SEABIRD STUDIES ON LUNDY

By
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This report contains the results of both recent seabird monitoring studies on Lundy and the details of a complete fulmar census that was carried out in 1987. Some recommendations for future seabird monitoring on Lundy are made.

INTRODUCTION

In 1980 a programme of seabird monitoring was established on Lundy by Davies (1981). In selecting the monitoring Study Plots (S.P.'s) emphasis was given to monitoring of the guillemot population. Changes in the numbers of this species were considered to give the best indication of changes in the marine environment, such as might be caused by a pollution incident. The S.P.'s also contain small numbers of razorbills, puffins, kittiwakes and fulmars. Details of the seven S.P.'s and their location were considered by Davies (1981), who also, in reviewing two years of monitoring information, indicated that no appreciable changes in numbers had occurred. However, he stressed that meaningful indications of long term trends are probably only detectable from count data taken over several years. Further counts have now been completed in 1982, '83 and '86 by Davies and in 1987 by myself. Total seabird censuses carried out in 1981, '82 and '86 are only considered here in as far as they are relevant to the monitoring studies and fulmar census (Davies & Price 1986).

Many factors such as date, time and weather affect seabird attendance at the breeding colony and this influences how counts are best conducted (for detailed discussion of methods see for example:- Davies 1981, Richardson *et al* 1981, Wanless *et al* 1982). Some general details of the methods are considered below; otherwise they are included in the text, where appropriate.

1. The distance of most of the S.P.'s from the counting position is such that accurate counting can only be achieved using a telescope. All counts, including those made in 1987, have used a telescope.

2. The count unit for auks is individual birds present within the plot. For kittiwakes and fulmars the Apparently Occupied Nest (A.O.N.) is used.

3. Auks show a diurnal pattern of attendance at the breeding cliffs and consequently counts are best carried out between 0800 and 1600 hrs, though mornings are preferred. A still greater degree of accuracy is achieved if individual S.P. counts are made at the same time on each count day. In 1987 I made counts from a north to south direction at approximately the following times:-

S.P.1 —	9.10	S.P.5 —	11.20
S.P.2 —	9.30	S.P.6 —	12.15
S.P.3 —	10.30	S.P.7 —	12.50
S.P.4 —	10.40		

4. All S.P.'s were counted five times and these were completed within the first three weeks of June. After this period numbers of auks begin to decline as young fledge. Fluctuations in the numbers of both adult plumaged kittiwakes and A.O.N.'s are normally minimal during June and early July. The numbers of fulmar A.O.N.'s are at their most stable between early June and early July, though even during this period numbers can fluctuate widely.

5. A new kittiwake monitoring site has been set up on the west coast which is here on referred to as S.P.8. This site is described by Davies & Price (1986) as F.7 and can be viewed from a narrow spur to the north of it. Within this site monitoring is taking place of the group of kittiwakes on the steep cliff face above the cave, which is described as Group 2. Photographs are held in the Lundy files in order to help with its location.

GUILLEMOT

Two factors suggest that the monitoring results for this species give an accurate indication of changes in the population as a whole. Firstly, the S.P.'s include almost 30% of the entire island guillemot population and secondly, the different S.P.'s show a remarkable degree of similarity (graph 1). Indeed, studies on Skomer con-

firm that counts made at study plots are good indicators of changes in the population of the island as a whole (Sutcliffe 1987). The counts indicate a drop in the guillemot population to a low 1982 level followed by a recovery, a small decline and most recently a large 40% increase. Monitoring trends are mirrored by the overall census totals (1981-2197, '82-1979, '86-2096).

RAZORBILL

Sutcliffe (1987) has shown that for this species, on Skomer, care has to be taken when using S.P. results as an indicator of island changes; counts often show a large daily variation (notice how the 95% confidence limits, as a percentage of the total, are greater for this species than for the guillemot — Graph 2). However, Lundy's S.P.'s contain 10% of the entire island population (just 5% on Skomer), which, considering the less colonial and more scattered nesting habit of the razorbill, is a reasonable sample. The S.P.'s show a similar pattern and they indicate a slight decline up until 1986 followed by a substantial 60% recovery to earlier levels (graph 2). The overall censuses, which show a substantial decrease (1981- 991; '82- 861; '86- 761) are supported by the monitoring results of those years. However, there is a cautionary lesson. Had the censuses been carried out in other years (such as 1982, '83 and '87) then the monitoring studies suggest that a different long term conclusion, perhaps even one of increase, might have been reached.

PUFFIN

Puffins have occurred in five S.P.'s, although only three would seem to contain breeding individuals (S.P.'s 2, 6 & 7). Contrary to the recent increases that have occurred in both the guillemot and razorbill population, the overall number of puffins within the S.P.'s has declined almost to the point of absence (graph 3). In 1987, for the first time, no puffins were recorded in S.P.7, and in S.P.2 there were only three records of single birds. Though puffins are notoriously difficult to census, the monitoring results, supported by census results (1981- 129; '82- 87; '86- 39) and circumstantial evidence, would seem to indicate a worsening situation for the Lundy puffin.

KITTIWAKE

Kittiwakes only occur in S.P.2. This colony, which contains approximately 6% of the entire island population, is typical of the larger breeding colonies that are to be found around Lundy. The average number of A.O.N.'s, taken from the five counts made in each year, indicate a recent decline (graph 4). The census information confirms that a substantial decline has occurred during this period (1981- 933; '82- 911; '86- 718). A closer look at the censuses shows that this decline is principally attributable to the colonies found around the north end between and including Gannets' Rock and a colony immediately south of Long Roost. Puffin Gully, which in 1982 had 416 A.O.N.'s, had declined to just 220 in 1986 (see below for more detailed information). On the other hand colonies on the west coast have shown increases.

In order to obtain a more representative sample of colonies, I have established a new monitoring site, S.P.8, on the west coast (refer to point five in the introduction). This colony was only first noted in 1986 when there were 32 A.O.N.'s. In 1987 on June 16th there were 38 A.O.N.'s, three containing chicks. A further count was carried out at both this site and S.P.2 on July 6th, so as to obtain information on chick production and hence breeding success:-

	S.P.2	S.P.8
A.O.N.'s with no chicks visible	4	3
A.O.N.'s with at least one chick visible	7	6
A.O.N.'s with one chick (AC1)	15	11
A.O.N.'s with two chicks (AC2)	10	11
A.O.N.'s with three chicks (AC3)	1	Zero

The average number of chicks hatched per nest is calculated from:-

$$\frac{\text{No. of chicks contained in AC1, AC2 and AC3}}{\text{AC1 + AC2 + AC3}}$$

This gives 1.46 and 1.5 for S.P.2 and S.P.8 respectively.

Chick production is calculated from:-

$$\frac{\text{Max. no. of nests recorded with chicks}}{\text{Max. no. of A.O.N.'s recorded}}$$

This gives 77% for S.P.2 and 74% for S.P.8 (though note that for S.P.8 this is on the basis of just one A.O.N. count in June).

Detailed results for Puffin Gully are held by David Dickens of the University of Liverpool, who has been monitoring kittiwake numbers and their breeding success at this site for many years. His results for the past two seasons (1986 & '87) are not encouraging. In 1986 166 nests were observed to produce eggs, while in 1987 this had fallen by a staggering 67% to just 55 (however, the 1987 figure, owing to a later recording date, is not strictly comparable with that in 1986). An additional feature of this site, which does not appear to have its counterpart in other colonies, is the presence of a large number of nests which are completely built but do not contain eggs; 32% of the total in 1986 and 63% in 1987. In 1986 60 nests hatched chicks and in 1987 49. The extraordinary high egg loss reported in 1986 has tentatively been attributed to corvid predation, which nas been noted at this site (Kruger 1984). The average number of chicks hatched per nest in 1986 was 1.45 and in 1987 1.6, while fledging success was 61% and 53% respectively (D. Dickens- personal communication). These figures, while a little on the low side, tend to suggest that in Puffin Gully breeding success is reasonable once eggs have been hatched (that is food supply is unlikely to be limiting), but that egg production and hatching is poor.

FULMAR

The fulmar was the subject of a detailed census in 1987. The total number of adults and A.O.N.'s was counted around the coastline between the 9th and the 26th of June. All the coastline was surveyed from the land using binoculars and telescope.

257 adults and 162 A.O.N.'s were counted (Fig. 1). The principal breeding areas remain in Jenny's Cove and on the north side of Gannets' Rock (76% of the total A.O.N.'s), which are the sites in which fulmars were first recorded breeding in 1944 and 1947 respectively (Dymond 1980). Despite the availability of suitable nesting sites fulmars have only moved into a limited number of new areas and within these areas they have only increased slowly. Comparisons with previous years are difficult (graph 5); count units have included pairs, nests, sites and prospected or occupied sites. Furthermore, fulmar A.O.N.'s are less easy to define than for other species, observers having to decide where it is possible for a bird to lay or incubate an egg. Consequently the possibility of observer error can lead to doubts over the validity of exceptional counts (Wanless *et al* 1982). Graph 5 suggests that up until the early 1970's fulmars only increased very slowly. This was followed by a greatly increased rate of growth and this continued up until 1986. (Too few counts exist to determine whether there was a genuine levelling off during the 1970's). In view of the well documented spread of fulmars in the north Atlantic (e.g. Sharrock 1980) the recent 22% decrease is surprising. Information from the monitoring sites seems to support this decrease, although the sample size is small (C.7% of the total: graph 5).

A close comparison between the 1986 and 1987 census shows that the greatest change in fulmar numbers has been on Gannets' Rock (a decline from 67 to 46 A.O.N.'s). The 1987 figure was based on a number of repeat counts made on different days, which were all very close. There is no obvious explanation for this decline and clearly this site should be counted in the future.

CONCLUSIONS AND RECOMMENDATIONS

The monitoring results for guillemots, razorbills, puffins and kittiwakes show a similar pattern up until 1986. 1982 was evidently a particularly poor year, a dip occurring in nearly all the S.P.'s. This may be connected with the supply of sandeel, *Ammodytes* spp, which forms an important part of the diets of all these species. After 1986 the downwards trend was dramatically reversed for the guillemot and razorbill, with numbers currently at their highest level during the course of this study. The numbers of puffins have continued to decline and their future breeding status on Lundy may now be in doubt.

Lundy's results need not be treated in isolation since monitoring studies have been carried out on Skomer (Sutcliffe 1987) and in North Devon (J. Waldon- personal communication) since 1981. Results for the guillemot and razorbill from Woody Bay in N. Devon indicate substantial increases over the past three years,

with no hint of the decline that occurred on Lundy during 1986. Skomer's counts for the razorbill show a great similarity to those on Lundy, falling in 1982 and in 1986; between the two years there was a gradual increase, which suggests that the Lundy results may be misleading and that rather than a gradual decline, there may have been an abrupt decline in 1986.

The situation with regard to kittiwake numbers is far from clear and, in view of the differing fortunes of different colonies, they clearly require a closer consideration than they have previously had. In view of the relative ease with which kittiwakes can be censused, entire island counts are likely to be the best means of examining population changes for this species. However monitoring studies can continue to play an important part and the new study plot, S.P.8, should now be added to the existing west coast site, S.P.2. It would be useful to have a series of weekly counts from late May through to late August. Otherwise counts in June and early July should give information on the numbers of breeding pairs and chick production respectively. The latter is a useful means of examining breeding success, which is most likely related to food supply. It is interesting to note that at Woody Bay there has been a marked decline since 1983. The situation on Skomer is unclear, but seems to indicate an increase up until 1984, followed by a levelling off.

The recent decrease for the fulmar, following on from years of increase, is most unexpected; on Skomer, not surprisingly, there has been further colonisation and a continued increase. Fulmars are probably best examined by periodic complete censuses. The traditional nesting areas might be expected to give less indication of change than peripheral areas, though note the decline that occurred on Gannets' Rock in 1987.

The factors which affect seabird numbers over many years are little understood. Counts of seabirds will, by themselves, probably provide little relevant information on the causes of either short or long term fluctuations in seabird numbers. Additional research into the feeding requirements of seabirds and the availability and distribution of prey species is needed.

Monitoring studies should continue on Lundy for many years to come. Their capability of detecting, quantifying and subsequently interpreting changes is increased by periodic detailed species counts. However the quality of information obtained from both these methods varies e.g. the study of sample sites can be treated statistically, while general surveys incorporate an unknown degree of error. We have seen that had razorbills been censused in different years a completely different conclusion regarding their status might have been reached.

ACKNOWLEDGEMENTS

This review has drawn upon the work of M. Davies and D. Price, who, over the past 8 years have done a lot for Lundy's seabirds. Thanks are due to S. Sutcliffe and J. Waldon for supplying information for Skomer and N. Devon respectively. Also to Dr. D. Dickens for allowing me to quote his results.

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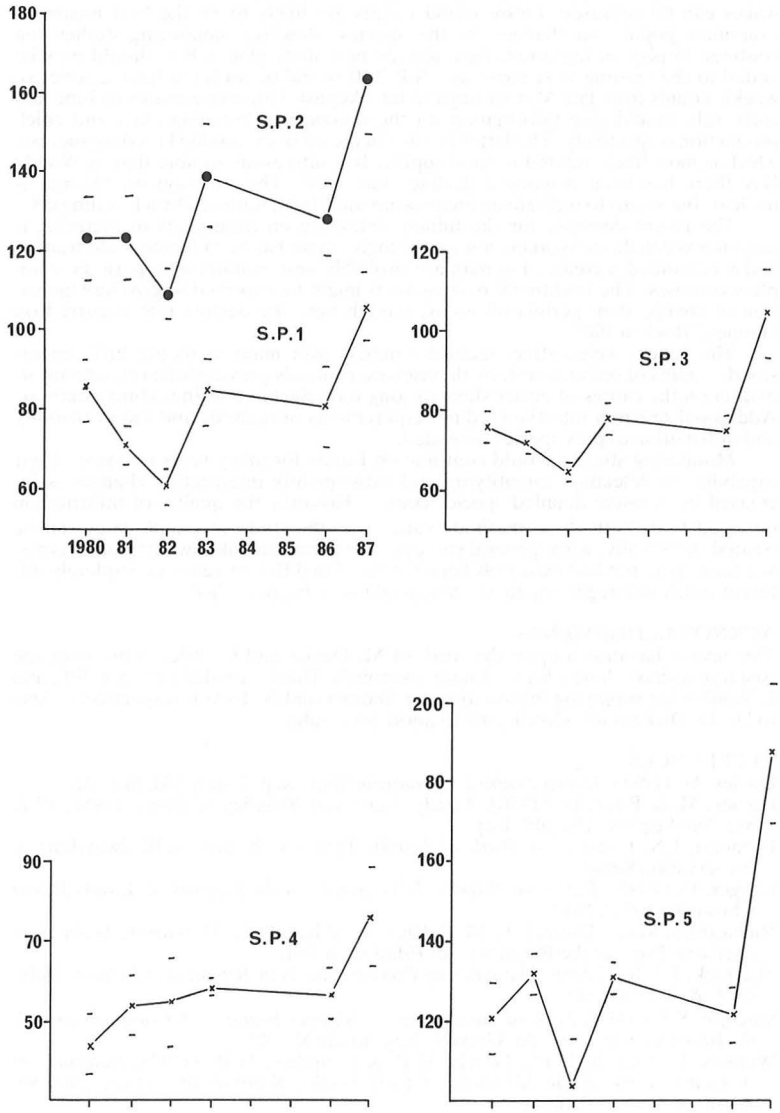
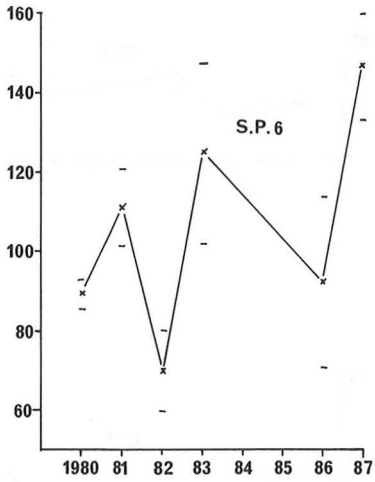
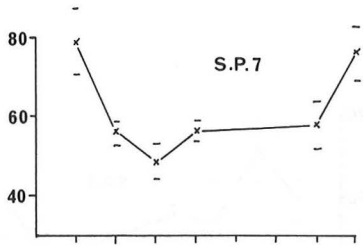
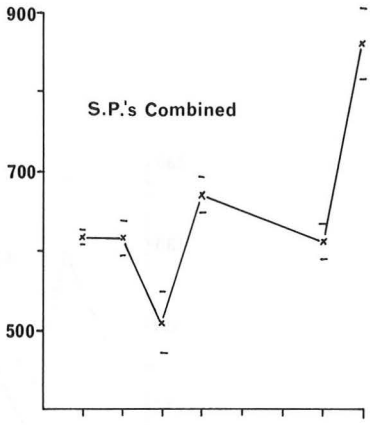
GRAPH 1 — Annual counts of individual guillemots at Study Plots. The means are shown along with 95% confidence limits.



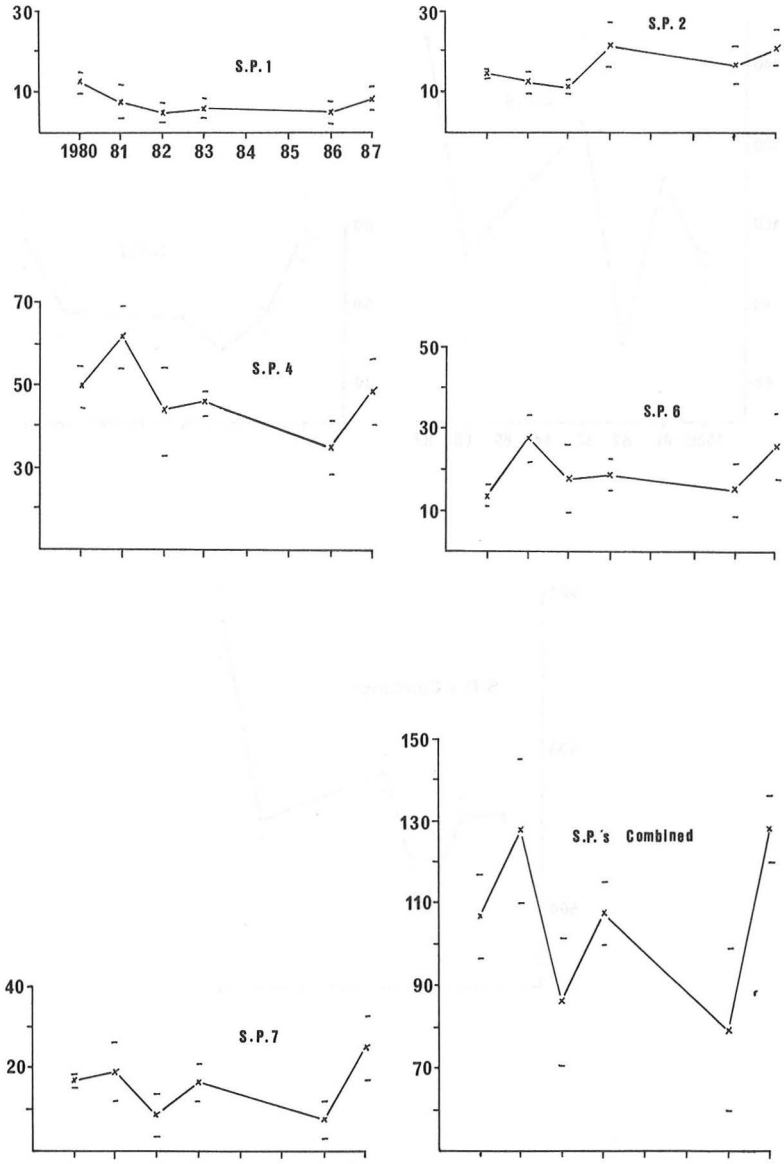
GRAPH 1 Cont.


160
140
120
100
80
60
S.P. 6
1980 81 82 83 84 85 86 87

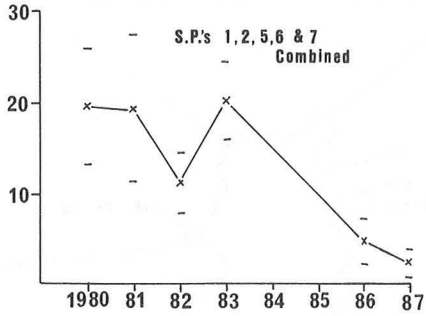

80
60
40
S.P. 7


900
700
500
S.P.'s Combined

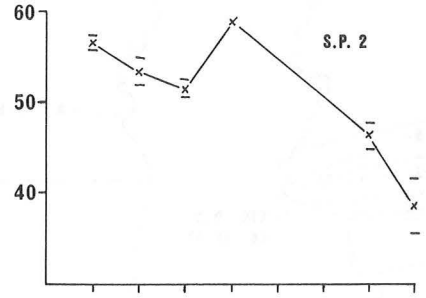
GRAPH 2 — Annual counts of individual razorbills at Study Plots. The means are shown along with 95% confidence limits.



GRAPH 3 — Annual counts of individual puffins at Study Plots. The means are shown along with 95% confidence limits.



GRAPH 4 — Annual counts of kittiwake A.O.N.'s at S.P.2. The means are shown along with 95% confidence limits where these are larger than the symbols.



GRAPH 5 — ● Numbers of fulmar A.O.N.'s since 1960. Information is taken from the annual reports of the L.F.S.

■ Mean annual counts of A.O.N.'s at Study Plots. The results from S.P.2, 5, 6 and 7 have been combined.

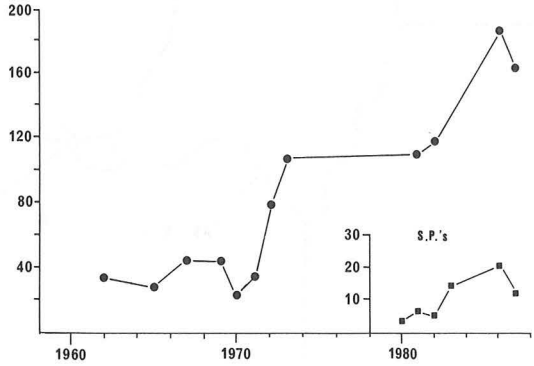


FIGURE 1 — Distribution of Fulmars. Site numbering (eg. E3) is according to Davies & Price (1986) and Davies (1981). Figures are expressed as:- No. of Apparently Occupied Nests . No. of Adults. (Total = 162.257)