 chicks were 307.1 (SE 5.4 g.) and 264.2 (5.8 g.).

There has been a gradual linear decline in both the annual peak and fledging weights of chicks since annual weighing of chicks started in 1974. This decline has been particularly marked in the fledging weights where it has averaged 1.6 g per year (Figure 5).

4.4 Food and feeding of chicks

Young were fed mainly small sandeels *Ammodytes sp* about 7 cm long - that is fish which had hatched early in the same year (the O-group of fishery biologists). The only other species to contribute significantly to the diet were herring *Clupea harengus* and saithe *Pollarchius virens* (Tables 4 & 5). Sandeels made up 87 and 86% of the diet by weight in the two years, Clupeidae (herring and sprat *Sprattus sprattus*) 4 and 1%. In only 3 years (1973, 1983 and 1985) of the 20 years for which we have data have Clupeidae made up less of the diet (Figure 6). This has important consequences as Clupeidae, especially sprat, have a high calorific density whereas the species which have replaced them, mainly Gadidae, are poor food value.

The mean weights of a load of fish brought to a chick was $8.3 \pm \text{SE } 0.3 \text{ g}$ ($n = 127$)

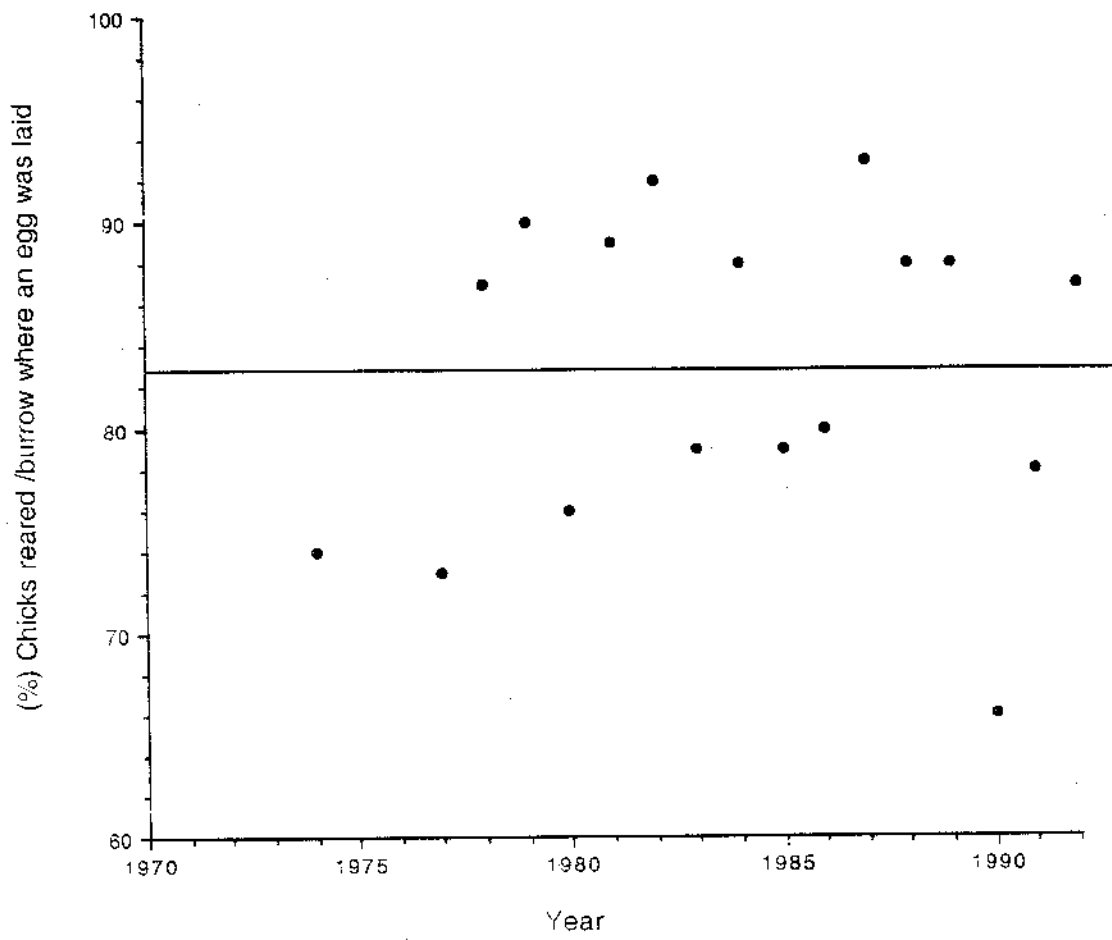


Figure 4. Breeding success of puffins 1974-92.

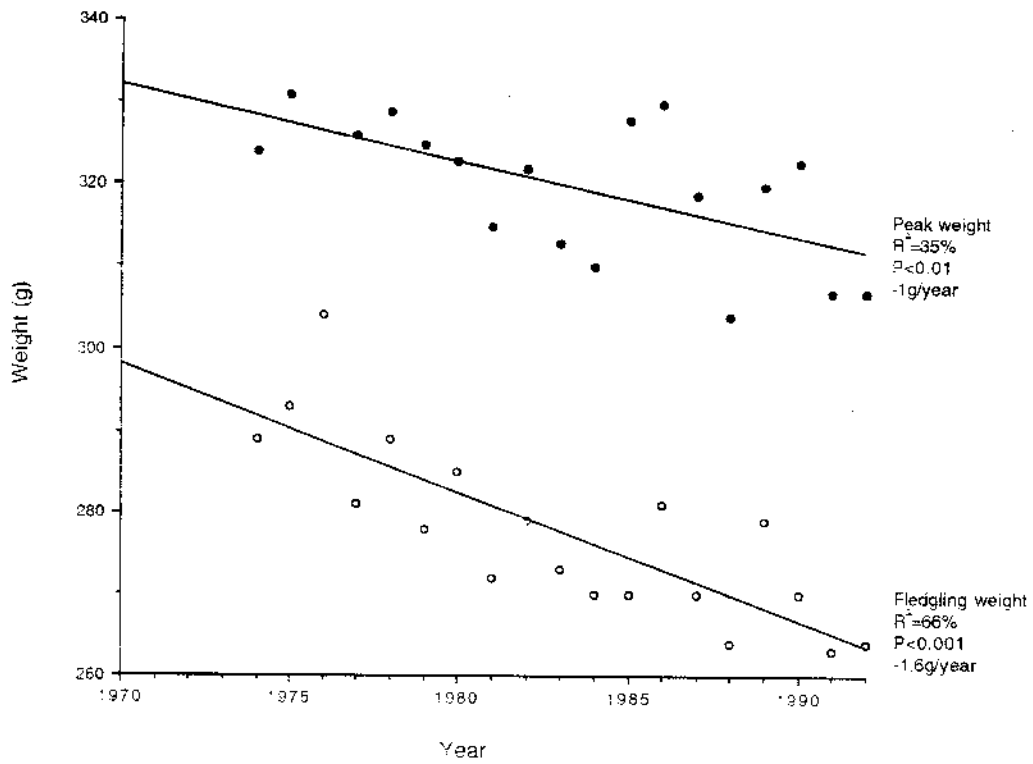


Figure 5. Annual mean peak and fledging weights of puffin chicks, 1973-92. In both cases, there is a significant linear decline with year.

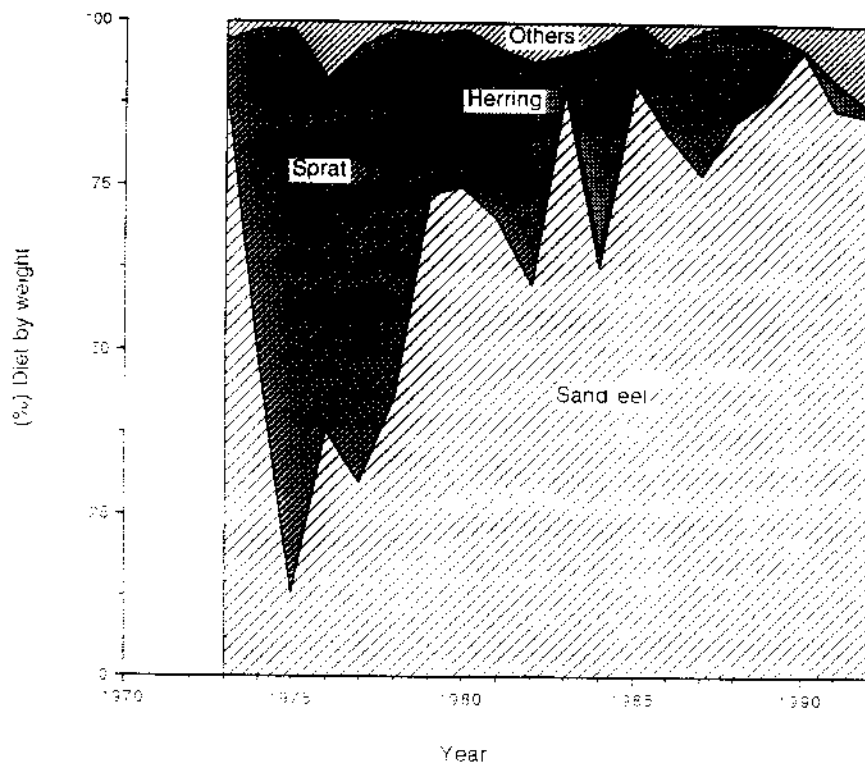


Figure 6. Diet of young puffins on the Isle of May, 1973-92.



Breeding adult puffin which still retains the dark winter plumage.

and 8.2 ± 0.4 ($\bar{n} = 126$) in 1991 and 1992, respectively. Chicks received, on average more feeds per day in 1992 (5.0, $\bar{n} = 15$ days of watches) than in 1991 (3.7, $\bar{n} = 7$ days; see Tables 4 & 5).

Analysis of the feeding data are being made by C. Wernham but generally 1991 and 1992 appeared to be typical years (Figure 7). However, when the mass of fish eaten by a chick is converted into energy terms it is apparent (Figure 8) that over the last 20 years there has been a gradual and significant decline in the daily energy intake of chicks. This is presumably responsible for the similar gradual decline in the weights of chicks (earlier).

4.5 Proportion of immatures in the population

In July 1991 11.2% of the 2412 birds examined were immature, in 1992 the figure was 8.6% of 3551 (Table 6). Although higher than the annual estimates in 1985-88, these figures are well below those of 15-37% recorded between 1977 and 1982 (Table 7).

4.6 Moulting of adults

Adults have a complete moult, during which they are flightless, in the late winter. During this moult the face lightens as the dark winter feathers are replaced by pale summer ones. Occasionally a bird retains winter feathers; this does not prevent it breeding. In the last 1980's, the proportion retaining some winter feathers in the spring reached 27%, which suggested that birds might be having difficulty in completing their moult during the winter. The pattern has changed again, and in 1992 only a single bird out of 544 examined closely had any dark feathers (Table 8). The significance (if any) of these changes is unclear.

4.7 Adult survival

Of 230 colour-ringed adults known to be alive in 1990, 173 (75.2%) survived to 1991. Comparable survival figures for 1991-1992 were 253 (86.6%) of 292. The latter will however, be an underestimate of true survival as not all birds alive are recorded every year, some probably because they do not return, others because they are overlooked. Thus any estimate of survival will improve in subsequent years as some of the missing birds are recorded. For instance, in 1992 I found 9 (14%) of 66 individuals which had been recorded in 1990 but not in 1991; these sightings increased the annual survival for 1990-91 from 71.3 to 75.2%.

Although annual survival in recent years has been undoubtedly much lower than it had been in the 1970s (Figure 9), the problems involved in allowing for missing birds make it difficult to say by how much. During the coming year attempts will be made to overcome this using recently developed (maximum likelihood) models.

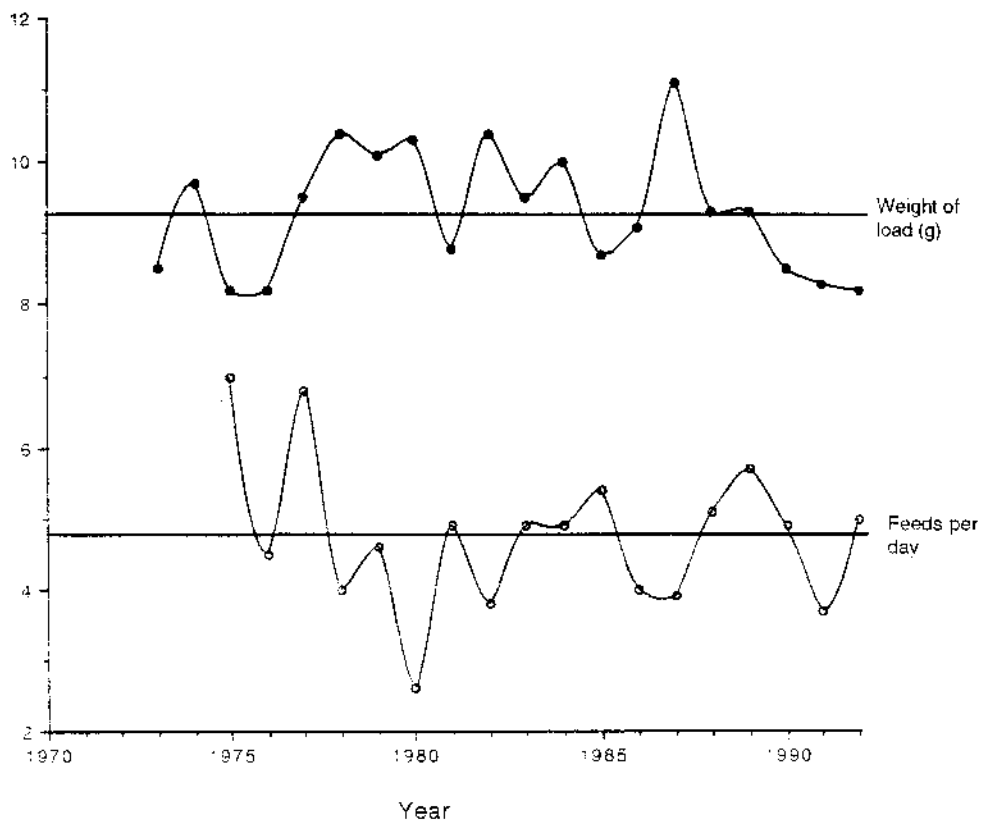


Figure 7. The annual mean mean load size (g. of fish) and daily feeding frequency of putlin chicks, 1973-92.

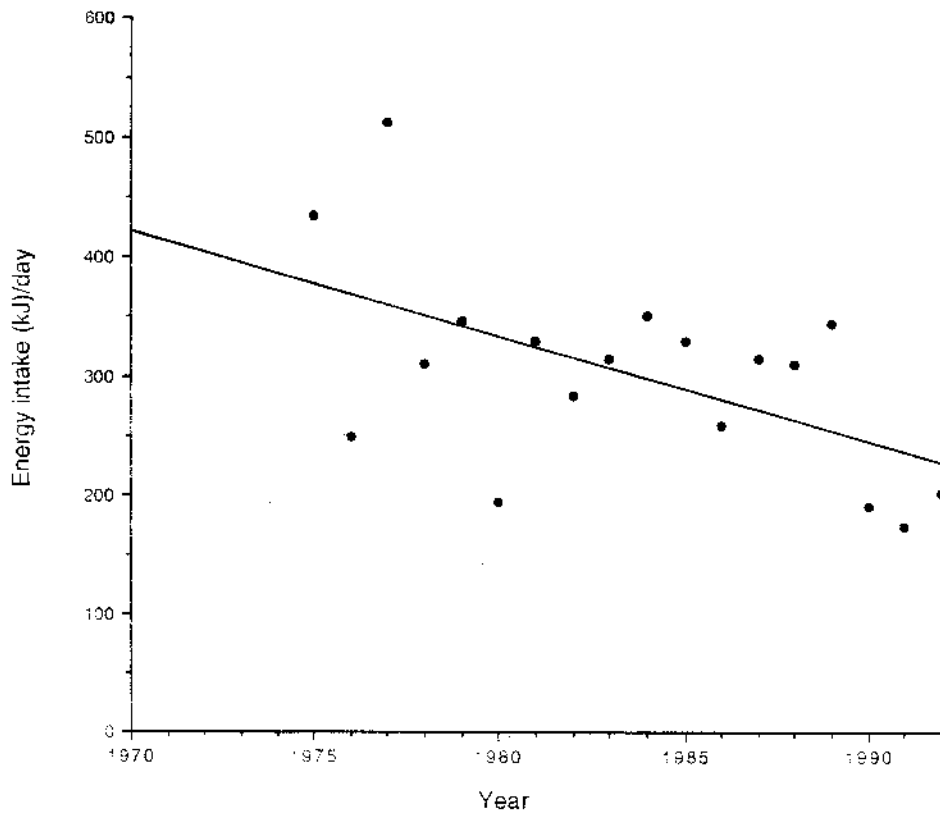


Figure 8. Calculated energy intake of young puffins, 1974-92. There is a significant decline (averaging 9 kJ per day) over the period ($R^2 = 30\%$, $P < 0.02$).

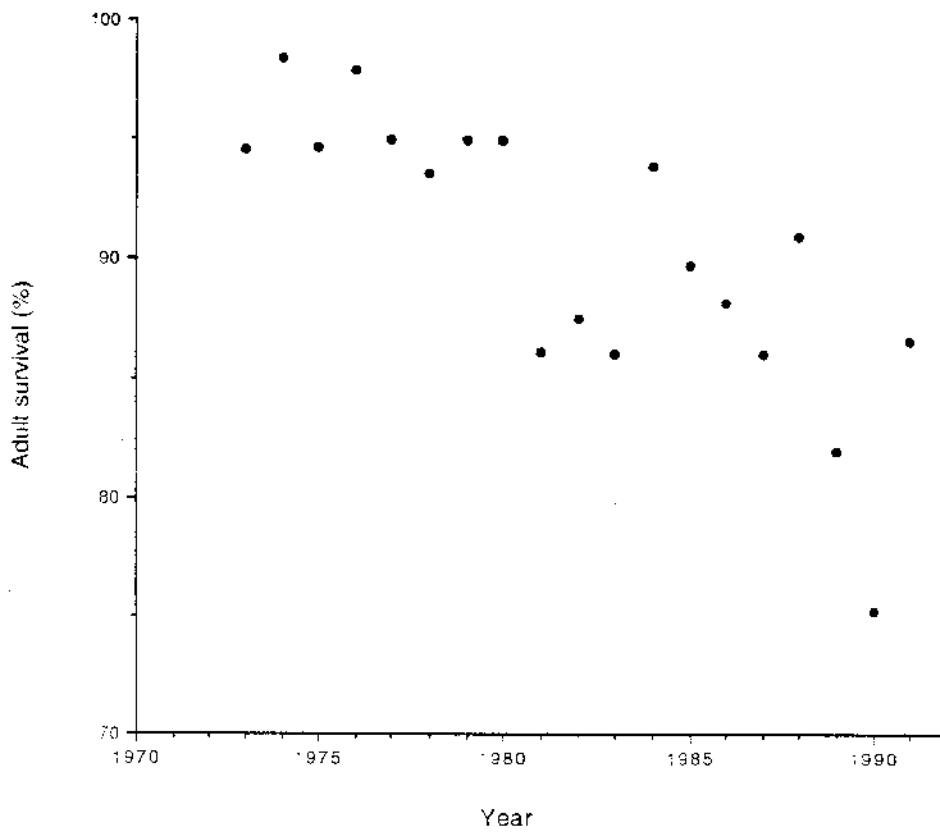


Figure 9. Annual survival rates of breeding puffins 1973-92. The year shown on the x-axis is the first year (e.g. 1973 = survival 1973-1974). The latest estimate is minimal as some birds not seen could still be alive.

Many of the colour-ringed adults are now of known sex (Table 9) and it will be possible to test for differences in the survival rates of the sexes. Some of our marked birds are now at least 25 years old and in a few years our new study using permanently marked burrows will enable us to follow the performance of these old birds and compare it with that of much younger individuals.

4.8 Mate and site fidelity

In anticipation of BP Exploration funding. C. Wernham marked 62 burrows in 1990, many of which had colour-ringed birds breeding in them. In 1991 and 1992 we followed 95 such burrows. At the end of 1992, 74 of these burrows had both adults colour-ringed, and 10 others had just one. Details of matings and burrow occupancy are given in Table 10.

4.8.1 Mate fidelity

At the end of the 1990 season there were 37 pairs where both adults were colour-ringed, in 1991 25 birds bred with the same mates, and three birds bred with different mates even though their original mates were still present in the colony (i.e. a divorce rate of $3/28 = 11\%$). In the remaining nine pairs, one bird had disappeared.

Of 36 new pairs in 1991, 31 remained the same in 1992, divorce occurred in four (11%) and in one a bird had disappeared. Of 24 pairs which remained together from 1990 to 1991 which could be followed again in 1992, 21 pairs remained unchanged, one pair divorced and in two pairs one bird did not return. The overall divorce rate of ca 10% was much higher than anticipated.

Unsuccessful pairs were no more likely to divorce than were pairs which reared a chick. For instance, between 1990 and 1991 3 (12%) of 25 successful pairs divorced whereas all three unsuccessful pairs remained together. Between 1991 and 1992 the figures were four divorces (9%) among 47 successful pairs and 2 (12%) from 19 unsuccessful pairs.

4.8.2 Site fidelity

Birds usually re-used their previous burrow:-

	1990-91	1991-92
Both pair members in same burrow in Year II as in Year I	21	56
Both pair members to different burrows in Year II	4	4
Divorce		
Male in same burrow, Female elsewhere	2	2
Female in same burrow, Male elsewhere	0	3
Both separately to new burrows	1	1
Male disappeared		
Female in same burrow	3	2
Female in different burrow	1	0
Female disappeared		
Male in same burrow	4	1
Male in different burrow	1	0
	<u>37</u>	<u>69</u>

Of the 8 instances where pairs moved together to new burrows, 3 pairs moved from accessible nest boxes to deep natural burrows, 3 moved to deep burrows from shallow natural burrows. In one instance a pair moved at the end of the season after breeding had been unsuccessful and the final case involved a pair which moved after the 1990 season and returned to their previous burrow in 1992. In all cases the new burrow was either unoccupied the previous season or both the owners had disappeared (1 case). Unsuccessful pairs were no more likely to change burrows than were successful pairs.

4.9 Immature survival

In 1991 and 1992, 151 and 168 young raised in burrows in the main study area were marked with both numbered and colour-rings. The colour-rings were a year specific colour (green in 1991, blue in 1992) and each had a unique two-letter combination engraved on it. Such colour rings can be read at a considerable distance and will

allow us to follow the survival of these birds without having to catch them. We also hope to get information on their occurrence at other colonies (Appendix 1).

As a preliminary to this study we marked 172 chicks with similar rings in 1989 and 147 in 1990. During 1992 we recorded 28 1989 chicks and 11 1990 chicks back at the colony. There is every reason to suppose that this project will be successful in measuring the survival of these chicks to breeding age.

Eight of these chicks have been recorded dead away from the Isle of May:

EN04215	1989 chick 23 Feb 1990	Dead on beach, Noord-Holland 52°28'N 4°38'E 622 km; 236 days
EN04042	1989 chick 9 Nov 1990	Shot, near Nolsoy, Faeroes 61°59'N 6°49'W 689 km, 506 days
EN96495	1990 chick 9 Nov 1990	Shot, Nolsoy, Faeroes 61°59'N 6°40'W 684 km, 146 days
ER44025	1990 chick 14 Jan 1991	Dead in wreck, Holm, Orkney 303 km, 202 days
ER44157	1990 chick 9 Feb 1991	Dead in wreck, Scapa Bay, Orkney 308 km 229 days
ER44042	1990 chick 1 Jun 1990	Dead, Druridge Bay, Northumberland 118 km, 218 days
ER47008	1990 chick	Dead, Cromarty Firth 192 km, 396 days
ER45283	1991 chick 3 Apr 1992	Oiled, Hartlepool 187 km, 282 days

5 ACKNOWLEDGEMENTS

Seabird research on the Isle of May is a cooperative venture and many people helped gather data. However, special thanks are due to Chris Wernham (who marked many of the adults and resighted even more and organized all the feeding watches), John Calladine (warden, who did many hide watches, early morning mist-netting and chick weighings), Sarah Wanless and Sheila and Andy Russell. The Scottish Natural Heritage allowed us to work on the island.

This study is part of an integrated seabird monitoring programme on the Isle of May National Nature Reserve funded by BP Exploration, Scottish Natural Heritage, the Department of the Environment and the Joint Nature Conservation Committee. All information collected is stored in the national data-base held by the latter body.

6 PUBLICATIONS ON PUFFINS IN 1991 AND 1992

Harris, M.P. & Wanless, S. 1991.

Population studies and conservation of Puffins *Fratercula arctica*.

In "*Bird Population Studies*" (eds. Perrins, Lebreton & Hirons). Oxford Univ. Press. pp. 230-248.

Harris, M.P. 1991.

Population changes in British common murre and Atlantic puffins, 1969-88.

In: *Studies of high-latitude seabirds. 2. Conservation biology of thick-billed murre in the northern Atlantic*, edited by A.J. Gaston & R.D. Elliott, 52-61. (Canadian Wildlife Service occasional paper no. 69). Ottawa: Environment Canada.

Hislop, J.R.G., Harris, M.P. & Smith, J.G.M., 1991.

Variation in the calorific value and total energy content of the lesser sandeel (*Ammodytes marinus*) and other fish preyed on by seabirds. *Journal of Zoology*, 224, 501-517.

Harris, M.P. Heubeck, M. & Suddaby, D. 1991.

Results of an examination of Puffins *Fratercula arctica* washed ashore in Shetland in winter 1990-91. *Seabird* 13, 63-66.

Harris, M.P. 1992.

North Sea puffins, *NERC News*, No. 20, 8-9

Harris, M.P. & Bailey, R.S. 1992.

Mortality rates of puffin *Fratercula arctica* and guillemot *Uria aalge* and fish abundance in the North Sea. *Biological Conservation*, 60, 39-46.

Harris, M.P. & Halley, D. 1992.

Auks on the move. *BTO News* 183, 8-9.

Table 1 Counts of occupied puffin burrows on the Isle of May on 25-29 April 1992 compared to counts in 1975, 1984 and 1989.

Area	1975	1984	1989	1992
Kirkhaven to Colm Hole	345	1518	2458	2525
Colm's Hole to Low Light				
Quadrat	144	378	570	612
Rest	968	2408	3522	4530
TOTAL	<u>1112</u>	<u>2786</u>	<u>4092</u>	<u>5142</u>
Holyman's Road (West side)				
South of Colm's Hole	40	561	1068	1078
North of Colm's Hole	63	347	517	414
Low Light to Tarbet	75	380	795	497
Tarbet (south)	0	0	0	19
Rona				
East quadrats	34	165	211	233
West quadrats	19	46	80	70
Rest	496	2360	2946	3015
TOTAL	<u>549</u>	<u>2571</u>	<u>3237</u>	<u>3318</u>
North Ness	160	225	371	286
North Plateau				
Horse Hole quadrat	147	609	656	556
Bishop's Cove quadrat	76	163	79	169
North of Three Tarn	83	1193	1698	2531
South of Three Tarn incl. Mill Door	10	182	226	590
TOTAL	<u>316</u>	<u>2147</u>	<u>2659</u>	<u>3946</u>
South Plateau				
Pilgrim's Haven to Loch	23	105	394	389
Loch Sides	c.10	c.100	c.150	246
TOTAL	<u>33</u>	<u>205</u>	<u>544</u>	<u>635</u>
South Horn	0	15	c.100	150
Maidens	5	2	0	
Ardcarron	113	274	635	530
Lady's Bed	244	1180	2152	1620
East Braes	0	0	0	20
Horse Hole to Altarstones	0	0	0	20
St Andrew's Well	0	0	0	5
GRAND TOTAL	<u>3064</u>	<u>12211</u>	<u>18628</u>	<u>20106</u>

The 1992 count was made by S. Wanless, C. Wernham, J. Cailladine and M.P. Harris

Table 2. Annual counts of apparently occupied burrows in permanently staked quadrats on the Isle of May. (a) is the main long-term area, (b) includes areas added in eroded* or newly-colonized+ areas.

Location	Area (m ²)																										
	Total	Excluding rock	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992				
(a) Rona (W)	800	400	9	?	?	19	22	18	24	30	27	34	36	33	46	46	37	54	65	103	59	55	70				
Rona (E)	400	360	27	?	?	34	51	102	130	142	117	148	140	163	165	201	189	233	222	211	213	253	233				
Horse Hole	2000	1600	55	?	?	147	173	146	268	208	324	400	416	430	609	633	600	663	550	656	721	620	556				
Bishop's Cove	1024	768	40	?	?	57	67	75	99	106	155	177	159	155	163	203	172	198	205	79	126	195	169				
Lady's Bed	1450	1450	34	?	?	35	53	100	124	146	217	264	263	267	266	342	333	393	353	412	251	280	306				
Burrian	1200	1050	119	?	?	144	179	192	235	215	286	289	353	399	378	552	580	558	568	570	686	632	612				
Holyman	396	337	34	?	?	53	78	81	78	147	130	146	144	152	141	165	113	190	150	229	116	105	105				
Monitoring Total			318	?	489	623	714	958	994	1256	1458	1511	1599	1768	2141	2141	2024	2289	2113	2260	2172	2140	2051				

(b) North Ness eroded ridge*	400	112	?	?	76	43	76	90	71	73	82	91	79	66	87	104	81	66	63	61	61	14	74
North Ness eroded bank*	1000	78	?	?	77	78	111	107	95	92	92	103	103	91	66	88	85	103	98	94	92	86	
Rona Seals*	1125	900										135	108	109	131	136	179	151	151	156	150	149	
North Plateau (a)+														4	6	5	8	9	13	14	17	19	
(b)+														12	10	19	13	40	49	44	40	53	

Table 3 Breeding success (chicks present at start of fledging period/number of burrows where an egg was known to have been laid) of puffins in 1991 and 1992. Area details of the 1991 count were lost in the arson attack but 50 burrows were initially marked in each area.

	Area	Successful	Total laid	
1992	Lady's Bed	37	46	
	Kettle	41	49	
	Rona	42	44	
	Burrian	40	45	
	Total	160	184	0.87
1991	Total	136	174	0.78

Table 4 Food and feeding frequency of young puffins on the Isle of May 1991.

Food	Sample	Mean	S.E.
a) Load weight (g)	127	8.3	0.34
b) Fish/load	127	7.6	0.43
c) Numbers and lengths of fish (mm)			
Sandeels <i>Ammodytes</i> sp.	826	70.3	0.65
Herring <i>Clupea harengus</i> *	52	56.2	1.32
Rockling probably <i>Gaidropsarus ciliata</i>	6	36.3	1.2
Saithe <i>Pollarchius virens</i>	38	58.0	1.4
Cod <i>Gadus morhua</i>	4	59	7.0
Unidentified Gadidae	2	62,72	
Squid	1	57	

* includes some unidentifiable small Clupediae

Feeding frequency

3 June	33	5.5 ± 2.7
9 June	38	4.6 ± 2.5
16 June	39	5.4 ± 2.4
23 June	41	2.2 ± 1.8
29 June	33	4.5 ± 2.7
7 July	25	0.7 ± 1.2
15 July	16	3.2 ± 2.2
Mean		3.7

- Notes** (1) Based on all-day watches by observers taking 2 hr shifts
 (2) Puffin feeding frequencies were from watches organised by C. Wernham

Table 5 Food and feeding frequency of young puffins on the Isle of May in 1992.

Food		Sample size	Mean \pm S.E.
a) Load weight (g)		126	8.2 \pm 0.4
b) Fish/load		126	6.7 \pm 0.4
c) Numbers and lengths of fish (mm)			
Sandeels <i>Ammodytes</i> sp.		670	71.3 \pm 0.9
Herring <i>Clupea harengus</i> *		9	64.3 \pm 4.3
Rockling probably <i>Gaidropsarus ciliata</i>		73	42.6 \pm 1.0
Saithe <i>Pollarchius virens</i>		76	54.3 \pm 0.9
Feeding frequency			
(a)	16 June	14	3.1 \pm 0.7
	25 June	17	1.8 \pm 0.4
	5 July	21	5.1 \pm 1.8
	13 July	22	3.7 \pm 0.4
	18 July	21	5.4 \pm 1.0
	22 July	20	6.6 \pm 0.7
	27 July	16	10.4 \pm 0.6
	31 July	14	8.1 \pm 1.1
	4 August	13	5.5 \pm 1.2
	8 August	9	4.8 \pm 1.3
(b)	13 June	20	4.7 \pm 0.6
	21 June	20	4.1 \pm 1.7
	27 June	20	4.3 \pm 1.9
	8 July	20	3.0 \pm 0.5
	16 July	11	4.5 \pm 1.1
	Mean		5.0

- Notes: (1) Based on all-day watches by observers taking 2 - 3 hr shifts.
- (2) Puffin feeding frequencies were from watches organised by C. Wernham.
- (3) Puffin (b) is an area not watched in previous years.

Table 6 Proportion of immature puffins among puffins standing at colonies on the Isle of May in 1991 and 1992

	Number of bill grooves							% Immatures
	Immature						Adult	
	0	trace	$\frac{1}{2}/\frac{3}{4}$	1	$1\frac{1}{2}$	$1\frac{3}{4}$	2 or more	
1991								
11 June	0	0	13	15	14	13	701	6.0
17 June	0	0	7	7	12	18	399	9.9
30 June	0	0	5	1	1	10	122	12.3
1 July	0	1	12	13	22	36	585	12.6
2 July	4	2	17	13	18	20	422	14.9
6 July	0	0	39	22	25	19	1020	9.3
7 July	0	0	3	4	0	1	114	6.6
Total in July	4	3	71	52	65	76	2141	11.2
1992								
2 July	0	0	3	1	13	2	220	7.9
3 July	0	3	6	5	10	7	610	4.8
5	1	5	10	4	15	14	391	11.1
7	0	4	13	12	32	30	1180	7.1
9	0	3	11	6	14	6	245	14.0
11	3	2	6	13	17	10	406	11.1
15	1	5	3	2	14	1	192	11.9
Total in July	5	22	52	43	115	70	3244	8.6

Table 7 Proportion of immature puffins (with less than 2 bill groves) 1 - 15 July 1976 - 92

	Year	Total Number	
		Handled up to 15 July	% immature
Mist-netted	1976	676	12
	1977	491	15
	1978	739	28
	1979	277	22
	1980	380	37
	1981	527	15
	1982	753	15
	1983	503	22
	1984	502	14
	1985	101	5
	1986	317	10
	1987	94	0
	1988	47	0
	1989	238	17
Telescope observations	1989	1107	15
	1991	2141	11
	1992	3244	9

Table 8 Proportions of puffins examined prior to the breeding season which showed traces of winter plumage.

Year	Date	Total examined	No. with traces of winter	% Winter
1973	9 - 11 April	160	0	0
1974	23 March - 10 April	440	1	<1
1975	21 March - 10 April	539	1	<1
1976	21 - 30 March	240	0	0
1977	30 March - 10 April	345	0	0
1978	29 March - 6 April	328	0	0
1979	1 - 11 April	107	2	2
1980	31 March - 6 April	314	0	0
1981	3 - 11 April	704	6	<1
1982	27 March - 10 April	885	10	1
1983	4 - 10 April	239	13	5
1984	2 - 5 April	171	2	1
1985	5 April	105	2	2
1988	27 March	287	77	27
1989	25 - 27 March	816	6	<1
1991	late March	?	?	very few
1992	7 April	544	1	<1

Note: no observations were made in 1986 and 1987

Table 9. Details of colour-ringed puffins on the Isle of May in 1991-92.
The columns are:-

Bird number
Ring number
Colours on left leg (zzz = missing, BTO = number)
Colours on right leg
Sub-colony
Sex (if known)
1991 summer (* = seen, 1 = seen at Colm, number = burrow number at Little
Hide)
1991 winter (D = Dead)
1992 summer (as above)
1992 winter
1993 summer
1993 winter

24	EJ70998	BLU-BTO	YEL-RED	COLM	?	1	-	-	-	-
92	EB21655	RED-RED	RED-BTO	COLM	?	-	-	-	-	-
93	EB21223	RED-GRN	RED-BTO	COLM	F	1	-	1	-	-
94	EB32183	BLK-RED	RED-BTO	COLM	?	-	-	-	-	-
95	EB21986	BLK-WHI	RED-BTO	COLM	?	-	-	-	-	-
96	EJ08410	BLK-BLU	RED-BTO	COLM	?	1	-	1	-	-
97	EB98409	WHI-BLU	RED-BTO	COLM	?	-	-	1	-	-
98	EB21966	WHI-WHI	RED-BTO	COLM	F	1	-	1	-	-
99	EB32698	YEL-GRN	RED-BTO	COLM	M	-	-	-	-	-
100	EB21888	YEL-YEL	RED-BTO	COLM	M	1	-	-	-	-
101	EB32692	RED-BTO	RED-WHI	COLM	M	1	-	1	-	-
102	EB89709	RED-BTO	GRN-BLU	COLM	M	-	-	-	-	-
103	EB89700	RED-BTO	BLU-RED	COLM	F	1	-	-	-	-
104	EB29645	RED-BTO	BLK-BLK	COLM	F	-	-	1	-	-
105	EB89723	RED-BTO	WHI-RED	COLM	M	1	-	1	-	-
106	EB29258	RED-BTO	YEL-RED	COLM	M	-	-	-	-	-
107	EB32683	RED-BTO	YEL-WHI	COLM	F	-	-	-	-	-
108	EB21417	RED-BTO	GRN-YEL	COLM	?	-	-	-	-	-
109	EB21743	RED-YEL	BLU-BTO	COLM	?	1	-	-	-	-
110	EB21751	BLU-BLK	BLU-BTO	COLM	?	-	-	-	-	-
111	EB21737	BLU-YEL	BLU-BTO	COLM	F	1	-	1	-	-
112	EB21455	GRN-BLK	BLU-BTO	COLM	?	1	-	1	-	-
113	EB21452	GRN-WHI	BLU-BTO	COLM	F	1	-	LIT	-	-
114	EB21684	BLK-GRN	BLU-BTO	COLM	M	1	-	-	-	-
115	EB89736	BLU-BTO	RED-RED	COLM	M	1	-	-	-	-
116	EB94725	BLU-BTO	RED-BLU	COLM	M	-	-	-	-	-
117	EJ42110	BLU-BTO	RED-BLK	COLM	F	1	-	1	-	-
118	EB87138	BLU-BTO	RED-WHI	COLM	F	-	-	-	-	-
119	EJ71006	BLU-BTO	RED-YEL	COLM	M	1	-	1	-	-
120	EB50353	RED-RED	GRN-BTO	COLM	?	-	-	-	-	-
121	EB32633	RED-BLU	GRN-BTO	COLM	M	-	-	-	-	-
122	EB21234	BLU-BLK	GRN-BTO	COLM	F	1	-	1	-	-
123	EB32646	BLU-YEL	GRN-BTO	COLM	?	-	-	-	-	-
124	EB18537	GRN-RED	GRN-BTO	COLM	F	-	-	-	-	-
125	EJ78434	GRN-GRN	GRN-BTO	COLM	?	-	-	-	-	-
126	EB32644	GRN-BLK	GRN-BTO	COLM	M	-	-	-	-	-
127	EB18596	GRN-WHI	GRN-BTO	COLM	F	1	-	-	-	-
128	EB32645	BLK-RED	GRN-BTO	COLM	F	-	-	-	-	-
129	EB32657	BLK-GRN	GRN-BTO	COLM	F	1	-	-	-	-
130	EB32667	WHI-BLU	GRN-BTO	COLM	M	-	-	-	-	-
131	EJ42108	WHI-WHI	GRN-BTO	COLM	?	-	-	-	-	-
132	EB29002	WHI-YEL	ZZZ-BTO	COLM	?	1	-	1	-	-
133	EB32654	YEL-BLU	GRN-BTO	COLM	F	-	-	-	-	-
134	EB79712	YEL-BLK	GRN-BTO	COLM	?	1	-	1	-	-
135	EB83493	YEL-WHI	GRN-BTO	COLM	?	-	-	LIT	-	-
136	EB98240	YEL-YEL	GRN-BTO	COLM	?	1	-	1	-	-
137	EJ83696	BLU-RED	GRN-BTO	COLM	?	-	-	-	-	-
138	EB98810	WHI-GRN	GRN-BTO	COLM	?	-	-	-	-	-
139	EB29006	GRN-BTO	RED-RED	COLM	?	-	-	-	-	-
140	EJ42201	GRN-BTO	RED-WHI	COLM	F	-	-	-	-	-
141	EB29208	GRN-BTO	RED-YEL	COLM	M	1	-	-	-	-
142	EB32647	GRN-BTO	GRN-BLK	COLM	F	1	-	1	-	-
143	EB32642	GRN-BTO	BLK-RED	COLM	M	-	-	-	-	-
144	EB29004	GRN-BTO	WHI-RED	COLM	?	-	-	-	-	-
145	EB32651	GRN-BTO	WHI-BLK	COLM	M	-	-	-	-	-
146	EB29007	GRN-BTO	WHI-ORN	COLM	?	-	-	-	-	-
147	EB29008	GRN-BTO	YEL-RED	COLM	?	-	-	-	-	-
148	EB32241	RED-YEL	LIM-BTO	COLM	F	1	-	-	-	-
149	EB94961	LIM-BTO	LIM-GRN	COLM	F	-	-	-	-	-
150	EN00383	RED-GRN	BLK-BTO	COLM	?	1	-	1	-	-
151	EB81755	RED-BLU	BLK-BTO	COLM	?	1	-	1	-	-
152	EJ70499	RED-YEL	BLK-BTO	COLM	?	-	-	-	-	-
153	EB81617	GRN-BLU	BLK-BTO	COLM	?	1	-	-	-	-
154	EB89717	GRN-WHI	BLK-BTO	COLM	?	1	-	1	-	-
155	EB89691	BLK-BLU	BLK-BTO	COLM	?	1	-	1	-	-
156	EB79562	BLK-WHI	BLK-BTO	COLM	?	1	-	-	-	-

157	EB89727	WHI-BLU	BLK-BTO	COLM	?	-	-	-	-
158	EB89739	ZZZ-GRN	BLK-BTO	COLM	?	-	-	-	-
159	EB89575	WHI-BLK	BLK-BTO	COLM	?	1	-	1	-
160	EB79793	YEL-BLK	BLK-BTO	COLM	?	-	-	-	-
161	EJ42107	BLK-BTO	RED-RED	COLM	?	-	-	-	-
162	EB89603	BLK-BTO	RED-WHI	COLM	?	-	-	-	-
163	EB87321	BLK-BTO	BLU-RED	COLM	?	-	-	-	-
164	EJ43024	BLK-BTO	BLU-YEL	COLM	?	1	-	1	-
165	EB79503	BLK-BTO	BLK-RED	COLM	?	-	-	-	-
166	EB29027	RED-RED	WHI-BTO	COLM	?	-	-	-	-
167	EB21778	RED-GRN	WHI-BTO	COLM	?	1	-	*	-
168	EB29058	RED-BRN	WHI-BTO	COLM	?	-	-	-	-
169	EB29023	BLU-RED	WHI-BTO	COLM	?	-	-	-	-
170	EB29024	GRN-RED	WHI-BTO	COLM	F	1	-	1	-
171	EB29209	GRN-BLU	WHI-BTO	COLM	F	1	-	1	-
172	EB29025	GRN-YEL	WHI-BTO	COLM	?	-	-	-	-
173	EB32040	BLK-GRN	WHI-BTO	COLM	M	-	-	-	-
174	EB32637	BLK-WHI	WHI-BTO	COLM	M	-	-	1	-
175	EB29212	WHI-BLU	WHI-BTO	COLM	M	-	-	-	-
176	EB29010	WHI-GRN	WHI-BTO	COLM	M	-	-	-	-
177	EB29009	WHI-YEL	WHI-BTO	COLM	?	-	-	-	-
178	EB29015	YEL-RED	WHI-BTO	COLM	?	1	-	-	-
179	EB29026	YEL-GRN	WHI-BTO	COLM	?	1	-	-	-
180	EB29066	WHI-BTO	RED-RED	COLM	F	1	-	1	-
181	EB29075	WHI-BTO	RED-WHI	COLM	?	-	-	-	-
182	EB29255	WHI-BTO	BLU-BLK	COLM	?	1	-	1	-
183	EN00063	WHI-BTO	BLU-WHI	COLM	?	-	-	-	-
184	EN00059	WHI-BTO	BLU-YEL	COLM	?	1	-	1	-
185	EB89742	WHI-BTO	BLK-BLU	COLM	F	1	-	1	-
188	EB21901	RED-WHI	YEL-BTO	COLM	?	-	-	-	-
189	EB21972	ZZZ-ZZZ	YEL-BTO	COLM	?	1	-	-	-
190	EB32653	BLU-GRN	YEL-BTO	COLM	M	1	-	1	-
192	EB98437	BLU-WHI	YEL-BTO	COLM	?	-	-	-	-
193	EB18545	GRN-BLK	YEL-BTO	COLM	?	-	-	-	-
194	EB21643	GRN-WHI	YEL-BTO	COLM	?	1	-	-	-
195	EB29091	GRN-GRY	YEL-BTO	COLM	?	1	-	1	-
196	EB21859	BLK-BLU	YEL-BTO	COLM	M	1	-	-	-
197	EB21981	BLK-GRN	YEL-BTO	COLM	?	1	-	-	-
198	EB21988	BLK-YEL	YEL-BTO	COLM	F	-	-	-	-
200	EJ77530	WHI-BLK	YEL-BTO	COLM	?	1	-	1	-
202	EB21849	WHI-GRN	YEL-BTO	COLM	?	1	-	-	-
203	EB21842	WHI-YEL	YEL-BTO	COLM	F	-	-	-	-
204	EB29086	WHI-GRY	YEL-BTO	COLM	?	-	-	-	-
205	EB21642	YEL-RED	YEL-BTO	COLM	F	1	-	-	-
206	EB82631	YEL-YEL	YEL-BTO	COLM	?	1	-	1	-
207	EB29077	YEL-BTO	RED-RED	COLM	?	1	-	1	-
208	EB32635	YEL-BTO	RED-BLU	COLM	M	-	-	-	-
209	EB29085	YEL-BTO	RED-GRY	COLM	M	1	-	1	-
210	EB32643	YEL-BTO	BLK-WHI	COLM	F	1	-	1	-
211	EB94779	YEL-BTO	GRN-RED	COLM	?	-	-	-	-
212	EN02495	YEL-BTO	RED-BLK	COLM	?	-	-	-	-
213	EN02491	YEL-BTO	BLK-RED	COLM	?	1	-	1	-
214	EN02493	YEL-BTO	BLK-GRN	COLM	?	1	-	1	-
215	EB21298	GRN-GRN	BRN-BTO	COLM	?	-	-	1	-
216	EB21301	GRN-YEL	BRN-BTO	COLM	?	-	-	-	-
218	EB13016	ORN-ORN	BRN-BTO	COLM	F	-	-	-	-
227	EN02880	GRN-BTO	RED-BLK	COLM	?	1	-	1	-
228	EN02882	GRN-BTO	GRN-RED	COLM	?	1	-	1	-
229	EN02881	GRN-BTO	GRN-YEL	COLM	?	1	-	-	-
230	EB21679	RED-BLK	GRN-BTO	COLM	?	-	-	-	-
231	EB21658	RED-YEL	GRN-BTO	COLM	?	-	-	-	-
234	EN03652	RED-BTO	RED-YEL	COLM	?	1	-	1	-
235	EN03654	YEL-BTO	WHI-RED	COLM	?	1	-	1	-
236	EN03658	YEL-BTO	WHI-GRN	COLM	?	1	-	1	-
237	EB81166	RED-BTO	RED-WHI	COLM	?	1	-	1	-
238	EJ71914	RED-BTO	GRN-RED	COLM	?	-	-	-	-

239	EJ98875	RED-BTO	RED-GRN	COLM	?	-	-	-	-	-
241	EN04038	RED-WHI	LIM-BTO	COLM	?	-	-	-	-	-
242	EN04039	RED-BLU	LIM-BTO	COLM	?	-	-	1	-	-
243	EN04040	RED-GRN	LIM-BTO	COLM	?	1	-	1	-	-
244	EN04041	RED-BLK	LIM-BTO	COLM	?	-	-	-	-	-
245	EN04046	RED-LIM	LIM-BTO	COLM	?	1	-	1	-	-
246	EN04048	BLU-RED	LIM-BTO	COLM	?	1	-	1	-	-
247	EJ11877	RED-RED	LIM-BTO	COLM	?	-	-	-	-	-
248	EN04050	BLU-BLU	LIM-BTO	COLM	?	1	-	1	-	-
249	EJ11594	RED-YEL	LIM-BTO	COLM	?	-	-	-	-	-
250	EJ08412	BLU-WHI	LIM-BTO	COLM	?	-	-	-	-	-
251	EN04053	YEL-RED	LIM-BTO	COLM	M	-	-	-	-	-
252	EN04057	YEL-BLK	LIM-BTO	COLM	?	-	-	1	-	-
253	EN04058	YEL-GRN	LIM-BTO	COLM	?	-	-	-	-	-
254	EN04061	BLU-YEL	LIM-BTO	COLM	?	1	-	1	-	-
255	EN04063	BLU-WHI	LIM-BTO	COLM	?	1	-	1	-	-
256	EN04064	BLU-BLK	LIM-BTO	COLM	?	-	-	1	-	-
257	EB21970	YEL-BLU	LIM-BTO	COLM	?	-	-	-	-	-
258	EN04065	WHI-RED	LIM-BTO	COLM	?	1	-	1	-	-
259	EN04070	WHI-GRN	LIM-BTO	COLM	?	-	-	-	-	-
260	EN04072	WHI-BLU	LIM-BTO	COLM	?	1	-	-	-	-
261	EN04074	WHI-YEL	LIM-BTO	COLM	?	1	-	-	-	-
262	EN04075	WHI-BLK	LIM-BTO	COLM	?	1	-	-	-	-
263	EN04076	GRN-RED	LIM-BTO	COLM	?	1	-	1	-	-
264	EB13038	WHI-WHI	LIM-BTO	COLM	?	1	-	1	-	-
265	EN02932	GRN-BLU	LIM-BTO	COLM	?	1	-	1	-	-
265	EN02932	GRN-BLU	LIM-BTO	COLM	?	-	-	1	-	-
266	EJ78220	WHI-LIM	LIM-BTO	COLM	?	1	-	1	-	-
267	EB81135	GRN-GRN	LIM-BTO	COLM	?	1	-	1	-	-
268	EJ70067	GRN-WHI	LIM-BTO	COLM	?	-	-	-	-	-
269	EN04078	GRN-YEL	LIM-BTO	COLM	?	1	-	1	-	-
270	EN04082	LIM-RED	LIM-BTO	COLM	?	1	-	-	-	-
271	EB81132	GRN-BLK	LIM-BTO	COLM	?	1	-	-	-	-
272	EJ82643	GRN-LIM	LIM-BTO	COLM	?	1	-	1	-	-
1	EJ84275	RED-WHI	RED-BTO	LIT	?	-	-	-	-	-
2	EB67819	RED-YEL	RED-BTO	LIT	?	-	-	-	-	-
3	EB94460	BLU-RED	RED-BTO	LIT	F	-	-	-	-	-
4	EJ70573	BLU-GRN	RED-BTO	LIT	F	-	-	-	-	-
5	EB29834	BLU-BLK	RED-BTO	LIT	M	*	-	199	-	-
6	EB87249	BLU-BLU	RED-BTO	LIT	M	-	-	-	-	-
7	EB21005	GRN-RED	RED-BTO	LIT	M	-	-	-	-	-
8	EB81545	GRN-BLU	RED-BTO	LIT	M	62	-	62	-	-
9	EB87250	GRN-GRN	RED-BTO	LIT	?	*	-	*	-	-
10	EJ82013	GRN-BLK	RED-BTO	LIT	F	107	-	107	-	-
11	EB67822	GRN-WHI	RED-BTO	LIT	M	-	-	-	-	-
12	EJ84479	GRN-YEL	RED-BTO	LIT	F	68	-	68	-	-
13	EJ84512	BLK-YEL	RED-BTO	LIT	?	-	-	-	-	-
14	EJ11088	WHI-YEL	RED-BTO	LIT	?	-	-	-	-	-
15	EJ78925	WHI-GRN	RED-BTO	LIT	M	133	-	133	-	-
16	EB21152	YEL-BLK	RED-BTO	LIT	F	-	-	-	-	-
17	EB13120	YEL-YEL	RED-BTO	LIT	M	-	-	*	-	-
18	EJ70575	RED-BTO	RED-BLU	LIT	F	-	-	-	-	-
19	EJ84501	RED-BTO	RED-BLK	LIT	?	-	-	-	-	-
20	EB21821	RED-BLU	BLU-BTO	LIT	?	-	-	-	-	-
21	EB21241	BLU-RED	BLU-BTO	LIT	?	-	-	-	-	-
22	EJ70568	BLK-BLU	BLU-BTO	LIT	M	*	-	*	-	-
23	EB21789	YEL-RED	BLU-BTO	LIT	?	-	-	-	-	-
25	EB79759	BLU-GRN	GRN-BTO	LIT	M	*	-	*	-	-
26	EB13292	GRN-BLU	GRN-BTO	LIT	M	-	-	-	-	-
27	EB13183	GRN-YEL	GRN-BTO	LIT	F	-	-	-	-	-
28	EJ71160	GRN-RED	BLU-WHI	LIT	?	-	-	-	-	-
29	EB32065	GRN-BTO	GRN-WHI	LIT	M	-	-	-	-	-
30	EB21536	GRN-BTO	BLK-WHI	LIT	M	-	-	-	-	-
30	EB29867	RED-RED	BLK-BTO	LIT	?	223	-	223	-	-
31	EJ70159	GRN-BTO	BLK-YEL	LIT	F	-	-	-	-	-
32	EJ42217	GRN-BTO	WHI-GRN	LIT	M	98	-	98	-	-

33	EB32088	GRN-BTO	YEL-WHI	LIT	M	-	-	-	-	-	-
34	EB94894	LIM-BTO	BLU-RED	LIT	M	*	-	*	-	-	-
35	EB94893	LIM-BTO	BLU-BLK	LIT	F	*	-	*	-	-	-
36	EB94954	LIM-BTO	BLK-WHI	LIT	M	*	-	*	-	-	-
37	EJ11047	RED-BLK	BLK-BTO	LIT	M	109	-	109	-	-	-
38	EB32853	RED-WHI	BLK-BTO	LIT	F	109	-	109	-	-	-
39	EB87245	BLU-BLK	BLK-BTO	LIT	?	-	-	*	-	-	-
40	EJ77756	WHI-RED	BLK-BTO	LIT	?	-	-	*	-	-	-
41	EJ70591	WHI-WHI	BLK-BTO	LIT	M	97	-	97	-	-	-
42	EJ77974	WHI-WHI	BLK-BTO	LIT	?	*	-	-	-	-	-
43	EB29751	WHI-YEL	BLK-BTO	LIT	F	-	-	-	-	-	-
44	EJ83917	YEL-RED	BLK-BTO	LIT	?	*	-	*	-	-	-
45	EB67536	YEL-GRN	BLK-BTO	LIT	?	-	-	*	-	-	-
47	EJ43329	YEL-YEL	BLK-BTO	LIT	?	-	-	-	-	-	-
48	EN02054	BLK-BTO	RED-BLU	LIT	F	58	-	58	-	-	-
49	EJ77919	BLK-BTO	RED-BLK	LIT	F	11	-	11	-	-	-
50	EN02051	BLK-BTO	RED-YEL	LIT	M	61	-	61	-	-	-
51	EJ43280	BLK-BTO	WHI-RED	LIT	M	169	-	169	-	-	-
52	EJ77074	BLK-BTO	WHI-YEL	LIT	?	-	-	-	-	-	-
53	EJ70186	RED-BLU	WHI-BTO	LIT	F	*	-	*	-	-	-
54	EB13146	RED-WHI	WHI-BTO	LIT	?	-	-	-	-	-	-
55	EB13230	RED-YEL	WHI-BTO	LIT	F	-	-	-	-	-	-
56	EB13187	BLU-YEL	WHI-BTO	LIT	?	-	-	-	-	-	-
57	EB21022	GRN-BLK	WHI-BTO	LIT	?	-	-	-	-	-	-
58	EB32095	WHI-BLK	WHI-BTO	LIT	?	-	-	-	-	-	-
59	EB13260	YEL-WHI	WHI-BTO	LIT	?	-	-	-	-	-	-
60	EB79803	YEL-YEL	WHI-BTO	LIT	F	94	-	94	-	-	-
61	EB67485	WHI-RED	WHI-BTO	LIT	?	*	-	188	-	-	-
62	EB67493	WHI-BTO	RED-BLU	LIT	?	-	-	-	-	-	-
63	EN00177	WHI-BTO	BLK-BLK	LIT	?	-	-	-	-	-	-
64	EJ82572	RED-RED	YEL-BTO	LIT	?	*	-	-	-	-	-
65	EB89794	RED-BLK	YEL-BTO	LIT	M	-	-	-	-	-	-
66	EB21336	GRN-RED	YEL-BTO	LIT	?	-	-	-	-	-	-
67	EB13235	GRN-BLU	YEL-BTO	LIT	M	-	-	-	-	-	-
68	EJ70179	BLU-BLU	YEL-BTO	LIT	?	*	-	-	-	-	-
69	EJ43277	BLU-YEL	YEL-BTO	LIT	?	*	-	189	-	-	-
70	EJ82556	BLK-RED	YEL-BTO	LIT	M	236	-	236	-	-	-
71	EB98684	BLK-BLU	YEL-BTO	LIT	M	43	-	43	-	-	-
72	???????	BLK-YEL	YEL-BTO	LIT	?	-	-	-	-	-	-
73	EJ82035	WHI-RED	YEL-BTO	LIT	M	-	-	-	-	-	-
74	EB32246	YEL-BLU	YEL-BTO	LIT	M	111	-	111	-	-	-
75	EB89802	YEL-GRN	YEL-BTO	LIT	M	144	-	144	-	-	-
76	EB29293	YEL-WHI	YEL-BTO	LIT	M	-	-	-	-	-	-
77	EJ70209	YEL-BTO	RED-GRN	LIT	M	-	-	-	-	-	-
78	EB89772	YEL-BTO	RED-YEL	LIT	F	-	-	-	-	-	-
79	EN00264	YEL-BTO	GRN-GRN	LIT	?	*	-	-	-	-	-
80	EN02058	YEL-BTO	RED-WHI	LIT	?	-	-	-	-	-	-
81	EJ71149	YEL-BTO	BLK-BLU	LIT	F	-	-	-	-	-	-
82	EB21148	GRY-YEL	BRN-BTO	LIT	?	*	-	*	-	-	-
83	EB13098	GRY-ORN	BRN-BTO	LIT	?	-	-	-	-	-	-
84	EB13138	RED-YEL	ZZZ-BTO	LIT	F	*	-	*	-	-	-
85	EB13199	BLU-BLU	ORN-BTO	LIT	M	*	-	-	-	-	-
86	EB21228	BLU-WHI	ORN-BTO	LIT	M	-	-	-	-	-	-
87	EB13236	GRN-GRY	ORN-BTO	LIT	M	-	-	-	-	-	-
88	EB13201	BLK-ORN	ORN-BTO	LIT	F	*	-	-	-	-	-
89	EB13118	YEL-RED	ORN-BTO	LIT	?	-	-	-	-	-	-
90	EB13210	ORN-BLU	ORN-BTO	LIT	M	-	-	-	-	-	-
91	EB13276	GRY-BLU	ORN-BTO	LIT	?	-	-	-	-	-	-
222	EJ84040	RED-WHI	GRN-BTO	LIT	?	*	-	*	-	-	-
223	EJ11491	BLU-RED	GRN-BTO	LIT	F	56	-	56	-	-	-
224	EN02879	GRN-BTO	RED-GRN	LIT	F	144	-	144	-	-	-
225	EB21100	BRN-BTO	YEL-WHI	LIT	?	-	-	-	-	-	-
226	EB21608	RED-RED	BLU-BTO	LIT	?	-	-	-	-	-	-
227	EN03061	YEL-BTO	WHI-BLU	LIT	?	*	-	-	-	-	-
228	EJ11664	YEL-BTO	WHI-YEL	LIT	?	-	-	-	-	-	-
229	EB21210	YEL-BTO	WHI-WHI	LIT	?	-	-	-	-	-	-

230	EN03677	YEL-BTO	YEL-RED	LIT	?	87	-	87	-	-	-
231	EN03681	YEL-BTO	YEL-WHI	LIT	F	133	-	133	-	-	-
232	EN03687	YEL-BTO	YEL-GRN	LIT	F	31	-	*	-	-	-
233	EN03690	YEL-BTO	YEL-BLU	LIT	?	-	-	-	-	-	-
240	EB67593	WHI-BLU	ZZZ-ZZZ	LIT	M	*	-	70	-	-	-
273	EN96460	RED-BTO	RED-RED	LIT	M	93	-	93	-	-	-
274	EN96461	RED-BTO	RED-LIM	LIT	F	88	-	91	-	-	-
275	EN96462	RED-BLU	YEL-BTO	LIT	M	115	-	115	-	-	-
276	EN96463	RED-YEL	YEL-BTO	LIT	M	40	-	40	-	-	-
277	EN96464	RED-WHI	YEL-BTO	LIT	M	89	-	-	-	-	-
278	EN96465	RED-LIM	YEL-BTO	LIT	M	108	-	108	-	-	-
279	EN96466	GRN-YEL	YEL-BTO	LIT	M	116	-	116	-	-	-
280	EN96467	BLU-RED	YEL-BTO	LIT	M	11	-	11	-	-	-
281	EN96468	RED-BTO	GRN-GRN	LIT	M	10	-	10	-	-	-
282	EN96469	RED-BTO	GRN-WHI	LIT	M	6	-	COL	-	-	-
283	EN96470	RED-BTO	GRN-BLK	LIT	?	32	-	NB	-	-	-
284	EN96471	RED-BTO	GRN-LIM	LIT	M	86	-	86	-	-	-
285	EN96472	RED-BTO	BLU-GRN	LIT	M	-	-	-	-	-	-
286	EN96473	RED-BTO	BLU-WHI	LIT	M	74	-	74	-	-	-
287	EN96474	RED-BTO	BLU-YEL	LIT	M	130	-	130	-	-	-
288	EN96475	RED-BTO	BLU-BLK	LIT	M	136	-	136	-	-	-
289	EN96476	RED-BTO	YEL-GRN	LIT	F	116	-	116	-	-	-
290	EN96477	RED-BTO	YEL-YEL	LIT	F	83	-	83	-	-	-
291	EN96478	RED-BTO	YEL-LIM	LIT	F	97	-	97	-	-	-
292	EN96479	LIM-BLK	YEL-BTO	LIT	M	-	-	-	-	-	-
293	EN96481	RED-BTO	WHI-YEL	LIT	F	102	-	102	-	-	-
294	EN96482	RED-BTO	WHI-WHI	LIT	M	53	-	-	-	-	-
295	EN96483	RED-BLK	BLU-BTO	LIT	F	89	-	89	-	-	-
296	EN96484	RED-BTO	WHI-LIM	LIT	F	161	-	161	-	-	-
297	EN96485	RED-BTO	BLK-RED	LIT	?	*	-	*	-	-	-
298	EN96486	BLU-BLU	BLU-BTO	LIT	F	141	-	141	-	-	-
299	ER44009	BLU-WHI	BLU-BTO	LIT	F	136	-	136	-	-	-
300	ER44010	RED-BTO	BLK-YEL	LIT	F	118	-	118	-	-	-
301	ER44011	RED-BTO	BLK-LIM	LIT	M	118	-	118	-	-	-
302	EB81044	RED-GRN	YEL-BTO	LIT	F	115	-	115	-	-	-
303	EJ71879	GRN-GRN	YEL-BTO	LIT	F	110	-	113	-	-	-
304	EJ82553	GRN-LIM	YEL-BTO	LIT	F	130	-	130	-	-	-
305	EJ67389	BLU-BLK	YEL-BTO	LIT	M	-	-	-	-	-	-
306	EJ78782	YEL-BLK	YEL-BTO	LIT	M	54	-	54	-	-	-
307	EJ78887	YEL-LIM	YEL-BTO	LIT	M	102	-	102	-	-	-
308	EB87142	BLU-LIM	YEL-BTO	LIT	F	128	-	128	-	-	-
309	EJ10648	WHI-WHI	YEL-BTO	LIT	F	67	-	67	-	-	-
310	EJ82671	WHI-LIM	YEL-BTO	LIT	M	83	-	83	-	-	-
311	EB94319	BLK-GRN	YEL-BTO	LIT	F	-	-	-	-	-	-
312	EJ11682	BLK-WHI	YEL-BTO	LIT	?	-	-	-	-	-	-
313	EJ71990	BLK-BLK	YEL-BTO	LIT	F	40	-	40	-	-	-
314	EJ77180	BLK-LIM	YEL-BTO	LIT	F	54	-	54	-	-	-
315	EB67608	LIM-RED	YEL-BTO	LIT	F	10	-	10	-	-	-
316	EB67445	LIM-GRN	YEL-BTO	LIT	M	67	-	67	-	-	-
317	EB32200	LIM-BLU	YEL-BTO	LIT	F	-	-	-	-	-	-
318	EJ70232	LIM-YEL	YEL-BTO	LIT	M	110	-	113	-	-	-
319	EJ82641	LIM-WHI	YEL-BTO	LIT	F	*	-	-	-	-	-
320	EB67448	RED-BTO	BLU-LIM	LIT	M	88	-	91	-	-	-
321	EB81328	RED-BTO	YEL-BLU	LIT	M	*	-	-	-	-	-
322	EB32514	RED-BTO	YEL-BLK	LIT	M	-	-	-	-	-	-
323	EJ83799	BLK-BTO	YEL-WHI	LIT	F	93	-	93	-	-	-
324	EB98408	RED-BTO	WHI-BLU	LIT	?	-	-	-	-	-	-
325	EJ82933	LIM-LIM	YEL-BTO	LIT	F	60	-	60	-	-	-
326	EB32328	RED-GRN	BLU-BTO	LIT	F	62	-	62	-	-	-
327	EJ70223	RED-BTO	WHI-BLK	LIT	M	31	-	*	-	-	-
328	EB67744	RED-LIM	BLU-BTO	LIT	M	163	-	163	-	-	-
329	EJ83600	RED-WHI	BLU-BTO	LIT	?	132	-	132	-	-	-
330	EJ82557	BLU-GRN	BLU-BTO	LIT	?	-	-	-	-	-	-
331	EJ71820	RED-BTO	BLK-BLU	LIT	F	135	-	135	-	-	-
332	EJ10630	YEL-WHI	LIM-BTO	LIT	M	1	-	1	-	-	-
333	EB67973	BLU-LIM	BLU-BTO	LIT	?	-	-	-	-	-	-

334	EJ70231	YEL-BLU	BLU-BTO	LIT	F	104	-	9	-	-	-
335	EB21227	YEL-GRN	BLU-BTO	LIT	M	56	-	56	-	-	-
336	EB98310	GRN-LIM	BLU-BTO	LIT	F	-	-	-	-	-	-
337	EJ77009	GRN-GRN	BLU-BTO	LIT	?	*	-	*	-	-	-
338	EB67429	GRN-RED	BLU-BTO	LIT	F	-	-	-	-	-	-
339	EB81198	GRN-BLU	BLU-BTO	LIT	F	111	-	111	-	-	-
340	EB67905	GRN-YEL	BLU-BTO	LIT	?	14	-	14	-	-	-
341	EJ71933	BLK-RED	BLU-BTO	LIT	?	104	-	104	-	-	-
342	ER44024	RED-BTO	LIM-RED	LIT	M	73	-	73	-	-	-
343	ER44267	RED-BTO	LIM-BLU	LIT	M	48	-	48	-	-	-
344	ER44269	WHI-BLU	BLU-BTO	LIT	F	6	-	6	-	-	-
345	ER44282	YEL-WHI	BLU-BTO	LIT	F	126	-	126	-	-	-
346	ER44283	RED-LIM	LIM-BTO	LIT	?	-	-	-	-	-	-
347	ER44286	RED-BTO	LIM-WHI	LIT	F	179	-	179	-	-	-
348	ER44287	GRN-BTO	RED-BLU	LIT	F	1	-	1	-	-	-
349	ER44288	GRN-BTO	BLU-RED	LIT	?	-	-	-	-	-	-
350	ER44290	GRN-BTO	BLU-YEL	LIT	?	*	-	*	-	-	-
351	ER44292	GRN-BTO	BLU-BLU	LIT	?	*	-	*	-	-	-
352	ER44293	GRN-BTO	BLU-GRN	LIT	?	-	-	-	-	-	-
353	ER44295	GRN-BTO	BLU-BLK	LIT	?	-	-	-	-	-	-
354	ER44298	GRN-BTO	BLU-WHI	LIT	?	-	-	-	-	-	-
355	ER44300	GRN-BTO	GRN-BLU	LIT	?	-	-	*	-	-	-
356	EJ77135	BLK-BLK	BLU-BTO	LIT	F	61	-	61	-	-	-
357	EB29832	BLK-WHI	BLU-BTO	LIT	?	*	-	*	-	-	-
358	EJ84832	WHI-RED	BLU-BTO	LIT	?	-	-	-	-	-	-
359	EJ85403	WHI-GRN	BLU-BTO	LIT	?	-	-	-	-	-	-
360	EB67390	LIM-RED	BLU-BTO	LIT	?	-	-	-	-	-	-
361	EB67531	LIM-BLU	BLU-BTO	LIT	?	*	-	NB	-	-	-
362	EN00107	BLU-BLU	WHI-BTO	LIT	F	73	-	73	-	-	-
363	ER44551	GRN-BTO	GRN-GRN	LIT	?	*	-	*	-	-	-
364	ER44553	GRN-BTO	GRN-LIM	LIT	?	123	-	NB	-	-	-
365	ER44554	GRN-BTO	LIM-RED	LIT	?	-	-	-	-	-	-
366	ER44556	GRN-BTO	LIM-BLU	LIT	?	*	-	*	-	-	-
367	ER44557	WHI-LIM	BLU-BTO	LIT	?	-	-	*	-	-	-
368	ER44558	GRN-BTO	LIM-GRN	LIT	F	121	-	121	-	-	-
369	ER44559	GRN-BTO	LIM-LIM	LIT	?	*	-	*	-	-	-
370	ER44562	GRN-BTO	LIM-BLK	LIT	M	145	-	145	-	-	-
371	ER44563	GRN-BTO	LIM-WHI	LIT	M	156	-	NB	-	-	-
372	ER44563	GRN-BTO	BLK-BLU	LIT	?	-	-	-	-	-	-
373	ER44565	GRN-BTO	WHI-BLU	LIT	?	-	-	-	-	-	-
374	ER44566	GRN-BTO	WHI-WHI	LIT	?	-	-	-	-	-	-
375	ER44567	WHI-BTO	RED-GRN	LIT	?	*	-	*	-	-	-
376	ER44568	WHI-BTO	WHI-BLK	LIT	?	*	-	*	-	-	-
377	ER44569	WHI-BTO	RED-BLK	LIT	?	*	-	*	-	-	-
378	ER44570	WHI-BTO	BLU-RED	LIT	?	*	-	*	-	-	-
379	ER44572	WHI-BTO	BLU-BLU	LIT	F	*	-	160	-	-	-
380	ER45033	RED-BLU	RED-BTO	LIT	F	156	-	NB	-	-	-
381	ER45034	YEL-RED	RED-BTO	LIT	F	236	-	236	-	-	-
382	ER45038	RED-BTO	LIM-YEL	LIT	M	228	-	228	-	-	-
383	ER45039	RED-BTO	LIM-BLK	LIT	M	141	-	141	-	-	-
384	ER45040	GRN-BTO	RED-LIM	LIT	M	16	-	16	-	-	-
385	ER45041	GRN-BTO	YEL-GRN	LIT	F	154	-	OUT	-	-	-
386	ER45042	WHI-BTO	YEL-WHI	LIT	M	68	-	68	-	-	-
387	ER45043	WHI-BTO	GRN-WHI	LIT	F	43	-	43	-	-	-
388	ER45044	GRN-BTO	BLK-GRN	LIT	M	151	-	151	-	-	-
389	ER45045	WHI-BTO	WHI-BLU	LIT	F	151	-	151	-	-	-
390	ER45046	WHI-BTO	WHI-RED	LIT	M	128	-	128	-	-	-
391	ER45047	RED-BLK	RED-BTO	LIT	M	171	-	NB	-	-	-
392	ER45049	WHI-BTO	WHI-WHI	LIT	M	121	-	126	-	-	-
393	ER45050	WHI-BTO	RED-YEL	LIT	M	58	-	58	-	-	-
394	ER44583	GRN-BTO	BLK-BLK	LIT	F	125	-	125	-	-	-
395	ER45084	GRN-GRN	BLK-BTO	LIT	M	127	-	171	-	-	-
396	ER44598	WHI-BTO	WHI-LIM	LIT	F	194	-	194	-	-	-
397	ER44612	BLK-BLK	RED-BTO	LIT	F	86	-	86	-	-	-
398	ER44620	GRN-BTO	BLK-LIM	LIT	M	64	-	64	-	-	-
399	ER44621	GRN-BTO	BLU-LIM	LIT	?	117	-	117	-	-	-

400	ER44626	WHI-BTO	BLK-WHI	LIT	F	163	-	163	-	-	-
401	ER44626	GRN-BTO	WHI-YEL	LIT	F	44	-	44	-	-	-
402	ER44628	GRN-BTO	WHI-LIM	LIT	F	70	-	70	-	-	-
403	ER44629	LIM-BLK	BLK-BTO	LIT	M	94	-	94	-	-	-
404	ER44638	BLU-RED	BLK-BTO	LIT	F	134	-	134	-	-	-
405	ER44649	WHI-BTO	GRN-RED	LIT	F	48	-	48	-	-	-
406	ER44650	GRN-LIM	RED-BTO	LIT	M	75	-	*	-	-	-
407	ER44956	WHI-BTO	BLU-GRN	LIT	M	134	-	134	-	-	-
408	ER44957	BLU-BLU	BLK-BTO	LIT	M	80	-	80	-	-	-
409	ER44960	BLK-BLK	BLK-BTO	LIT	?	114	-	114	-	-	-
410	ER44961	YEL-GRN	GRN-BTO	LIT	M	179	-	179	-	-	-
411	ER44965	BLU-GRN	WHI-BTO	LIT	M	204	-	204	-	-	-
412	ER44971	BLU-WHI	WHI-BTO	LIT	M	206	-	206	-	-	-
413	ER44975	GRN-GRN	WHI-BTO	LIT	F	185	-	185	-	-	-
414	ER44982	GRN-WHI	WHI-BTO	LIT	F	16	-	16	-	-	-
415	ER44986	LIM-LIM	RED-BTO	LIT	F	120	-	OUT	-	-	-
416	ER44987	WHI-BTO	BLK-GRN	LIT	M	120	-	OUT	-	-	-
417	ER45089	LIM-LIM	GRN-BTO	LIT	F	175	-	*	-	-	-
418	ER45090	WHI-BTO	BLK-YEL	LIT	M	175	-	*	-	-	-
419	ER45414	YEL-WHI	RED-BTO	LIT	M	185	-	185	-	-	-
420	ER45415	WHI-BTO	YEL-YEL	LIT	?	224	-	-	-	-	-
421	EB89953	WHI-LIM	WHI-BTO	LIT	M	107	-	107	-	-	-
422	EJ10631	BLU-GRN	LIM-BTO	LIT	?	165	-	165	-	-	-
423	EB81274	RED-LIM	GRN-BTO	LIT	M	29	-	29	-	-	-
424	ER44432	BLU-BLU	GRN-BTO	LIT	F	75	-	*	-	-	-
425	EJ77139	LIM-BLU	GRN-BTO	LIT	M	161	-	161	-	-	-
426	EJ82670	BLK-LIM	WHI-BTO	LIT	F	80	-	-	-	-	-
427	EJ71152	WHI-RED	GRN-BTO	LIT	M	27	-	27	-	-	-
428	EN01165	BLK-WHI	GRN-BTO	LIT	F	164	-	164	-	-	-
429	EN02926	ZZZ-BTO	WHI-WHI	LIT	F	171	-	169	-	-	-
431	EJ82610	BLK-BLK	WHI-BTO	LIT	M	154	-	OUT	-	-	-
432	EH19506	BLU-WHI	GRN-BTO	LIT	F	106	-	106	-	-	-
433	EB98913	YEL-RED	GRN-BTO	LIT	F	45	-	*	-	-	-
434	EJ70689	BLK-BLU	GRN-BTO	LIT	?	131	-	*	-	-	-
435	EB98889	WHI-RED	RED-BTO	LIT	F	78	-	78	-	-	-
436	EJ71793	BLK-BLK	LIM-BTO	LIT	M	106	-	106	-	-	-
437	EJ82669	GRN-RED	BLK-BTO	LIT	F	108	-	108	-	-	-
438	EJ77219	BLK-WHI	LIM-BTO	LIT	M	45	-	45	-	-	-
439	EB67609	BLU-WHI	RED-BTO	LIT	F	29	-	29	-	-	-
440	EN02925	WHI-BTO	GRN-GRN	LIT	F	27	-	27	-	-	-
441	EB89620	GRN-YEL	BLK-BTO	LIT	M	194	-	194	-	-	-
442	EB67713	GRN-BLK	BLK-BTO	LIT	?	23	-	23	-	-	-
443	EJ70207	YEL-BLU	RED-BTO	LIT	?	30	-	-	-	-	-
444	EJ77977	LIM-RED	RED-BTO	LIT	F	145	-	145	-	-	-
445	EJ10644	LIM-BLU	LIM-BTO	LIT	?	21	-	21	-	-	-
446	EB67953	BLU-YEL	RED-BTO	LIT	F	112	-	112	-	-	-
447	EN01152	BLK-RED	LIM-BTO	LIT	M	122	-	122	-	-	-
448	EB89627	WHI-BLK	RED-BTO	LIT	F	174	-	174	-	-	-
449	EJ70240	BLK-BLK	GRN-BTO	LIT	M	135	-	135	-	-	-
450	EN02057	GRN-BTO	WHI-WHI	LIT	F	*	-	NB	-	-	-
451	EB21231	BLU-LIM	LIM-BTO	LIT	F	206	-	206	-	-	-
452	EH14932	LIM-GRN	LIM-BTO	LIT	M	174	-	174	-	-	-
453	EB29679	BLK-RED	BLK-BTO	LIT	F	190	-	190	-	-	-
454	EJ10575	BLU-BLK	WHI-BTO	LIT	M	112	-	112	-	-	-
455	EJ70185	WHI-BLK	BLU-BTO	LIT	M	164	-	164	-	-	-
456	EB32206	LIM-LIM	LIM-BTO	LIT	M	78	-	78	-	-	-
457	EJ78162	WHI-BTO	GRN-BLU	LIT	M	125	-	125	-	-	-
458	EN00587	LIM-WHI	RED-BTO	LIT	F	213	-	213	-	-	-
459	EN04208	GRN-LIM	GRN-BTO	LIT	F	204	-	204	-	-	-
460	ER44039	RED-BTO	LIM-GRN	LIT	M	126	-	121	-	-	-
461	ER44634	WHI-BTO	YEL-BLU	LIT	F	64	-	64	-	-	-
462	EJ71173	YEL-BTO	BLK-YEL	LIT	M	-	-	-	-	-	-
463	ER45434	WHI-BTO	BLK-RED	LIT	?	-	-	*	-	-	-
464	ER45737	WHI-YEL	BLU-BTO	LIT	M	-	-	55	-	-	-
465	ER45769	WHI-BTO	GRN-LIM	LIT	F	-	-	176	-	-	-
466	ER45770	LIM-WHI	WHI-BTO	LIT	F	-	-	80	-	-	-

467	ER45773	YEL-LIM	LIM-BTO	LIT	M	-	-	160	-	-	-
468	ER45791	LIM-WHI	BLU-BTO	LIT	F	-	-	122	-	-	-
469	ER45792	YEL-BLK	WHI-BTO	LIT	M	-	-	25	-	-	-
470	ER45810	LIM-BLU	WHI-BTO	LIT	M	-	-	69	-	-	-
471	ER45877	GRN-BTO	YEL-YEL	LIT	F	-	-	69	-	-	-
472	ER46044	GRN-BTO	YEL-BLK	LIT	F	-	-	84	-	-	-
473	ER46207	WHI-BTO	WHI-YEL	LIT	M	-	-	123	-	-	-
474	ER46209	LIM-LIM	BLK-BTO	LIT	M	-	-	84	-	-	-
475	ER46247	WHI-BTO	RED-LIM	LIT	F	-	-	76	-	-	-
476	ER45248	WHI-BTO	WHI-GRN	LIT	M	-	-	60	-	-	-
477	EJ43212	YEL-BLU	WHI-BTO	LIT	F	-	-	15	-	-	-
478	EB67438	BLK-BLU	LIM-BTO	LIT	F	-	-	55	-	-	-
479	EB67712	YEL-BLK	BLU-BTO	LIT	M	-	-	176	-	-	-
480	EB81015	YEL-YEL	LIM-BTO	LIT	M	190	-	190	-	-	-
481	EB67553	BLU-GRN	BLK-BTO	LIT	F	-	-	25	-	-	-
482	EB84362	YEL-LIM	RED-BTO	LIT	F	-	-	165	-	-	-
483	EB67419	BLU-LIM	GRN-BTO	LIT	M	-	-	15	-	-	-
484	EJ84276	BLK-BLU	WHI-BTO	LIT	M	-	-	213	-	-	-
485	EN01176	YEL-BLU	BLK-BTO	LIT	F	-	-	171	-	-	-
486	EJ58928	LIM-GRN	BLU-BTO	LIT	M	-	-	76	-	-	-
487	EJ77186	GRN-LIM	WHI-BTO	LIT	M	-	-	9	-	-	-
488	ER45834	BLK-YEL	BLU-BTO	LIT	F	-	-	228	-	-	-
489	EJ82014	YEL-YEL	BLU-BTO	LIT	M	-	-	6	-	-	-
490	EB81038	RED-BTO	LIM-LIM	LIT	M	44	-	44	-	-	-
491	ER46587	BLU-LIM	RED-BTO	LIT	F	-	-	123	-	-	-
492	EH19526	WHI-BLK	GRN-BTO	LIT	?	-	-	*	-	-	-

Table 10. Pairings of breeding puffins in permanently staked burrows at Little Hide, 1990-1992. Each number refers to an individually colour-ringed adult (see listing of ring numbers and combinations). UR = bird without a colour-ring. ? = burrow difficult to see but birds from the previous year definitely not there. — = outside the system that year.

	1990	1991	1992
1	322 x UR	322 x 348	322 x 348
4	329 x UR	collapsed	
6	282 x 344	282 x 344	489 x 344
9	—	—	487 x 334
10	281 x 315	281 x 315	281 x 315
11	280 x 10	280 x 10	280 x 10
14	305 x 340	UR x 340	UR x 340
15	—	—	483 x 477
16	—	384 x 414	384 x 414
21	—	445 x UR	445 x UR
23	—	442 x UR	442 x UR
25	—	—	469 x 481
27	—	427 x 440	427 x 440
28	312 x UR	UR x UR	UR x UR
29	—	423 x 439	423 x 439
30	—	443 x UR	?
31	327 x 232	327 x 232	?
32	283 x UR	283 x UR	?
40	pair in 50	276 x 313	276 x 313
43	—	71 x 387	71 x 387
44	337 x UR	490 x 401	490 x 401
45	—	438 x 433	?
48	343 x UR	343 x 405	343 x 405
50	276 x 313	UR x UR	UR x UR
53	294 x 338	294 x UR	? unoccupied
54	306 x 314	306 x 314	306 x 314
55	—	UR x UR	464 x 478
56	335 x 223	335 x 223	335 x 223
58	—	393 x 48	393 x 48
60	325 x UR	325 x UR	325 x 476
61	50 x 356	50 x 356	50 x 356
62	8 x 326	8 x 326	8 x 326
64	UR x UR	398 x 461	398 x 461
65	—	UR x UR	?
67	316 x UR	316 x 307	316 x 307
68	—	68 x 12	68 x 12
69	—	UR x UR	470 x 471
70	240 x 309	240 x 402	240 x 402
73	342 x	342 x 73	342 x 73
74	—	286 x UR	286 x UR
75	—	406 x 424	?
76	286 x 311	UR x UR	486 x 475
78	—	456 x 435	456 x 435
80	UR x UR	408 x 426	408 x 446
81	361 x UR	unoccupied	unoccupied
83	310 x 333	310 x 290	310 x 290
84	—	—	474 x 472
86	284 x 43	284 x 397	284 x 397

	1990	1991	1992
87	230 x UR	230 x UR	230 x UR
88	unoccupied	320 x 274	occupied (to 91)
89	277 x 295	277 x 295	UR x 295
90	—	UR x UR	UR x UR
91	320 x 274	(at 88)	320 x 274
93	273 x 323	273 x 323	273 x 323
94	324 x 60	403 x 60	403 x 60
96	—	378 x UR	unoccupied
97	41 x 291	41 x 291	41 x 291
98	—	32 x UR	32 x UR
102	307 x 293	307 x 293	307 x 293
104	334 x 341	334 x 341	341 x no partner
106	—	436 x 432	Both ? divorced
107/150	421 x 10	421 x 10	421 x 10
108	278 x UR	278 x 437	278 x 437
109	37 x 38	37 x 38	37 x 38
110	318 x 303	318 x 303	unoccupied (to 113)
111	74 x 339	74 x 339	74 x 339
112	—	454 x 447	454 x 447
113	288 x 299	unoccupied (to 136)	318 x 303
114	—	409 x UR	409 x UR
115	275 x 302	275 x 302	275 x 302
116	279 x 289	279 x 289	279 x 289
117	—	399 x UR	399 x UR
118	unoccupied	301 x 300	301 x 300
120	UR x UR	416 x 415	unocc/pair outside
121	368 x UR	368 x 392	368 x 460
122	—	447 x UR	447 x 468
123	—	—	473 x 491
125	—	457 x 394	457 x 394
126	460 x UR	460 x 435	392 x 345
127	—	395 x UR	?
128	322 x 308	390 x 308	390 x 308
130	321 x 317	287 x 304	287 x 304
131	—	434 x UR	?
132	287 x 304	329 x UR	329 x UR
133	15 x 231	15 x 231	15 x 231
134	—	407 x 404	407 x 404
135	331 x UR	331 x 449	331 x 449
136	330 x UR	288 x 299	288 x 299
140	47 x 319	unoccupied	unoccupied
141	285 x 53	383 x 298	383 x 298
144	75 x 224	75 x 224	75 x 224
145	UR x UR	370 x 444	370 x 444
151	—	388 x 389	388 x 389
153	300 x 301	unocc/to 118	unoccupied
154	—	431 x 385	unoccupied/outside
156	—	371 x 380	UR x 380
160	—	?	467 x 379
161	296 x UR	296 x 425	296 x 425
163	328 x 336	328 x 400	328 x 400
164	—	455 x 428	455 x 428
165	—	422 x UR	422 x 482
169	—	51 x UR	51 x 429
171	—	391 x 429	395 x 485

174
175
176
179

—
—
—
—

452 x 449
418 x 417
UR x UR
410 x 347

452 x 449
unocc./to 219 area
479 x 465
410 x 347