

# **SEABIRD REPORT 1972-74**



**The Seabird Group**

**Four 1974**

## **THE SEABIRD GROUP 1972 – 1974**

### **EXECUTIVE COMMITTEE**

*Chairman:* Stanley Cramp

*Hon. Secretary:* W.R.P. Bourne

*Hon Treasurer:* J. Crudass

#### *Members*

C.J. Bibby 1973 –

T.R.E. Devlin – 1972

G.M. Dunnet

D. Melville 1973–74

O.J. Merne

J.L.F. Parslow – 1974

C.M. Perrins

### **REPRESENTATIVES OF SOCIETIES**

*British Ornithologist's Union* S. Cramp

*British Trust for Ornithology:* C.M. Perrins

*Royal Society for the Protection of Birds:* J. Crudass

### **DIRECTOR OF RESEARCH**

W.R.P. Bodrne

### **REPORT EDITOR**

C.J. Bibby

### **CIRCULAR EDITOR**

J. Crudass

### **ADDRESSES**

Secretary, c/o Zoology Department, Aberdeen University, Tillydrone Avenue,  
Aberdeen, AB9 2TN Tel: Aberdeen 40241 ext 6435

Treasurer and editors, c/o Royal Society for the Protection of Birds,  
The Lodge, Sandy Beds SG19 2DL. Tel: Sandy 80551

## CONTENTS

The Seabirds of the Shetlands. W.R.P.Bourne & T.J.Dixon.	1
Studies of the Great Skua <i>Catharacta skua</i> on Foula. R.W.Furness.	19
Status of the Kittiwake and Great Black-backed Gull on North Rona. J.A.Love.	29
The Effect on Tern Populations of Black-headed Gull Numbers. J.H.Taverner.	36
Analysis of Herring Gull Pellets collected in Co. Antrim. D.Melville.	40
Rhum and Canna Manx Shearwaters; Some Introductory Observations. A.D.K.Ramsay.	46
A Brief History of the Storm Petrel on Burhou. R.Barrow.	49
Diurnal Variations in Numbers of Seabirds at Colonies. H.E.M.Dott.	55
Seabird Movements in Scotland, Autumn 1973. A.C.B.Henderson.	65
Movement of Seabirds at Clogher Head, Co. Louth 1971-73. C.C.Moore.	78
Observations of Seabird Movements at Barfleur, Normandy in the Autumn. D.B.Wooldridge.	87
Purple Sandpipers - Offshore Migrants? H.P.K.Robinson.	93
Seventh Report of the Seabird Group, 1971-72.	94
The Seventh Annual General Meeting of the Seabird Group.	96
Eighth Report of the Seabird Group, 1972-73.	97
The Eighth Annual General Meeting of the Seabird Group.	100
The Seabird Group.	101

### **Publication schedules**

Because of the long time taken in assembling enough material, the *Seabird Report* has fallen behind its publication schedules. The last published in 1973 was nominally for 1971 which causes confusion when citing references. For this reason, the present issue, published in 1974, has been numbered four in the series of printed reports and is dated 1972-74 so as to reduce confusion in looking through the whole series. In future it is hoped that reports will bear a sequential number and the year of publication. References to this issue should be cited as *Seabird Report 4 (1974)*.

# THE SEABIRDS OF THE SHETLANDS

From the Proceedings of a Nature Conservancy Council  
Symposium on the Natural Environment of Shetland, Edinburgh,  
29 – 30 January, 1974

W.R.P. Bourne and T.J. Dixon

## Introduction.

Off the north-west coast of Europe there occurs an area of high marine productivity where warm saline water moving north-east from the tropics in the North Atlantic Drift meets coastal water diluted and enriched by drainage from the land moving north up the coast of Europe and is mixed with it and deeper water by turbulence and strong tidal currents around the irregular coastline and outlying islands and by storms moving east along the Polar Front. This process of mixing brings nutrient salts to the surface and results in a rich growth of plankton in summer which ultimately supports a large population of pelagic fish and the predators which feed on them, so that the area has come to serve as a nursery for many of the larger marine animals of the temperate North Atlantic.

The birds which come to this area to breed require safe nest-sites, which they find in part along the rugged mainland coasts, but especially on the islands close to the area of water-mixing along the edge of the continental shelf, off Ireland, western and northern Scotland, Norway and Iceland, in the Faroes, the Westmann Islands, the Lofotens, Svalbard and the Siberian archipelago. The Shetlands occupy a central position in this area, between the branch of the North Atlantic Drift sweeping round the north of Scotland through the Fair Isle Channel and down into the North Sea, and the main stream moving north-east. They have an intermediate type of structure, more rugged than the Orkneys with less shallow water, but less precipitous than St. Kilda or the Faroes, with many cliffs and offshore islands and a stormy maritime type of climate, cool in summer, not too cold in winter, so that they provide a rather exposed but otherwise favourable environment for hardy marine animals throughout the year.

They are generally recognised to be one of the great seabird stations of the world, despite millenia of human interference with the environment. The information on their ornithology has been reviewed by Venables and Venables (1955). That for the seabirds can now be supplemented with the results obtained during the Seabird Group's National survey of breeding seabirds (Cramp et al. in press) and subsequent investigations of the ecology of the birds at sea based at Aberdeen University, which has involved a series of cruises all round the islands at all seasons of the year in the Department of Agriculture and Fisheries for Scotland's Fishery Cruisers and Research Vessels, together with numerous observations collected by

members of the recently-formed Shetland Bird Club. We are particularly indebted to Roger Broad and Fair Isle Bird Observatory, Graham Bundy for information from Unst, Peter Kinneat for information on Eiders (collected on behalf of the Nature Conservancy Council), David Saunders for the seabird census results, many of which he collected himself, Bobby Tullock of the Royal Society for the Protection of Birds for information on distribution, Alan Whitfield for the results of aerial surveys, and Laughton Johnson for a variety of assistance.

### History.

It seems probable that temperate North Atlantic seabirds originally evolved their characteristic adaptations at places like the Shetlands before the arrival of man. The impact of the first human colonists in prehistoric times must have been devastating. The bone deposits excavated at the Jarlshof demonstrate that until quite recently birds, and especially seabirds, provided a major element in the diet of the human population, perhaps especially in the spring when the winter stores were becoming exhausted and the birds were starting to return to the breeding stations. In the Bronze Age the species taken included Great Auks, otherwise unknown in Shetland, and Great Northern Divers, now mainly winter visitors. In the Viking period they included many Gannets, which presumably must have bred and been exterminated then, and have only recently recolonised the group. On the other hand, it is notable that two of the most prominent seabirds at the present day, the Fulmar and the Great Skua, are apparently absent from these deposits, though the Fulmar is represented in Dark Age ones from St. Kilda. It is clearly a recent colonist in Shetland, and it may be wondered whether the Great Skua, which is also missing from the list of vermin for which rewards used to be offered, although included in the Faroes, might be a recent arrival in Shetland too?

The destruction appears to have reached a climax when the human population reached a maximum of over 30,000 and began to acquire breech-loading guns in the middle of the last century. The first important resident ornithologist, Henry Saxby (1874) recorded that virtually all the larger birds except possibly the gulls, which fed on the waste from the expanding fishing industry, were becoming reduced at that time, though the inhabitants were beginning to lose interest in taking the adults of the commoner species following the introduction of the gun tax while still taking many eggs for food and specimens of rarer species for collectors. The survival of the Great Skua, whose population had never amounted to more than a handful of pairs since it was first recorded in 1774, appears to be due entirely to the action of a few enlightened landowners, notably the Edmonston family on Unst and John Scott on Foula.

The next major review of the local ornithology at the end of the nineteenth century by Evans and Buckley (1899) recorded some improvement in the situation with growing enforcement of the Bird Protection Acts of the 1880's,

and as the Venables and the latest check-list by Tulloch and Hunter (1970) demonstrate, it has improved steadily since then, except for Herring and Lesser Black-backed Gulls, which have shared the decline of the local summer "haaf" fishery since the First World War. A parallel increase in deep-water trawling out at sea appears to have favoured more pelagic species instead, notably the Fulmar, which first colonised Foula in 1878 and is now the commonest seabird, and also probably the Great Skua. The other seabirds are nearly all also flourishing in a comparable if less spectacular way, with the possible exception of the auks. Even here any decline is less noticeable than further south, so that the Puffin and Guillemot remain the commonest birds after the Fulmar.

#### **The present situation.**

The numbers of apparently occupied nest-sites reported for the main colonial seabirds at the largest discrete colonies during the 1969-70 census, the totals reported for the whole of Shetland (which are probably fairly complete) and their approximate proportion in those for the whole of Britain (where a good many small gulls nesting inland are omitted) are shown in table 1. In addition to the birds recorded at the colonies, some species such as the skuas Fulmar, Herring Gull, Arctic Tern and Black Guillemot also nest dispersed along the coast or inland, others such as the Cormorant and Storm Petrel have colonies of their own as well, and some species feeding offshore such as the divers and sea duck normally have a scattered type of breeding distribution. No attempt appears to have been made to estimate their breeding population yet, though Peter Kinnear is currently studying the number of Eiders at other seasons.

It will be noted that with the more marine species the population is often both large in absolute terms, and forms a considerable proportion of the British total. By far the most important species is clearly the Great Skua, in which case not only 96.5% of the British population but between a third and a half of that for the whole Northern Hemisphere now nests in Shetland, most of the remainder breeding in the Faroes and Iceland, while the species has recently also colonised Bear Island. A large majority of British Arctic Skuas also breed in Shetland, but this species is also much more widespread and numerous further north. The 40% of British Fulmars that breed in Shetland probably form a considerable proportion of the population of the large-billed low-latitude race *Fulmarus glacialis auduboni* (Salomonsen, 1965) while Shetland also supports a large proportion of the British population of such northern coastal-feeding species as the Black Guillemot (31%), Shag (30%), Arctic Tern (26%), Eider (possibly 10-20%) and Red-throated Diver (difficult to estimate, over 10%?).

It may be noted that while there are substantial populations of some of the other pelagic species, such as the Gannet, Great Black-backed Gull, Kittiwake, Guillemot, Razorbill and Puffin, there are comparable or larger

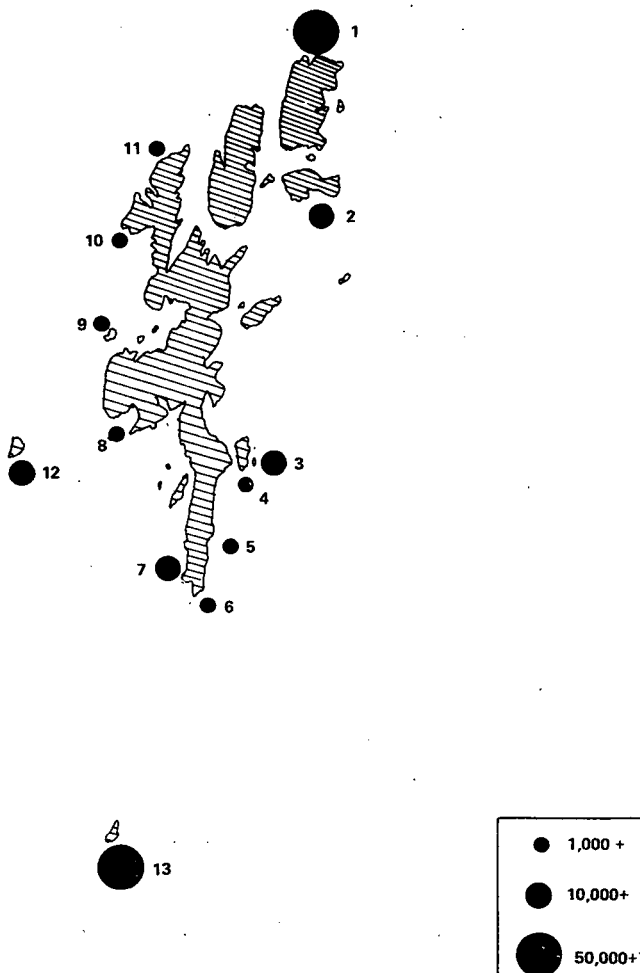
Table 1: Composition of the main Shetland Seabird colonies. Shetland totals and their proportion of the British totals.

Colony	Fulmar	Manx Shearwater	Storm Petrel	Gannet	Cormorant	Shag	Great Skua	Arctic Skua	Great Black-backed Gull	Lesser Black-backed Gull	Herring Gull	Common Gull	Black-headed Gull	Kittiwake	Arctic Tern	Razorbill	Guillemot	Black Guillemot	Puffin	Total
1. Unst	16,300	?	?	5,900	20	1,800	400	80	160	20	480	—	300	5,200	670*	2,620	19,200	100	21,000	71,250
2. Fetlar	13,000	100	+	—	—	750	275	200	350	75	275	200	3	700	750*	200	400	150	c5,000	22,500
3. Noss	2,080	—	—	4,300	—	140	210	40	400	30	500	20	—	10,500	15*	3,100	25,000	50	1,000	47,500
4. Bressay	3,880	?	?	—	—	ord. 2	92	18	20	40	1,230	30	5	230	500*	10	—	100	70	6,350
5. Mousa and Nones	1,030	—	ord. 3-4	—	—	40	15	6	10	45	950	—	—	1,000	170	ord. 1	600	94	ord. 2	4,000
6. Sumburgh Hd Fitful Head	2920	—	—	—	—	500	—	—	35	—	50	—	—	1,400	—	360	2,000	25	1,250	8,500
7. Cliff Sound	8,920	—	—	—	36	50	—	—	70	5	690	—	—	840	—	60	600	35	1,600	12,900
8. Vaila	1,840	—	—	—	30	50	6	—	50	—	140	6	—	180	ord. 1	10	350	30	15	2,700
9. Papa Stour	1,900	—	?	—	20	350	6	20	15	180	90	70	10	750	375	50	c2,000	45	100	6,000
10. Eshaness	150	—	—	—	—	—	—	—	—	—	330	—	—	3,400	—	100	4,500	—	400	8,800
11. Uyea	700	—	?	—	—	70	2	—	10	—	100	—	—	450	80	100	1,000	100	2,006	4,600
12. Foula	ord. 5	+	ord. 3	—	—	ord. 4	1,780	102	15	10	30	3	—	1,210	280	530	ord. 4	60	ord. 5	25,000
13. Fair Isle	17,264	—	50?	—	—	1,530	10	180	55	30	315	—	—	12,120	—	1,200	10,000	160	15,000	58,000
Shetland Total	117,000	100+	?	10,200	460	8,600	3,060	770	2,500	570	10150	1380	530	43,000	7650	8900	77,400	2,300	50,000+	350,000
British Total	40%	0.1%		8.6%	7.4%	30%	96%	71%	13%	1.2%	3.6%	12%	0.7%	10%	26%	9.3%	15%	31%	10+%	10+%

Extracted by David Saunders from the results of the "Operation Seafarer", 1969-1970. ? = possibly present, + = present, not counted, ord. 1,2 etc. = total in range 1-9, 10-99 etc. Common terns were also present in the colonies marked with an asterisk; the Shetland total was 390, 3.3% of the British Total. A small colony of Leach's Petrels is also present on Foula).

Figure 1

Main Shetland seabird colonies listed  
in Table 1.





numbers elsewhere, while at least one nationally important species, the Manx Shearwater, is surprisingly scarce. The Storm Petrel does not seem particularly numerous either, though there are apparently large colonies on some of the smaller islets which receive little attention. Despite repeated speculation that Shetland should provide a stronghold for Leach's Petrel like St. Kilda or the Faroes, so far only one apparent colony has been located, half-way down a cliff on Foula, though birds occasionally appear elsewhere from time to time as well. The comparatively small numbers of some of our commoner seabirds may be a legacy of past persecution, since they may be slow to return if driven away and established elsewhere, or a consequence of the isolated northerly position of the Shetlands, beyond the main zone of water-mixing running up the west coast of Britain and round through the Fair Isle channel into the North Sea which provides the main feeding-area for most of our largest seabird populations, with comparatively little shallow water, as that the Shetlands tend to be favoured mainly by either coastal or pelagic species, with fewer intermediate types feeding offshore.

#### **The location and character of the colonies.**

It is usually taken for granted that seabirds should nest on cliffs in the north temperate zone, so it may be worthy of comment that in the comparable parts of the Southern Hemisphere where there are fewer natural predators at the main oceanic breeding sites and the climate is even worse they commonly nest in more sheltered sites inland, while in the tropics they often nest in trees. Clearly it must be the presence of predators, notably foxes along the mainland coasts and in the Arctic, which has caused our seabirds to become adapted to nest in inaccessible places; in the Arctic the wildfowl do so as well. Likewise it would appear that it is these adaptations which have enabled most of our seabirds to survive several millennia of intense human persecution in Shetland which seems soon to have wiped out species obliged to nest on level ground such as the Great Auk, and possibly the Great Northern Diver, caused the loss of the Gannet for a time, and nearly lead to the loss of the Great Skua. Even the large gulls and the Eider seem to have retreated to inaccessible sites when the pressure was least in the last century, when the latter had a colony of forty pairs on top of Lyra Skerry.

The introduction of alien predators such as dogs and cats, stoats and rats, already present by the 17th century, must have accelerated this process in Shetland, and a watch needs to be kept that the larger ones such as foxes and mink are never introduced. The increase in large gulls and Great Skuas in recent years while probably due to the increased supply of fish-offal also increases the pressure on other birds. This is offset by the loss of some natural avian and marine mammal predators, since there were doubtless once more Killer Whales and seals, while the Snowy Owl which was exterminated about 1820 has only recently become

established, the White-tailed Eagle was lost at the beginning of this century, and the Peregrine is becoming rare, possibly owing to poisoning by organochlorines in seabird prey.

While where they are persecuted seabirds tend to retire to breed on inaccessible sites, where the larger species such as the Gannet and Cormorant, Guillemot and gulls, and especially the Kittiwake are specially adapted to breed on ledges, and the smaller ones such as the Shag, Razorbill, Black Guillemot, Puffin, Manx Shearwater and storm-petrels in holes, when the pressure is removed they soon expand to less inaccessible places. The Arctic Tern, which is particularly inclined to nest on islets offshore or in inland waters where it is persecuted, also breeds on inland moors in the northern isles, and the large gulls are increasingly doing likewise, to some extent in Shetland but especially in Orkney. The skuas, which are particularly adapted for the tundras of high latitudes, where most likely predators can be intimidated by fierce threat-displays, also used by the Arctic Tern, have always bred on barren ground inland, where the small and elusive Arctic Skua has managed well enough until now, but the less wary Great Skua was in severe trouble until it was given protection. Since then it has progressively started to take over all the best sites from the smaller species. The wildfowl and divers which breed around the inland waters were severely reduced in the last century, and the species which feed there still are, possibly owing to a loss of habitat due to reclamation, but the Red-throated Diver, which feeds largely at sea and can manage to breed by the most insignificant tarns, has recovered well.

The distribution of the largest seabird colonies, shown in figure 1, is of some interest. Apparently in the last century the largest were in the most formidable cliffs, on Fair Isle (Williamson 1965) to the south, Foula to the West, (Jackson 1965, Fabritius 1969) and Noss to the east (Perry, 1948) while those at opposite extremities of the main islands were smaller, possibly owing to persecution. With the reduction in persecution and growing overcrowding following the arrival of Gannets at Noss, Hermaness with its lower and more accessible cliffs and stacks at the north end of the islands seems to have gained an importance, (Williamson 1951, Dott 1967), so that we now have the two largest colonies commanding the currents flowing round the extremities of the islands and smaller ones scattered at regular intervals around the rest of the coast. The original colony of Fulmars, the main one of Great Skuas, and the only known colony of Leach's Petrel, three of the most pelagic species, are located on the most westerly island, Foula, in the same way that some of the most important seabird colonies are on the most westerly islands of the St. Kilda Group in the Hebrides and Mykines in the Faroes, whereas in this case the Gannet colonies and some of the largest colonies of the other pelagic species are located on the comparatively precipitous and sheltered north and east coasts of Shetland, where they also overlook some of the richest fishing-grounds around Out Skerries.

## **The annual cycle and distribution at sea**

The attendance at the breeding stations and distribution elsewhere varies greatly with different species. Some, such as the Fulmar, Shag, Great Black-backed and Herring Gulls, Guillemot, Black Guillemot, Red-breasted Merganser and Eider are sedentary when adult, though the young birds may be more mobile, and in some cases may frequent the breeding places during much of the year except when they are moulting in the late summer. Others such as the Manx Shearwater, storm-petrels, Gannet, Cormorant, skuas, Lesser Black-backed Gull, Kittiwake, terns, Razorbill, and Puffin are to a varying extent migratory, and only visit the breeding places in summer. The Great Northern Diver, Glaucous Gull, Little Auk, Long-tailed Duck and Goldeneye occur mainly in the winter, though some birds, usually immature may linger in summer, while a number of the resident species are reinforced by the arrival of additional birds from the north in winter, notably the wildfowl, gulls and auks, though the origin of birds seen at sea then is hard to determine. Variable numbers of the more migratory species may also pass through on passage, depending on the extent to which beam winds drift them away from the direct routes between Scandinavia, Iceland or Greenland and the British Isles, but few seem to stay long with most species. The time of arrival and departure of some of the migrants at Fair Isle is shown in table 2.

**Table 2 : Time of arrival and departure of Migrants.**

Red-throated Diver	mid April - Oct/Nov.
Manx Shearwater	early April - Sept/early Nov.
Storm Petrel	late May - Oct.
Long-tailed Duck	mid Sep. - May.
Great Skua	early April - late Oct.
Arctic Skua	Mid April - late Sep.
Lesser Black-backed Gull	late March - early Sep.
Kittiwake	mid Feb./early April - Aug/Sept.
Arctic Tern	May - Oct.
Razorbill	Jan/Feb. - July/early Aug.
Puffin	late March - Aug

The attendance at the colonies of the resident species tends to vary greatly with the weather. Fulmars may visit the colonies irregularly in fine weather from October, and Guillemots in the early mornings at least from November, but they usual depart if the weather deteriorates, possible because they need to spend more time feeding at

sea then. On the other hand, while the big gulls may roost along the cliffs throughout the year, the largest numbers tend to be seen inland in bad weather, when they cannot follow fishing-boats at sea. Great Black-backs often seen to hang around at least more isolated nest-sites in pairs throughout the winter, whereas the Herring Gulls do not take up actual territories until February. The arrival of the first migrants is equally erratic; some Gannets hang around all winter when the food supply is good whereas they do not start to take up territories until late January or February. Although the first Razorbills and Kittiwakes may return in February the whole population do not arrive until April. The movements of the long-distance migrants such as the Manx Shearwater, skuas, Lesser Black-backed Gull, Arctic Tern and Puffin are more predictable, however, most arriving in April and leaving in August or September. Counts of the number of birds of resident species attending the colonies made by Roger Broad at Fair Isle between March and November 1972 and March and December 1973 are shown in Table 3 :-

**Table 3 : Number of birds attending colonies.**

	<b>Fulmar</b>	<b>Guillemot</b>	<b>Razorbill</b>
March	13-175	0-600	0-19
April	15-185	1-450	0-27
May	15-139	550-910	11-40
June	105-124	855-1082	40-51
July	40-117	265-1040	3-63
Aug.	0-69	0-1	0
Sep.	0-58	0	0
Oct.	66-112	0	0 (Many of the autumn
Nov.	11-64	0-56	0 counts were made in
Dec.	0-103	0-324	0 bad weather, and more birds may often be present).

The number of birds visiting the breeding stations may vary during the year. The Fulmar and Guillemot may appear suddenly in very large numbers in the mornings in mid-winter, and one wonders whether winter visitors from elsewhere may call at the colonies then. Otherwise the largest numbers tend to occur towards the end of the breeding season, when immature birds from a wide area may again visit the colonies to prospect and display there. The colonies may be deserted with varying suddenness, depending on the extent to which laying was synchronised, the number of clutches that were lost and whether they were replaced,

Figure 2

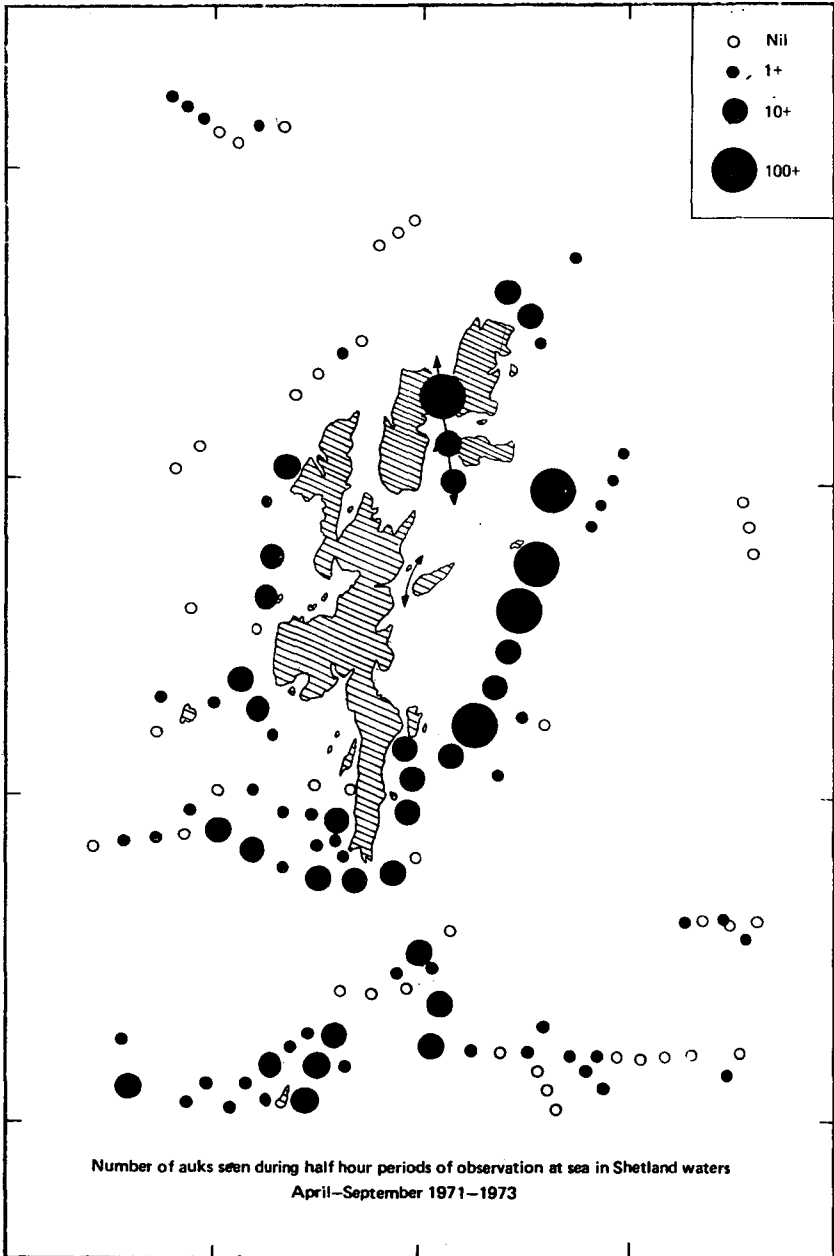
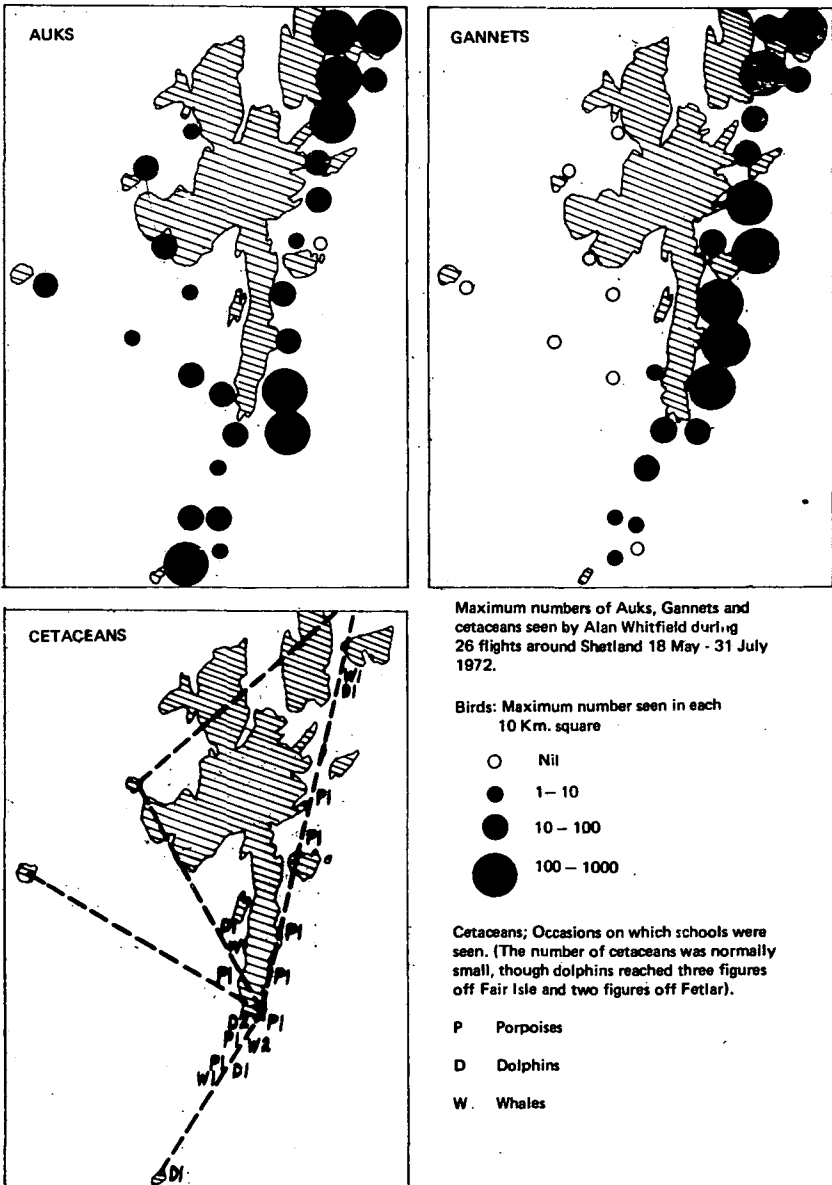


Figure 3

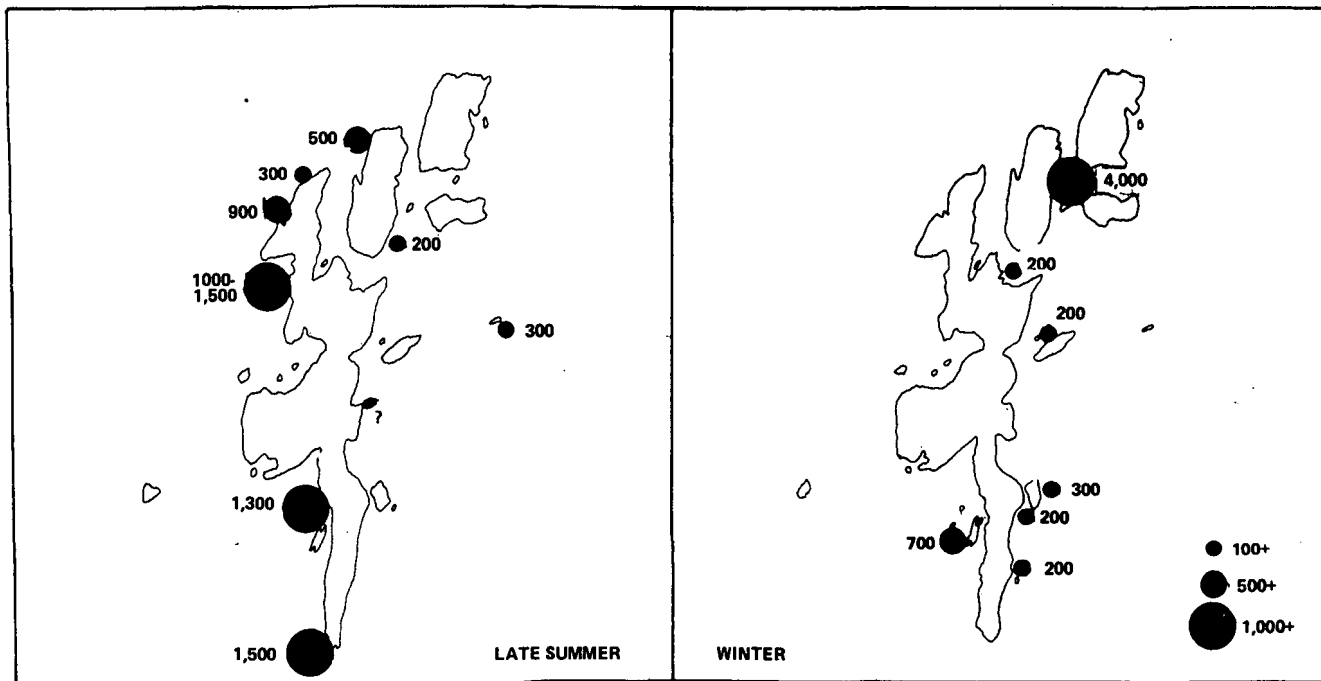


and so forth. Young petrels, Cormorants, the Shags go to sea when they are full grown, and then fend for themselves, whereas young skuas, gulls and terns are fed by the parents to some extent when they start to wander away from the nest; young Sandwich Terns are fed by their parents for months after leaving it, while Eider Ducklings gather in parties looked after by one or two ducks while the rest of the parents go away to moult. Young Guillemots and Razorbills leap into the sea at dusk when only one third grown and less than three weeks old (Kay, 1947), and then complete their growth rapidly in company with the adults while they moult at sea, whereas young gannets and puffins swim out to sea alone.

The Gannet, Cormorant and Shag have a very prolonged moult, which interferes little with their other activities. The big gulls have a shorter one starting towards the end of the breeding season, while the Kittiwake has a rapid one after the breeding season, when flocks of birds gather along the shore in August and September. The divers, wildfowl and auks all lose their flight-feathers simultaneously and gather in flightless flocks in some good feeding area until they grow again; usual this happens in the late summer, but the larger divers and Puffin postpone the moult until they reach their winter quarters. This period has received little attention in Shetland, but the Eiders apparently move to outlying feeding places then (figure 4), while judging by experience elsewhere the Red-throated Divers and large auks may congregate on good fishing grounds offshore, possibly off the east coast of Shetland, further south down the east coast of Britain, or in the case of the auks where ringed birds are recovered along the west coast of Norway. The notorious birdkill in the Irish Sea in the autumn of 1969 may have been due to a failure of the food-supply while the auks were flightless in moult.

In winter the Eiders appear to flock in more sheltered areas (figure 4) where they are joined by wintering wildfowl, notably smaller numbers of Long-tailed Duck and Goldeneye. The Red-throated divers appear to be replaced offshore by Great Northern Divers from Iceland and Greenland, possibly associating with a few White-billed Divers from the north-east though these are rarely recognised. Most of the inshore seabirds such as Shags and Black Guillemots appear to remain sedentary then, though the young birds may wander. The adults of some of the pelagic species continue to visit the colonies in fine weather as already reported. It is not clear to what extent they leave the area if the weather deteriorates. In the last century before oil pollution became a problem it was recorded by several authors that the most sedentary of the

Figure 4



Some Eider flocks observed by Peter Kinnear in July–October 1973 and November – January 1974.

There appears to be a movement off-shore when the birds are flightless in moult in the more sheltered waters in the winter. The full total could be up to twice as large.



pelagic auks, the Guillemots, were liable to be wrecked in bad weather; apparently these were mainly birds of the year which had not yet assumed the summer plumage adopted by the adults in the autumn; this type of mortality still occurs. A variable number of Little Auks occur in the winter, frequenting tide-races in such areas as Sumburgh Roost and Yell Sound, together with other arctic auks more difficult to distinguish from local populations (Bourne, 1968), though the bulk of the Arctic seabird populations appear to migrate south-west towards the Grand Banks of Newfoundland rather than south down the west coast of Europe (Salmonsén, 1972)

The distribution at sea varies with the birds' species and sometimes its age or sex, the season and the weather. In so far as surface-feeding ducks appear at all it appears to be where streams reduce the salinity at the heads of the voes. In the past the Red-breasted Merganser was considered one of the commoner ducks, present throughout the year in the inner channels, where it is joined by Goldeneye in the winter, and the Cormorants are likely to feed here; their numbers apparently run into hundreds. Eiders tend to occur further out to sea; they appear to number at least 6,000 both when they are moulting around the outer coasts in the late summer and when they retire into more sheltered waters in the winter (figure 4). and the extent to which they migrate seems uncertain, though there is apparently a temporary increase in numbers in the autumn at Fair Isle. They are joined by much smaller numbers of Long-tailed Duck in the winter. Their distribution is probably related to that of beds of Shellfish, about which little seems to be known.

The divers and the very large local populations of Shags and Black Guillemots feed around the mouths of the channels and at sea generally within sight of land. The Red-throated Diver is the main species in summer but seems to be largely replaced by a comparable number of Great Northern Divers in Winter. The divers appear to be commonest on passage, especially in the spring, when there is an impression that migrants moving north up the coast of Britain may accumulate in Shetland Waters before starting their overseas migrations. The Herring Gulls follow the fishing boats or fish shoals out to sea to a comparable extent, but are replaced as the commonest big gulls by the black-backed gulls further out to sea, where there are small numbers of Glaucous Gulls in winter. It is notable that the Great Black-back is less numerous around Shetland than off the Orkneys and Hebrides, possibly because they meet more competition from Great Skuas; despite their reputation for piracy around the

breeding stations (Perry, 1948, Lockie, 1953, Oades, 1968) Great Skuas seem to be pelagic feeders most of the time (otherwise no other birds could survive on Foula). and also take offal around fishing boats with the big gulls, Kittiwakes, Fulmars, and sometimes Gannets. The three pelagic auks disperse widely at sea out to the edge of the continental shelf in summer, but the Guillemot and Razor-bill, whose chicks fledge early move inshore to moult later, whereas the Puffin, whose chick fledges late, postpones the moult until it reaches its winter quarters and goes away out to sea as soon as it finishes breeding.

Large numbers of seabirds of all species and also cetaceans congregate to feed together on fish shoals off the east coast of Shetland in summer, and indeed there appear to be many birds here throughout the year (figures 2 and 3). The birds take a variety of species forced to the surface by larger marine animals, including sand-eels, clupeids, young gadoids, and in the case of the Gannet Mackerel. The fish taken by different bird species appear to depend more on their availability than the preference of each species, though of course size also has some influence on what it can catch. While some species normally leave in the winter, they may stay behind when the food-supply is good; thus many Gannets remained behind to fish in the voes when young Saithe (*Gadus virens*) were usually abundant in the winter of 1945-46 (Kay, 1940).

Some spectacular feeding movements occur between the breeding stations and feeding-grounds. Kay (1936) has described how Kittiwakes from the east coast colonies fly low north-west through Yell sound to feed in the Atlantic, returning much higher, possibly to avoid skuas. Myres (1963) studied this phenomenon with radar, and found that the main exodus occurs at dusk, possibly to feed on marine animals that come to the surface at night, with a return at dawn. Fulmars may behave similarly (Coulson and Horobin, 1972), but their movements are less obvious. In the 1930s Kay also saw numbers of auks flying north from Noss between Mainland and Whalsey to feed off the north-east coasts, but since the Gannets started to displace many of the auks from Noss this movement has apparently become less conspicuous and been replaced by another from the growing colonies at Hermaness south through Blue Mull Sound (figure 2). Smaller numbers of birds can often be seen passing round projecting headlands all along the coast; few observations have been made on these movements yet, but they offer outstanding opportunities for the investigations of variations in the behaviour

of the birds with the season of the year and the weather.

### **Threats to Shetland seabirds**

It should be clear that man has had a continuing influence on the welfare of Shetland seabirds ever since he first arrived several millennia ago. At first this was through direct predation, the introduction of alien predators to replace natural ones, and the alteration of habitats, especially marshes. This phase may have reached a climax a little over a century ago. More recently conditions have been improved by the introduction of protection measures associated with the provision of additional food-supplies in the form of fish-offal, at first close to the shore where it benefited mainly the gulls, later further out to sea to the advantage of more pelagic species. This has resulted in the disturbance of the original balance of species in favour of some of the more aggressive ones, which might cause some harm since gulls and skuas are liable to prey on other birds, though it seems possible the damage has been overrated. In addition, Fulmars, spit oil as a defence mechanism which may cause much more harm since it is known to have disabled several scarce stray predators, including at least one of the White-tailed Eagles recently reintroduced to Fair Isle.

In addition new threats have emerged, oil pollution for the more aquatic species (Bourne, 1970; Bourne and Johnston 1971), and organochlorines for the more predatory ones at the end of a food-chain (Bogan and Bourne, 1972). Overfishing which has had a disastrous effect on the guano birds of Peru (Paulik 1971) is also a potential threat to local food-supplies, especially for such species as the auks which depend on small fish of the type taken in industrial fisheries and have not learnt to take offal as an alternative. The last two threats still require evaluation, but there is no doubt about the hazards of oil pollution.

In general, it appears that the cliff-breeding aquatic species are now safer than they have been for a long time at the breeding sites, which are unlikely to be subjects for development, but are increasingly exposed to the risk of oil pollution at sea both where they sit on the water off the breeding sites, and on the feeding-grounds. The birds become flightless in moult, including the divers, wildfowl, and auks, are also particularly endangered then. Oil leaking from installations at sea to the east is likely to be drifted to Norway by the prevailing winds, but this is no particular cause for comfort as the ringing recoveries suggest our auks spend much time off that coast. If an

east wind should chance to occur, the oil is liable either to come ashore under breeding stations such as Noss, or to pass up the channels between the islands sweeping up the birds in them as it goes. Leaks to the west are rather more likely to result in oil coming ashore in Shetland. A particularly severe threat is posed by spills in the channels between the islands such as Yell Sound, where the oil is likely to be swept first one way and then the other by the tide, gradually escaping to drift up and down the opposite coasts of the islands simultaneously as the direction of the wind changes with the passage of weather systems. At most seasons pollution control measures at sea will not be practical.

The situation is different with the birds that breed inland; These are aerial species which suffer little from oil pollution but under modern conditions are more likely to have difficulties at the breeding-places. The large, aggressive species are provoking an increasing reaction from farmers, the Great Skuas by chasing sheep away from their breeding territories, the big gulls because they are suspected of killing lambs, even the Fulmars because they spit oil on sheep. Where these nuisances become serious it would possibly be best to allow the farmers to discourage the birds before their numbers become excessive, so that the large colonies may develop where they cause no harm. In addition, if industrial development proceeds further in Shetland it seems possible the birds may lose an increasing amount of their breeding habitat and meet a growing amount of disturbance of the remainder by people and their pets, and this could prove disastrous on islands with large populations of sensitive species such as Unst. One development recently proposed south of Baltasound is in the immediate vicinity of some fourteen pairs of breeding Arctic Skuas, four of Great Skuas, two of Whimbrel, one of Red-throated Divers, and a colony of a hundred pairs of Arctic Terns. Even if one development of this type was permissible, it may be wondered how many more will be suggested if this is accepted. It may be noted that Arctic Skuas seem particularly at risk in this sort of situation, because the Great Skuas are tending to displace them from all the best sites, in the same way that gulls tend to displace terns from their breeding islands further south.

#### References

- Bogan, J.A. and Bourne, W.R.P. 1972. Polychlorinated biphenyls in North Atlantic seabirds. *Marine Pollution Bull.* 3:171-175
- Bourne, W.R.P. 1967. Arctic auks on the Scottish coast. *Scot. Birds* 5 : 104-107
- Bourne, W.R.P. 1970. Special review-after the Torrey Canyon disaster. *Ibis* 112 : 120-125.

- Bourne, W.R.P. and Johnston, L. 1971. The threat of oil pollution to north Scottish seabird colonies. *Marine Pollution Bull.* 2 : 117-120, 181.
- Cramp, S., Bourne, W.R.P. and Saunders, D. in press. *The Seabirds of Britain and Ireland*, Collins, London.
- Coulson, J.C. and Horobin, J.M. 1972. The annual reoccupation of sites by the Fulmar. *Ibis* 114 : 30-42
- Dott, H.E.M. Number of Great Skuas and other seabirds of Hermaness. *Unst. Scot. Birds* 4 : 340-350.
- Evans, A.H. and Buckley, T.E. 1899. *A vertebrate fauna of the Shetland Isles*. David Douglas, Edinburgh.
- Fabritius, H.E. 1969. Notes on the birds of Foula. *Ardea* 57 : 158-162.
- Jackson, E.E. 1966. Birds of Foula, Scot. *Birds*. 4 supp., P.60.
- Kay, G.T. 1936. Sea-bird movements. *Brit. Birds* 28 : 361-363.
- Kay, G.T. 1947. The young Guillemot's flight to the sea. *Brit. Birds* 48 : 156-157.
- Kay, G.T. 1948. The Gannet in Shetland in winter. *Brit. Birds* 41 : 268-270.
- Lockie, J.D. 1952. The food of Great Skuas at Hermaness, Unst, Shetland, Scot. *Nat.* 64 : 158-162.
- Oades, R.D. 1968. Observations on the behaviour of the Great Skua or Bonxie *Catharacta skua skua* during the early fledging period in Shetland, *Seabird Bull.* 6 : 22-34.
- Paulik, A.J. 1971. Anchovies, birds and fishermen in the Peru current, in W.W. Murdoch (ed.), *Environment, resources and society*, Sinauer Books.
- Perry, R. 1948. *Shetland sanctuary*. Faber and Faber, London
- Salomonsen, F. 1965. The geographical variation of the Fulmar *Fulmarus glacialis* and the zones of the marine environment in the North Atlantic. *Auk* 82 : 327-355.
- Salomonsen, F. 1972. Zoogeographical and ecological problems in Arctic birds, *Proc.XV International Ornithological Congress*: 25-77.
- Saxby, H.L. 1874. *The birds of Shetland*, Edinburgh.
- Tulloch, B. and Hunter, F. 1970. *A guide to Shetland birds*. The Shetland Times, Lerwick.
- Venables, L.S.V. and Venables, U.M. 1955. *Birds and mammals of Shetland*, Oliver & Boyd, Edinburgh and London.
- Williamson, K. 1951. The moorland birds of Unst, Shetland, Scot. *Nat.* 63 : 37-43.
- Williamson, K. 1965. *Fair Isle and its birds*. Oliver and Boyd. Edinburgh and London.

# **GREAT SKUA STUDIES ON FOULA**

**R.W. Furness**

## **Introduction.**

The Brathay Exploration Group has been running expeditions to Foula for many years. These have developed from a programme of observation and ringing of migrants and summer visitors into long term studies on the avian population of the island. These studies are presented in the Field Studies Reports published by Brathay Hall Trust (see references under Mawby) and in Jackson (1966)

The expeditions comprise individuals from schools, colleges and industry, many of whom know little about birds, so the annual bird programme is arranged in advance with this in mind. Expeditions are led by "A" ringers, so the programme leans heavily on large scale ringing projects. Research effort has tended to concentrate on the Bonxie population of Foula, which is now the biggest and densest colony of this species.

There are many minor references to the Bonxie. These are listed in Jackson (1966) and Furness (in press). Major contributions to Bonxie biology include Venables and Venables (1955) on distribution, Perry (1948) on breeding, Bayes, Dawson and Potts (1964) and Lockie (1952) on feeding, Perdeck (1960) on behaviour and Thomson (1966) on migration. More detailed studies of Catharacta have been carried out in the southern hemisphere on the Brown Skua (*C. skua lonnbergi*) and McCormick's Skua (*C. maccormicki*) but these populations differ from the one on Foula in many respects.

## **Methods of study used by Brathay.**

A formal research programme was begun in 1968. Prior to this little had been done other than ringing of numbers of pulli. The programme, repeated annually since 1969, includes ringing and ageing of chicks, colour ringing of chicks using a different colour each year, estimation of number of chicks using a Lincoln index method, examination of variations within the colony of chick density and ages, observation of colour ringed adults, and observation of the feeding and interactions of Bonxies. These studies are continuing. Over and above the annual programme individual studies of Bonxie clubs have been carried out by Mortimer (1971).

and Lindsay (1971), studies of Bonxie pellets by Lindsay (1971) and studies of various aspects of Bonxie ecology by Furness (1973 and in press).

### **Ringling.**

About 15,000 Bonxies, virtually all pulli, have been ringed on Foula to date. These have already yielded a large number of recoveries. Thomson (1966) analysed the recoveries from 5,600 pulli ringed in Shetland before 1965 and found a low recovery rate of about 2½% but it will soon be worth examining the movements of the Shetlandic, Faroese and Icelandic populations using the data from the large numbers ringed in these areas, mainly by Brathay.

### **Numbers.**

Estimation of the total population of Bonxies on Foula is difficult. Direct count methods as used by Dott (1967) at Hermaness could not be used with any accuracy in such a large colony as Foula, but estimates have been made using ringing data and sample censuses in representative regions of the colony.

The colony was divided subjectively into regions on a 1 to 5 scale of arbitrary density of chicks. Chicks in each region are ringed by a team and the ringing efficiency is subsequently determined, using a Lincoln index method, by a second team covering the same area to record the proportion of chicks found by the first team. By summing the numbers ringed in each region and calculating the ringing efficiency for the colony as a whole, the total number of chicks present may be estimated (table 1).

TABLE 1. Estimates of numbers of chicks on Foula each year.

YEAR.	CHICKS RINGED IN COLONY	ESTIMATED % EFFICIENCY	ESTIMATED TOTAL NUMBER OF CHICKS.
1969	1539	54	2860
1970	1162	45	2610
1971	1661	46	3580
1972	1733	54	3200
1973	1300	42	3100

Case histories of 160 nests in regions of density 1, 3 and 5 were followed in 1973. These were taken to be representative of the whole colony. They gave a breeding success of 1.5 eggs hatching per pair. Chick mortality was estimated by recording all corpses found.

This suggested a fledging rate of 1.3 chicks per pair. Thus at the time of ringing there are about 1.4 chicks per breeding pair. This suggests a breeding population of between 1900 and 2600 pairs, assuming that this rate is representative and uniform from year to year.

The absolute nest density was also determined for several areas in 1973. Assuming that these are typical of other areas assigned to the same arbitrary density category, the total breeding population can be estimated from these values. (table 2) This method, which is based on rather small sample areas, agrees with the estimates from ringing data and indicates that the present breeding population stands at 2,400— 3000 pairs

TABLE 2 Estimation of the number of breeding pairs using data from representative areas.

Region Density	Number of Nests in Census Area.	Census Nest Density (nests per Km <sup>2</sup> )	Area of Region (Km <sup>2</sup> )	Total Number of nests.
1	80	320	2.5	800
2	-	-	3.5	900
3	23	230	3.5	800
4	-	-	1.5	150
5	11	70	1.5	100
"clubs"	47	1500	0.1	150
Whole Colony .....				2900

There are also numbers of Bonxies which are present on Foula during part of the summer but do not breed. Their numbers cannot be accurately assessed until the organisation of the clubs and bathing parties is understood, but would seem to be well over 1,000 individuals.

These figures show that the Bonxie population on Foula is continuing to increase rapidly as it has been doing since the turn of the century, when only a score of pairs bred.

#### Aggregations.

The first accurate recording of aggregation sites was made in 1973. These comprise 4 bathing sites, 9 clubs and 5 temporary clubs. Bathing sites are defined as pools where Bonxies habitually gather to bathe, but do not show early reproductive behaviour or hold "club territories". Numbers present increase in the morning, peak in the afternoon and



decrease to zero in the evening. Clubs are defined as areas where birds show early reproductive behaviour (see Perdeck 1960) and considerable aggression. They may establish "club territories" and pair up. Around the edge of the club pairs nest at very high density. The vegetation of the club site is usually markedly changed by trampling and manuring. (Fergusson 1973). Numbers present increase at an afternoon peak after which there is a slight decrease, but this is followed by an increase so that all the club birds are present on the club overnight. Temporary clubs are formed only late in the season and may be the beginnings of a new club in an area where Bonxies are spreading or increasing in density. The site can usually only be identified as a club by the presence of known club birds.

There is no indication of birds breeding until they are at least 5 years old as no colour ringed adults have been seen with eggs or chicks. Thus the clubs probably hold pre-breeders of up to 6 or more years of age, but the extent to which off-duty breeders visit the clubs is unknown. The percentage of birds colour ringed among the club population has been recorded. As about one third of the pulli are colour ringed each year, one would expect about 30% of club birds to be colour ringed if they consist only of pre-breeders. The recorded values are 4% at Mill bathing site, 6% at Overfandal bathing site, 8% at Strem Ness club and at Flick club 8% in 1971, 14% in 1972 and 18% in 1973. The increase at Flick is probably due to the fact that pre-1968 birds were not colour ringed so any of these at the club would reduce the observed percentage. However, all sites were well below the expected level, especially bathing sites, so it seems that most birds at bathing sites are breeders, while a proportion of club birds are probably failed or non-breeders but may include off-duty birds.

Changes in colour ring frequencies recorded at Flick club in 1973 indicate that the oldest pre-breeders return to the club first, followed later by progressively younger birds (table 3). Some of the older birds then leave the club to establish territories. Because birds in the regions of high nest density around clubs are late to lay it seems probable that these are largely young birds which take small territories in these areas to breed for the first time. Table 4 shows the age structure of Flick club pre-breeders. The figures are corrected to allow comparison as if 1000 pulli had been colour ringed in each season. This shows that some birds do not appear to return until they are 4 years old, after which they begin to move off the clubs into territories.

**TABLE 3** Changes in age structure of the club population during one breeding season: Flick club 1973.

Year Ringed	Age (years)	PERCENTAGE RINGED IN SAMPLE TAKEN ON:					
		25.5	1.6	17.6	23.6	30.6	10.8
1968	5	11.2	9.0	4.7	2.0	1.5	2.0
1969	4	4.4	7.3	10.7	9.0	7.0	8.0
1970	3	1.2	1.7	2.7	7.0	8.5	8.0
1971	2	0.0	0.0	0.0	0.0	1.0	0.3
Sample size		160	300	150	100	200	300

**TABLE 4** Age structure of Flick club population in July-August corrected to 1,000 pulli colour ringed each year.

Year.	Age Class (years old)				
	5	4	3	2	1
1971	5.0	-	10.0	1.4	0.0
1972	-	10.0	6.2	0.7	0.0
1973	4.0	7.0	8.0	0.6	0.0
AVERAGE.	4.5	8.5	8.0	0.9	0.0

### **Nesting.**

The ringing data of each year were used to examine the variation in nest density in the regions subjectively delineated, and to examine variations in chick ages through the colony. Both of these were also examined by direct observation of nests in small study areas in 1973.

Between 1969 and 1973 one region has increased in density by two arbitrary categories, three have increased by one category and one has decreased by one category. The colony limits however have remained fairly constant in these five years. Chick density in each region was calculated from the Lincoln index data. The values obtained are given below, each region being placed in its 1972 category (table 5). Part of region 4 has recently increased rapidly in density, resulting in anomalously high values for 1971 and 1972. This area was promoted to density 3 in 1973. Detailed examination of nest densities in 1973 showed that there is a great concentration of nests around the perimeter of the clubs. (table 6).

TABLE 5 Chick densities in each region calculated from ringing data...  
(chicks per Km<sup>2</sup>)

Region Density	Region Area.	Year				Average
		1969	1970	1971	1972	
1	2.5	550	500	525	500	520
2	4.5	200	150	325	320	250
3	3.0	120	130	120	130	125
4	2.0	100	100	150	170	130
5	1.0	30	35	64	47	45

TABLE 6 Nest densities around club sites. (Flick and Lochs clubs)

Distance from club edge(metres)	Number of nests		Nest Density (nests per Km <sup>2</sup> )	
	Flick	Lochs	Flick	Lochs
0-25	11	7	5000	3300
25-50	12	5	2000	830
50-75	13	9	1250	900
75+	80	23	330	250

The ages of chicks were estimated at ringing by plumage characters to the nearest half week. The average age was then calculated for each density region (table 7). It would appear that breeding occurs earliest in the higher density regions. Hatching dates of all nests in three areas were recorded in 1973. The mean laying dates in each area were May 20 in region 1, May 22 in region 3 and May 24 in region 5. These are all significantly different. The laying dates in nests around two clubs were also calculated (table 8). These differ significantly.

TABLE 7 Average age in weeks of chicks ringed in each region corrected to age on July 1st.

Year.	Region.					Average.
	1	2	3	4	5	
1969	3.28	2.86	2.87	2.66	2.81	2.94
1970	2.20	2.18	1.91	1.40	1.37	2.14
1971	2.23	1.52	0.84	0.61	0.39	1.83
1972	2.17	2.20	1.85	1.74	0.97	2.12
Average.	2.49	2.19	1.87	1.60	1.38	2.20

TABLE 8 Laying dates around Flick and Lochs clubs.

Distance from club edge (metres)	Number of clutches	Average laying date.
0-25	17	May 26 **
25-75	34	May 21 **
75 +	117	May 17 **

\*\* Average laying dates differ significantly at 5% level.

The different regions do not show significant differences in chick productivity, but "club" nests are significantly less productive than "colony" nests. 94 colony nests produced 140 chicks, while 52 club nests produced only 58 chicks.

From the above evidence it is suggested that Bonxies breed for the first time around the edge of clubs at higher density, later and less successfully than established colony breeders. It is generally held that the "best" birds breed in the centre; i.e. in the high density portion of the colony where laying is earlier and success higher. The high density regions of the Foula colony may be strictly analogous to the "centre" but club areas seem to be anomalous in combining very high density with late laying and low success. It may be that the greatly enlarged population on Foula strongly restricts the recruitment of immature Bonxies. The high social stimulation of the club system may be one way of overcoming this inhibition.

Bourne and Bogan (1972) found that the Bonxie has one of the highest organochlorine levels of the North Atlantic seabirds, so it is interesting to examine the breeding success of the Bonxie with this in mind. Future increases in the organochlorine load may be accompanied by increased egg losses. The present loss rate may already be affected for although the Foula Bonxie population shows the highest recorded fledging rate for *Catharacta* (1.3 chicks per breeding pair) the hatching rate is slightly lower even than some of the Antarctic populations. (1.5 eggs hatching per pair compared with 1.6 (Young 1963), and 1.4 in Burton (1968), Eklund (1961) and Morvan et al. (1967)). 50% of egg losses were due to eggs failing to hatch, while 25% were due to careless incubation resulting in cracking or rolling out of the nest, and 25% died during the emergence of the chick from the egg.

## Food and Feeding.

The impact of the Bonxie on its prey species has been much debated. Pennie (1948) claimed that Bonxies were causing a drastic decrease in the Arctic skua population of Foula by predation. Venables and Venables (1955) claimed that Bonxies were causing a decline in the Kittiwake population of Foula, but Lockie (1952) and Jackson (1966) could find no evidence of declining prey populations as a result of Bonxie predation. Brathay have monitored the seabird populations on Foula and also recorded all corpses thought to have been taken by Bonxies during the period when expeditions were on the island.

It is difficult to tell how accurate these data are, but they indicate that the toll taken varies considerably from year to year (table 9); 1969 being a "Kittiwake year" and 1972 a "Puffin year". The peak period of killing seems to differ from year to year. This may either reflect differences in the annual availability of preferred food differences in the fledging dates of the Bonxie chicks or of the prey species. This requires further investigation, but the peak of predation appears to be unimodal in all species although occurring at slightly different times in each species, so it is probably determined by the breeding seasons of both the the Bonxie and the prey species. Thus if species A has a relatively late season it may escape heavy predation as species B may be available in synchrony with the maximum growth period of the Bonxie chicks. This may account for the marked yearly differences.

The marked increase in cannibalism may be the result of overpopulation, but it may be significant that the two seasons in which cannibalism was low were seasons when few other birds were killed, so fish may have been more abundant than usual.

TABLE 9 Numbers of prey items recorded each year between July 15 and August 10th.

PREY SPECIES	1969	1970	1971	1972	1973
Bonxie Chicks	26	40	130	140	155
Puffin	49	14	51	103	70
Kittiwake	113	12	126	36	93
Arctic Skua	53	13	62	47	25
Rabbit	6	2	13	19	18
ALL PREY SPECIES	269	100	400	350	350

In 1972 and 1973 the distribution of kills was mapped. This indicated that chance contacts probably determine which species are predated as kills tend to be found in proportion to their availability in the area. Pellet analyses from territories supported this, and also indicated that pairs will tend to specialise on one or two types of prey, for which they may develop a distinct hunting technique. Further discussion can be found in Furness (1973 and in press).

## Interactions

There has been no indication of species declining in numbers as a result of Bonxie predation, but numbers continue to be monitored as the Bonxies increase. The interaction of the Bonxie with the Arctic skua has been looked at in some detail.

The population of Arctic skuas has remained stable at 120 pairs for many years. However the Bonxies have taken a minimum of 36 adult and 182 juvenile Arctic skuas in the 5 years on record. It is not known whether this rate can be sustained or to what extent immigration may occur, but Arctic skua clubs hold numbers of pre-breeders indicating a reserve of recruitment.

Dott (1967) suggests that Bonxies at Hermaness feed at sea within view from the colony, but, except in very misty weather, this is not the case on Foula, for although Arctic skuas may often be seen patrolling the cliffs Bonxies are lost from sight as they go to feed. This suggests that the two species do not come much into conflict while feeding, but it was observed that Bonxies were more often successful in obtaining food from other seabirds than Arctic skuas when they do feed within sight of the island, although only a small number of attacks were observed.

Both Bonxies and Arctic skuas seem to spend a large proportion of their time resting in their territories during the first part of the breeding season, suggesting that at least until the chicks are well grown, there is no difficulty in obtaining sufficient food.

Jackson (1966) suggested that the Bonxie is more likely to oust the Arctic skua by taking over its breeding areas than by direct predation. The differences between areas where Bonxies bred, where Arctic skuas bred, where both bred and where neither bred were examined. It was found that the species present were related to vegetation height, variability in height and ground wetness.

The vegetation height around Bonxie nests was significantly greater than around Arctic skua nests in the same area so it seems that where the vegetation is suitable for either species to nest, Bonxies choose sites with taller vegetation and Arctic skuas choose sites with shorter vegetation. Thus the Bonxie may be inhibited from pushing into Arctic skua areas because the vegetation is shorter than required for nest protection. The spread of the Bonxie which has been documented shows that areas of long vegetation are colonised before areas of shorter vegetation. For this reason Arctic skuas are now mainly found in areas where the vegetation is recovering from peat workings in the last century. As this regenerates the Bonxies may be able to oust the Arctic skuas from these refuges.

## **Acknowledgements**

The writing of this paper was made possible by the field work of many members of Brathay Expeditions, under the direction of P. J. Mawby and A. E. Land. I would like to thank Dr. J. C. Coulson for his assistance and R. J. Metcalfe for making it possible for me to stay on Foula.

## **References**

- Bayes, J. C., Dawson, M.J. and Potts, G. R. 1964 *Bird Study* 11:272-279  
Bourne, W.R.P. and Bogan, J.A. 1972 *Nature* 240:358  
Burton, R. W. 1968 *Br. Ant. Surv. Bull.* 15:9-28  
Burton, R.W. 1970 *Antartic Ecology Vol.* 1:561-567.  
Dott, H.E.M. 1967 *Scottish Birds* 4:340-350  
Eklund, C. 1961 *Bird Banding* 32:187-223  
Fergusson, M. 1973 *Brathay Exploration Group Field Studies Report*  
No. 21:43-52  
Furness, R. W. 1973 *Ibid.* 21:5-21  
Furness, R. W. 1973 *Ibid.* 21:22-42.  
Furness, R. W. in press *Ibid.*  
Jackson, E. E. 1966 *Scottish Birds* 4: supplement.  
Lindsay, R. A. 1971 *B.E.G. Field Studies Report* 11:105-107  
Lindsay, R. A. 1971 *Ibid* 11:109-114  
Lockie, J. D. 1952 *Scottish Naturalist* 64:158-162  
Mawby, P. J. 1969, 1970, 1972, 1973, in prep. *B.E.G. Field Studies*  
Reports 9, 14, 18, 24, in prep.  
Mortimer, M.A.E. 1971 *B.E.G. Field Studies Report II.*  
Morvan, Mougin et Prevost. 1967 *L'Oiseau* 37:193-220  
Perdeck, A.C. 1960 *Ardea* 48:111-136  
Perry, R. 1948 *Shetland Sanctuary* Faber and Faber.  
Reid, B.E. 1967 *Wildlife Pub. N.Z.* 84:1-20  
Stonehouse, B. 1956 *F.I.D.S. Sci. Rep.* 14: 1-25  
Thamson, A. L. 1966 *Brittish Birds* 59:1-15  
Venables, L. S. V, and U.M. 1955 *Birds and Mammals of Shetland.*  
Edinburgh.  
Young, E. C. 1963 *Ibis* 105:203-233

# THE STATUS OF THE KITTIWAKE AND GREAT BLACK-BACKED GULL ON NORTH RONA

J. A. Love

## Introduction

In spite of the scarcity of comparable counts it has become obvious that the numbers of at least three species of seabirds on North Rona have increased quite markedly in recent years. The Fulmar *Fulmarus glacialis* first nested on the island at the end of the last century (Harvie-Brown 1888) and by 1958 numbered over 2000 pairs (Bagenal and Baird 1959). In 1972 this total appeared to have doubled (Evans 1973). In the 1930s both Harrison (1932) and Atkinson (1949) counted about a thousand Kittiwakes *Rissa tridactyla* on North Rona. In 1958 Bagenal and Baird (1959) counted over 3000 pairs. No such comparable counts are available for the Great Black-backed Gulls *Larus marinus* but this species too has evidently increased, now apparently numbering some 2000 pairs (Evans 1973).

The predatory habits of the last named species are well known and fears have been expressed about the effect that such a large population could have on other breeding species. During two brief visits to the island between 18-31 July 1971 and with the Evans party from 24 June to 7 July 1972, some observations were made on the problem. Examination of food remains in the gull colonies indicated which species were falling prey to the black-backs. Counts were made in 1958 by the Glasgow University Expedition (Bagenal and Baird 1959) and in 1971 an estimate of the breeding success was obtained.

## Great Black-backed Gull prey

Food remains in the Great Black-backed Gull colonies showed fish, marine molluscs, starfish and seabirds to be included in the diet. Most if not all the corpses could be attributed to the black-backs since the only other large predators breeding on North Rona are about a hundred pairs of Herring Gulls *Larus argentatus* a few pairs of Great Skua *Catharacta skua* and Lesser Black-backed Gull *Larus fuscus* pairs of Hooded Crow *Corvus cornix* and Raven *C. corax*.

The results of a collection of prey species made by the author in 1971 and by the Evans party in 1972 are summarised in Table 1. Large numbers of dead and often partially eaten gull chicks were found but have been excluded since the causes of death were not clear. Five species made up over 95% of each sample — the Puffin *Fratercula arctica*, Kittiwake Shag *Phalacrocorax aristotelis*, Storm Petrel



**Hydrobates pelagicus** and Leach's Petrel **Oceanodromo leucorha**. The remainder included the Guillemot **Uria aalge**, Black Guillemot **Cepphus grylle**, Razorbill **Alca torda** and Oystercatcher **Haematopus ostralegus**.

TABLE 1. Numbers of corpses of different prey species found in the Great Black-backed Gull colonies of North Rona.

	24 Jun-6 Jul 72	18-31 Jul 71
Puffin: adult	78	30
Kittiwake: adult	15	2
immature	6	22
Shag: immature	37	0
Storm/Leach's Petrel :		
adult	42	11
Others:	6	0
TOTAL	184	65

The value of such data is limited by the large number of biases and errors involved. For example some species such as the Kittiwake are conspicuous, while the small dark remains of petrels may be more difficult to find. It is however possible to compare in the two samples the incidence of each individual prey species. Since no changes in seabird numbers were evident between the two years it is assumed that the differences between the two samples reflect seasonal changes in the incidence of prey species in the diet of the Great Black-backs.

The two collections were similar except that Shags were not taken later in the season, presumably because they were then too large. At this time however young Kittiwakes were just fledging, and therefore vulnerable to predation by the gulls, making up 34% of the total sample at the end of July. A similar collection made in early August 1936 also showed a high incidence of Kittiwakes (both adult and immature) but no Shags (Ainslie and Atkinson 1937). Robson (1968) gathered five dead Puffins and thirty Kittiwakes during his stay from late July to 19 August 1966. The Puffins had departed by 8 August, and it appears that Kittiwakes may assume even more importance in the gulls' diet after this time.

#### **Census of breeding Kittiwakes on North Rona and Sula Sgeir.**

Both Puffins and small petrels are notoriously difficult to count, while the available data for the Shag indicate that their numbers have remained fairly static at around 300 pairs (Harrisson 1932, Bagenal and Baird 1959, Evans 1973). Reliable and detailed counts are available only for the Kittiwake.

TABLE 2. Counts of Kittiwakes on North Rona in 1958 (Bagenal and Baird 1959), 1971 and 1972 (figures are apparently occupied nests) The localities on Figure 1 are indicated by the numbers in brackets, while square brackets refer to estimates made from a boat.

	Locality	1958	1971	1972
(9)	Stoch a Phriosain	16	138	138
(11)	Poll Healleair	107	67	53
(15)	Poll Thothatom	55	32	64
(17)		6	12	0
(18)		8	2	1
(19)		18	52 +	19
(21)	Geodha na Breatuinn	129	61	51+ [c30]
(26)		46	16+	136
(29)	Geodha Mairi	370	371	357
(31)		451	245	175+ [50-100]
(42)	Stack	0	2	0
(42)		0	9	9
(45)		34	49	37
(49)	Geodha Leis	293	294	284
(51)	Geodha Blatha Beag	382	342	389
(52)		125	97	
(53-54)	Geodha Blatha Mor to Ton Breighe	1312	1620	1751+ [100-150]
(57)		24	0	0
(58)		12	3	8
TOTAL		3388	3412+	3486 [c 3800]

In 1958, Glasgow University counted from the cliff-tops 3388 occupied nests. The results of two comparable counts made by the author in late July 1971 and again in late June 1972 showed that the numbers have changed little in the 14 year interval (Table 2). Observations from the sea in 1972 indicated that a further 300 or so nests could not be seen from the cliff-top, suggesting that North Rona supported nearly 3800 pairs of Kittiwakes whose distribution is mapped in Figure 1.

The nearest alternative breeding station is Sula Sgeir, some 11 miles to the west. Since no other previous counts have been published, it is of interest to include the 1972 census in detail. The Evans party spent three hours on the rock during which time I undertook a census of Kittiwakes. This was then supplemented by observations from the sea. It was established that the rock supported 1035 occupied nests (Figure 1). 38 Great Black-backed Gulls were also counted (Evans 1973)

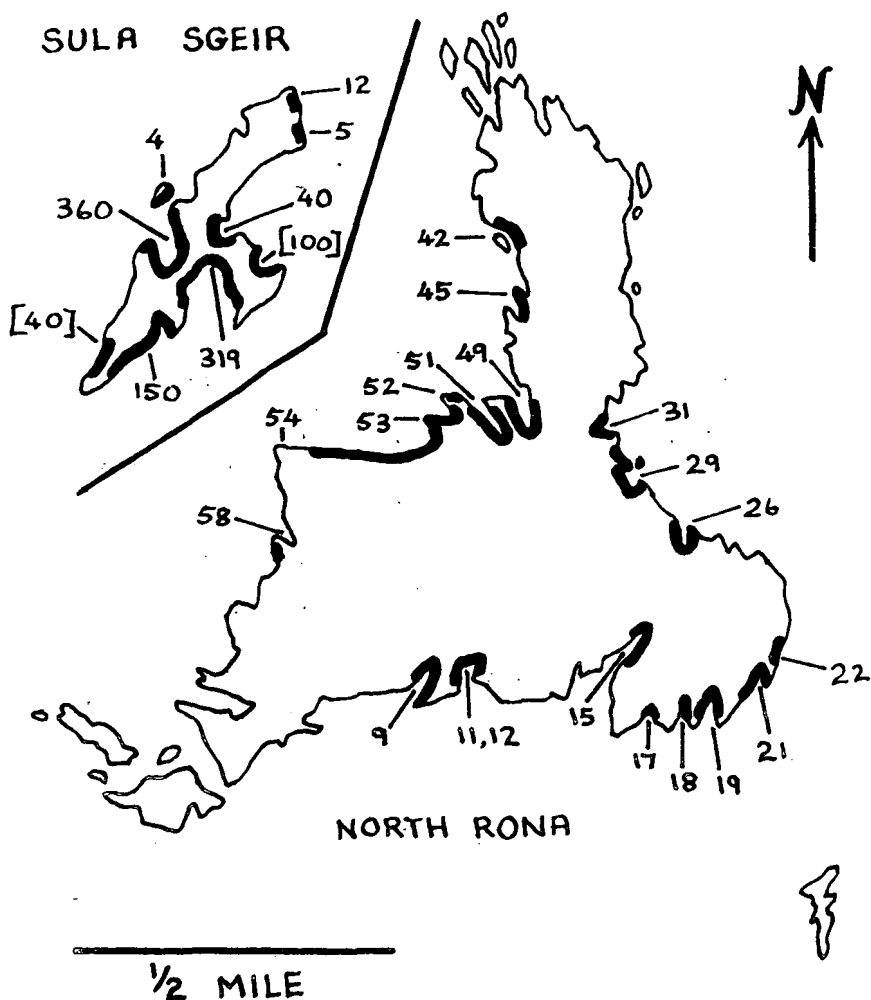


FIGURE 1. Distribution of Kittwakes on North Rona and Sula Sgeir 1972. The numbers around North Rona are those used for the localities mentioned in Table 2 and first used by Bagenal and Baird (1959). Those on Sula Sgeir refer to the number of occupied nests counted in 1972. Square brackets indicate estimates from a boat.

but it is not known whether their numbers or those of the Kittiwake have changed in recent years.

### **Kittiwake breeding success on North Rona**

The 1971 visit to the island coincided with the start of fledging of young Kittiwakes. After their first flight chicks return to the nest and may continue to be fed there by their parents. (Maunder and Threlfall 1972). Atkinson (1949) noted that the first young Kittiwakes flew on 1 August while in 1971 the first was seen flying on 20 July. From 18 to 22nd July I examined the contents of some 80% of the nests which were visible from the cliff-top using an X25 telescope. Peak fledging was not expected to take place for at least a week or two, so it was considered that a good estimate was obtained of the number of chicks fledged. 1346 young were counted in 2777 nests, representing about 1840 young Kittiwakes fledged on the island as a whole.

### **Discussion**

With recoveries from the BTO Ringing Scheme Coulson and White (1959) calculated that 21% of young Kittiwakes die in their first year of life and 12% in each subsequent year. Coulson (in Lack 1966) also found that Kittiwakes did not breed until three, sometimes four years old. Thus if a minimum of three years elapse before the young are old enough to breed, 39% may be expected to have died. Of the total production of young in 1971 about 1100 might have survived to breed in 1974 to replace the 900 breeding adults (12% of 3800 pairs) which will have died in the year. It must also be remembered that on North Rona many immatures and indeed adults too are killed by Great Black-backed Gulls while still in the vicinity of the nest and the mortality on North Rona may well be higher than elsewhere. Thus although the breeding output of Kittiwakes from the nest in 1971 was well above the estimated replacement level it seems as if the Great Black-backed Gull predation is sufficient to prevent the population from increasing as might be expected.

No observations were made of Great Black-backs taking eggs or young from the nest so their influence on pre-fledging mortality cannot be assessed. Both Coulson (1963) and Maunder and Threlfall (1972) considered predation of Kittiwake nests to be rare, although it did occur. Herring Gulls (Buxton and Lockley 1950), Ravens (Pearson 1904, Maunder and Threlfall 1972), and Great Skuas (Pennie 1948, Lockie 1952, Venables and Venables 1955, have been recorded taking both eggs and chicks of Kittiwakes while D. Sobey (pers comm) noted predation by Carrion Crows.

## **Acknowledgements**

I am grateful to R. W. Summers, A. R. Mainwood and Dr. W.R.P. Bourne for reading and commenting upon the manuscript.

## **Summary**

Although the numbers of breeding Great Black-backed Gulls on North Rona have increased markedly in recent years to about 2000 pairs, no change was detected in the Kittiwake population. Counts undertaken in 1971 and 1972 were similar to one undertaken in 1958 by Glasgow University. However the production of young Kittiwakes in 1971 was estimated to be more than sufficient to compensate for adult mortality, calculated by Coulson and White (1958). The extent of predation on eggs by the Great Black-backed Gull was not determined but the remains of recently fledged Kittiwakes were frequent in the gull colonies in late July. It is suggested that on North Rona the Great Black-backed Gulls are preventing Kittiwakes from increasing in numbers as they are doing elsewhere. Earlier in the season the gulls were taking young Shags while Puffins and to a lesser extent small petrels occurred both in late June and late July.

## **References**

- Ainslie, J. A. & Atkinson, R. 1937. Summer bird notes from North Rona. *Scot. Nat.* 1937: 7-13
- Atkinson, R. 1949. *Island Going*. London
- Bagenal, T.B. & Baird, D.E. 1959. The birds of North Rona in 1958 with notes on *Sula sgeir*. *Bird Study*, 6: 153-174.
- Coulson, J.C. 1963. The status of the Kittiwake in the British Isles. *Bird Study*, 10: 147-179.
- Coulson, J.C. & White, E. 1959. The post-fledging mortality of the Kittiwake. *Bird Study*, 6: 97-102
- Evans, P.G.H. 1973. Summary report of the B.O.U. supported expedition to North Rona and *Sula sgeir*, 1972. *Ibis*, 115: 476-478
- Harrisson, T.H. 1932. Resident and migratory birds of North Rona, the remotest Scottish island. *Ibis*, 1932: 441-457

- Harvie-Brown, J.A. 1888. Further notes on North Rona, being an  
appendic to John Swinburne's paper  
on that island in the 'Proceedings'  
of this Society, 1883-4.  
**Proc. Roy.Soc. Edin., 9: 284-299.**
- Lack, D. 1966. Population Studies of Birds. London
- Lockie, J.D. 1952. The food of the Great Skuas on Hermaness, Unst,  
Shetland. **Scot. Nat., 64: 158-162.**
- Maunder, J.E. & Threlfall, W. 1972. The breeding biology of the Black-  
legged Kittiwake in Newfoundland.  
**The Auk, 89: 786-816.**
- Pennie, I.D. 1951. The Clo Mor bird cliffs. **Scot Nat., 63: 26-32.**
- Robson, M.J.H. 1968. The breeding birds of North Rona. **Scot. Birds.**  
**5: 126-170**
- Venables L.S.V. & Venables U.M. 1955. Birds and Mammals of Shetland.  
London.

# THE EFFECT ON TERN POPULATIONS OF BLACK-HEADED GULL NUMBERS

J.H. Taverner

In a previous paper (Taverner 1965) I described how Common Terns *Sterna hirundo* and Sandwich Terns *Sterna sandvicensis* at the Needs Oar colony in Hampshire relied on Black-headed Gulls *Larus ridibundus* to defend their territories against predators, and I suggested that the large number of gulls present was of benefit to the terns. Recent calls for the control of gull numbers have involved the general public (the Automobile Association's magazine *Drive* launched Operation Gullwatch where drivers were asked to count gulls. The resulting information to "help the British Trust for Ornithology decide future policy on gulls" — *Drive*), and since most laymen will not differentiate between one gull species and another, it seems worthwhile outlining subsequent events at Needs Oar where an explosive increase in Black-headed Gull numbers seems to have helped and not harmed the tern populations at the same locality. I think there is a danger of the Black-headed Gull being condemned in a blanket attack on all *Larus* species because of the harm done by the larger gulls to the eggs and young of other birds, especially terns.

The following table shows breeding numbers at Needs Oar since wardening started in 1962. Previously, the colony was subjected to considerable trespass by yachtsmen fishermen and casual visitors, but since wardening started the area has been almost entirely free from human interference.

TABLE 1. Breeding pairs of Black-headed Gulls *Larus ridibundus*, Common Terns *Sterna hirundo*, Little Terns *Sterna albifrons* and Sandwich Terns *Sterna Sandvicensis* at Needs Oar Point (Hampshire).

	1962	1963	1964	1965	1966	1967	1968	1969
Black-headed Gull	1200	3900	4500	6500	6700	9700	10500	15000
Common Tern	50	82	113	111	128	150	50+	119
Little Tern	3/4*	24	20	31	23	26	20+	34
Sandwich Tern	3	45	5	127	128	112	167	179

TABLE 1 Continued

	1970	1971	1972	1973
Black-headed				
Gull	17000	20000	20000	20000
Common Tern	130+	180	170+	225
Little Tern	32	25	35	47
Sandwich Tern	228	242	116+	225

\*= probably an incorrect figure,  
below the true count.

Clearly, wardening has increased the tern population, but the fact remains that this increase has taken place amidst rapidly rising gull numbers, and at Needs Oar the Common and Sandwich Terns nest in amongst the gulls. The gulls seem positively to help the terns by protecting the latter's nests against intruders. Common and Sandwich Terns leave the defence of their territories against human predators entirely to the Black-headed Gulls. A human trespasser is constantly mobbed by a dense umbrella of gulls but the Common Terns do not come down to join the attack. Instead, they form a quite separate layer above the gulls, coming down only when the trespasser has moved on. I have never been attacked by a Common Tern at Needs Oar whilst the gull umbrella has been present, not even when handling tern chicks. The only occasions when Common Terns have attacked have been late in the season when most of the gulls have gone and a few terns are still present with young. Sandwich Terns will come closer, but they pull out of their attacking dives when some ten or fifteen feet overhead and an intruder to their nesting area is only under real attack from the neighbouring Black-headed Gulls. The reason why Sandwich Terns put in at least a token attack whilst the Common Terns stay well clear — a reversal of normal behaviour — may be that the Sandwich Terns nest in dense concentrations, thus stimulating one another to aggression, whereas the Common Terns are distributed through the colony so that concentrations of the species are missing and they are consequently deprived of any stimulation to attack that might arise from numbers of their own kind.

However, it is not only human trespassers that the gulls attempt to drive from the colony. A considerable gathering of Herring Gulls *Larus argentatus* and Great Black-backed Gulls *Larus marinus* builds up on the fringe of the colony, mostly consisting of immature birds,



and this might be a real threat to the terns. They are only tolerated by the Black-headed Gulls on the fringe of the colony however, and they are driven off if they attempt to penetrate deeper. Sometimes terns will join in the attack on these intruders. Other predators such as Carrion Crows *Corvus corone* of the occasional Arctic Skua *Stercorarius parasiticus* are driven off in like fashion; the huge number of gulls again clearly being ~~the~~ **the main deterrent**. Since the terns nest on an island, there is little risk of predation from mammals and the only predator that is allowed into the colony is the Jackdaw *Corvus monedula* and a few of these scavenge throughout the area and are the cause of some loss of eggs.

Over a thousand hours of observations have convinced me that the defence given by such huge numbers of gulls is of great benefit to the terns, and I am hard pressed to find ways in which the terns are harmed by these large numbers. In many hours of close observation from a hide, I have never seen a Black-headed Gull harm a tern's young or eggs. Indeed, whenever disputes have arisen, both Common and Sandwich Terns have almost invariably driven off offending Black-headed Gulls and I have seen Sandwich Terns viciously attack well-grown young gulls that have strayed too close to the tern's chick. The terns raise a remarkably high proportion of young to the flying stage and the rapidly expanding gull population has not left the terns short of nesting spaces, even though the density of nests is considerable. Nearly all the Common Terns nest amongst the Sea Purslane *Atriplex portulacoides* which grows along the sides of the gullies that cross and drain the colony, and there is plenty of room in such habitat for the gulls seem to prefer the Rice-grass *Spartina townsendii* that covers most of the remaining parts.

Sandwich Terns deal with the situation by arriving en masse, fifty or more pairs appearing together and packing into a small area — soon covered with their excreta — from which nearly all the gulls move. The gulls will not tolerate being in such a concentration of Sandwich Terns unless they are well set on a full clutch of eggs, and gulls with only one egg or a nest in which they have not laid will move off elsewhere, the nests frequently being taken over by a tern. I have records of Sandwich Terns taking over gulls nests that contained single eggs, and eventually sitting on a mixed clutch. As the gulls' eggs are collected until the first week in May, only a few of whose nests have been overlooked have full clutches when the Sandwich Terns arrive and this makes it easier for the terns to evict the gulls. Perhaps the collection of gulls' eggs is a crucial factor at Needs Oar, for if they were not taken then the gulls would be well set on full clutches when the Sandwich Terns arrived and they might then find it difficult to win territories.

The Little Terns are not in competition for nesting space since they breed alone on a small shingle patch apart from the rest of the colony.

I am not claiming that the huge increase in Black-headed Gull numbers at Needs Oar has been the only factor, or even the main one, responsible for the growth of the Common and Sandwich Tern populations and the maintainance of Little Tern numbers, but the evidence suggests that the gull numbers have been a contributory factor **positively helping** the terns in that they afford massive protection against predators that is far more effective than anything the terns could muster by themselves. Conditions in other colonies are obviously different, and the precise relationship between the species at Needs Oar is necessarily unique, but events there suggest that any control of Black-headed Gull numbers should only be pursued after a full examination of each particular colony. Needs Oar, with 20,000 pairs of gulls, must be one of the largest colonies in Britain, and it is very probably the one that has grown most rapidly. If such conditions can allow tern numbers to expand, then the same could be true elsewhere.

### **Summary**

Breeding numbers of Black-headed Gulls, Common Terns, Little Terns and Sandwich Terns are given for the years 1962/1973 at the Needs Oar colony (Hampshire). Little Tern numbers have remained fairly constant but the other three species have experienced marked increases. It is suggested that the increase in Black-head Gull numbers has a contributory factor in the terns' increase because of the protection given to the terns against predators by mobbing from the gulls. There is no evidence that the Black-headed Gulls harm the terns that nest amongst them. Because of this, any attempt to control Black-headed Gull numbers should only take place after an examination of the colony in question.

A full description of the habitat at Needs Oar, and a description of the gullery, appears elsewhere (Taverner 1966).

### **References**

- Anon (1971) 'Operation Gullwatch'. **Drive**, Spring 1971, 129.
- Taverner, J.H. (1965) 'Observations on breeding Sandwich and Common Terns'. **Brit. Birds** 58, 5-9.
- Taverner, J.H. (1966) 'The Needs Oar Gullery and Ternery'. **Hampshire Bird Report**. 1965, 32-45.

# ANALYSIS OF HERRING GULL PELLETS COLLECTED IN CO. ANTRIM

David Melville

A number of investigations have been made into the feeding ecology of the Herring Gull *Larus argentatus* and the results varied considerably between different geographical locations (Harris 1965). However no work has previously been undertaken in Northern Ireland. The breeding population of the Skerries Islands, Co. Antrim has increased from about 260 pairs in 1940 to 3-4000 pairs in 1970/71, while the small local fishing industry has declined until landings in recent years have been negligible. There appears to have been little change in land use in the adjacent mainland area between 1948 and 1972 except for an increase in housing as the total human population of Portrush, Portstewart and Coleraine has increased (12695 in 1926, 18478 in 1951 and 22282 in 1966).

Between May 1971 and February 1972, 870 Herring Gull pellets were collected from nest sites and loafing areas around the Skerries and Portrush on the North Antrim Coast. Each pellet was dissected dry using mounted needles and forceps and the contents sorted into fairly broad categories. Microscopic examination for earthworm chetae was not undertaken. The frequency of occurrence of each item and the total volume (estimated by eye) were recorded.

**TABLE 1. Contents of pellets collected May 1971 – February 1972.**

	% occurrence	% volume
Grass	84.5	72.0
Beetle	74.5	4.1
Down	16.0	2.1
Paper	7.6	4.7
Stone/Grit	6.7	0.7
Mammal Bone	5.9	2.4
Corn	5.4	4.2
Condom	4.3	2.1
Fur	4.0	1.5
Mytilus	3.6	0.4
Silver Paper	3.2	0.7
Plastic	2.4	0.6
Patella	1.8	0.8
Glass	1.8	0.0
Crab	1.0	0.5
'Meat'	0.9	0.2
Miscellaneous	9.5	3.0

Total pellets 870

A summary of these results is given in Table 1. It was not possible to collect samples regularly throughout the whole study period as rough weather frequently prevented visits to collection sites during the winter and the majority of pellets was collected in July (Table 2). However observations showed that there were no major differences in the proportions of birds feeding in 'agricultural', 'urban/tip' and littoral habitats throughout the study.

TABLE 2. Contents of pellets collected July 1971

	% occurrence	% volume
Grass	94.2	75.2
Beetle	87.0	5.4
Down	27.5	2.7
Paper	5.2	3.0
Stone/Grit	5.0	0.9
Mammal Bone	3.9	2.5
Corn	0.5	0.2
Condom	4.2	1.2
Fur	3.9	1.3
Mytilus	2.9	0.5
Silver Paper	2.2	0.4
Plastic	4.3	1.3
Patella	2.4	1.2
Glass	1.0	0.0
Crab	0.6	0.9
'Meat'	0.7	0.2
Miscellaneous	6.7	3.1

Total Pellets 650

The problems associated with pellet analysis are well known (Hartley 1948) and will not be discussed here but it should be borne in mind that there will be a bias towards items in the diet with a hard shell, integument or skeleton.

The most frequently occurring pellet component was grass, followed by beetle remains, and grass was found in most chick stomachs examined (Table 3). The high values for grass (both in occurrence and volume) are unusual (Table 4) and although Otterlind (1948) recorded vegetable matter in many of the stomachs examined and to a lesser extent in pellets, the total volume was small.

**TABLE 3. Stomach contents of Herring Gull chicks collected on the Skerries 2 July 1971**

	<b>% occurrence</b>	<b>% volume</b>
Grass	95.8	50.0
Beetle	58.3	0.0
Bread	58.3	19.2
Stone/Grit	54.2	0.8
Mammal Bone	33.3	6.3
Silver Paper	25.0	3.3.
'Meat'	20.8	3.8
Down	16.7	0.4
'Butcher's Bone'	16.7	4.2
Egg Remains	16.7	0.0
Glass	12.5	2.5
Bird Bone	8.3	2.9
Plastic	8.3	0.0
Potato	8.3	2.9
Paper	8.3	3.3.
Fur	4.2	0.0
Earthworm	4.2	0.0
Crab	4.2	0.0
Match	4.2	0.0
Elastic Band	4.2	0.0
Wool	4.2	0.0
Fish Bone	4.2	0.4

**Total stomachs 24**

Vernon (1970) found grass in all Common Gull *Larus canus* stomachs which he analysed. In autumn he considered that they fed on fresh grass, while during the winter the grass was from earthworms eaten by the gulls. It seems unlikely that either of these explanations could account for all of the grass found in the present study. Harris (1965) suggests that grass may be eaten presumably accidentally along with more digestible items and Spaans (1971) also considered that the straw, leaves and petals which occurred in 2.7% of 264 chick regurgitations from Terschelling had been swallowed accidentally. While some of the grass taken by the Skerries Herring Gulls probably was taken accidentally, this is unlikely to account for it all. Brooke and Hodgson (1971) suggest

that the Secretary Bird *Sagittarius serpentarius* may eat grass to aid pellet formation and while this may be the case with the Herring Gull many of the 'grass' pellets only contained beetle remains which could easily have been passed with the faeces.

TABLE 4. The occurrence of plant material in Herring Gull pellets and stomachs. % Occurrence

% Occurrence	Sample size	Stomach/ Pellet	Locality	Source
96	24	S	N.Ireland	This study
89	132	S	Sweden	Otterlind 1948
86	870	P	N. Ireland	This study
54	179	P	Sweden	Otterlind 1948
47	515	S	Barents Sea	Belopol'skii 1957
c. 38	107	S	Britain	Florence 1912- 1915
33	401	S	Newfoundland	Threlfall 1968
20	60	S	Anglesey	Harris 1965
19	36	S	Canada	Mills 1957
c. 12	c. 1000	S	Denmark	Sparck 1951
10	97	S	Pembrokeshire	Harris 1965
8	537	P	Sweden (inland)	Anderson 1970
4	3208	P/Food remains	Pembrokeshire	Harris 1965
4	160	P	Britain	Collinge 1924- 1927
1	27060	P/Faeces	Holland	Spaans 1972

Down may also have been ingested to aid pellet formation or may have been ingested accidentally while preening since more down was present in the July sample, when the birds would have started their body moult, than during the rest of the study period. Imber (1973) found pellets of the Grey-faced Petrel *Pterodroma macroptera gouldi* containing Cephalopod beaks and Crustacean remains loosely bound with down, and Kop (1972) reports Great Crested Grebes *Podiceps cristatus* ejecting pellets containing down, but in both cases it was thought that the down was swallowed accidentally while preening, rather than intentionally as a binding matrix for the pellets.

The number of condoms in the present results tends to over-emphasise the importance of sewage outfalls as feeding sites and in fact there were seldom more than 40 Herring Gulls at the Portrush outfall throughout the study and even fewer at Portstewart. It is likely that most condoms were taken by young inexperienced birds and one Herring Gull ringed on the Skerries was found dead in its first winter having choked on a condom. A first winter Great Black-backed Gull *Larus marinus*, found dying near Portrush, had one condom and a few beetle remains in its stomach.

The mammal bones present were usually Rabbit *Oryctolagus cuniculus* or hare *Lepus* sp. but some pellets contained bones of shrews, voles, or mice but specific identification was not possible as no skulls were found.

Miscellaneous items in the pellets further emphasise the very generalised feeding habits of the species and included hair net, crown bottle top, expanded polystyrene, plasticine, candle wax and a plastic model scorpion. Remains of a Spider Crab *Hyas araneus* were found beside one nest. This species does not appear to have been previously recorded in the diet of the Herring Gull (Harris 1965) found that 'Each pellet was composed of a single species or item of prey'. This would appear to be an unusual situation and in this study only 10.3% of the pellets examined contained a single prey item (Table 5). A number of pellets contained remains of both 'agricultural' and littoral food items, thus demonstrating that birds were not necessarily faithful to one feeding area throughout the day.

TABLE 5. Pellets containing a single food item, collected May 1971-February 1972.

Contents	Number
Corn	39
Grass	35
Paper	7
Cancer pagurus	4
Condom	2
Bread	1
Feathers	1
Selotape	1
Total	90
Total examined	870
% containing only one food item	10.3

There undoubtedly has been a considerable increase in the breeding population of Herring Gulls on the Skerries and generally along the North coasts of Cos. Antrim and Londonderry during the past 30 years. The fishing industry has never been large enough to play a major role as a food source and littoral feeding is very restricted. While the human population has increased it is unlikely that the proportionate increase in household refuse has been a particularly important factor for adult survival, but chick survival may be enhanced by an increase in potential food supply during the tourist season. The relaxation of egg collecting, which formerly was very heavy, and a general reduction in disturbance coupled with the increasingly widespread habit of feeding on farmland would appear to be the most likely factors responsible for the increase.

### **Bibliography**

- Anderson A. 1970. Food habits and predation of an inland-breeding population of the Herring Gull (*Larus argentatus*) in southern Sweden. *Ornis Scand.* 1. 75-81.
- Belopol'skii L.O. 1957. (The ecology of the colonial seabirds of the Barent Sea). Moscow. Translated and published by the Israel Program for Scientific Translations.
- Brooke R.K. and Hodgson C.J. 1971. Winter food of the Secretary Bird as revealed by pellets. *Bull Brit Orn Club.* 91. 121-125.
- Collinge W.E. 1924-1927. The food of some British wild birds. York.
- Florence L. 1912. The food of birds. *Trans High Agric Soc Scotland* 1912 180-219
- Florence L. 1914. The food of birds. *Trans High Agric Soc Scotland* 1914. 1-74
- Florence L. 1915. The food of birds. *Trans High Agric Soc Scotland* 1915. 1-53
- Harris M.P. 1965. The food of some *Larus* gulls. *Ibis.* 107. 43-53
- Hartley P.H.T. 1948. The assessment of the food of birds. *Ibis.* 90. 361-381
- Imber M.J. 1973. The food of grey-faced petrels (*Pterodroma macoptera gouldi* (Hutton)), with special reference to diurnal vertical migration of their prey. *J Anim Ecol.* 42(3). 645-662.
- Kop. P.P.A.M. 1972. Pellet-ejection by hand-reared Great Crested Grebes. *Brit Birds.* 65(8). 319-321



- Otterlind G. 1948. Til gratrutens (*Larus a. argentatus*, Pont.)  
näringsöch spridningsekologi. K. Fysiogr Sällsk Lund Forh. 18. 36-46
- Spaans A.L. 1971. On the feeding ecology of the Herring Gull (*Larus  
argentatus*, Pont.) in the northern part of the Netherlands. Ardea. 59.  
73-183
- Sparck R. 1951. The food of North European Gulls. Proc 10th.  
Orn Congr. 1950. 588-591
- Threlfall W. 1968. The food of three species of gulls in Newfoundland  
Can Field Nat. 82. 176-180
- Vernon J.D.R. 1970. Food of the Common Gull on grassland in  
autumn and winter. Bird Study. 17. 36-38

## **RHUM AND CANNA MANX SHEARWATERS; Some introductory observations**

**A. D. K. Ramsey**

Canna and Rhum are important breeding stations of the Manx Shearwater. The islands lie approximately 15-20 miles west of the mainland. Canna has a colony of probably between 1200 and 2000 pairs while Rhum probably has 70,000-100,000 pairs (personal discussion with Peter Wormell who was on Rhum from 1947-1973). The two islands are about three miles apart but there is a very important difference between the two colonies. The Canna colony is found from 30-300 feet above sea level while the Rhum colonies are found above 1600 feet, the large majority of birds being found between 2,000 and 2,700 feet above sea level.

While a high percentage of Canna birds are now ringed only an insignificant number of the Rhum birds are — even on one intensively worked slope. We are particularly interested in the possibility of the two islands having different populations of Shearwaters. There is an excellent chance of catching any Rhum-ringed bird which regularly visits Canna on the latter island. However, the converse is not true. In 1973 two ringed birds from Copeland and Skokholm were caught on Canna. These are believed to be the first indication of inter-island visiting between the southern and northern British Colonies. The bird ringed on Copeland in murky, foggy weather in July 1972 was caught on Canna in both June and August 1973. It is possible that this bird is a Canna bird which was visiting Copeland as a non-breeder. The control from Skokholm is less easily explained. The

- Otterlind G. 1948. *Til gratrutens (Larus a. argentatus, Pont.)* naringsoch spridningsekologi. K. Fysiogr Sallsk Lund Forh. 18. 36-46
- Spaans A.L. 1971. On the feeding ecology of the Herring Gull (*Larus argentatus*, Pont.) in the northern part of the Netherlands. *Ardea*. 59. 73-183
- Sparck R. 1951. The food of North European Gulls. Proc 10th. Orn Congr. 1950. 588-591
- Threlfall W. 1968. The food of three species of gulls in Newfoundland. *Can Field Nat.* 82. 176-180
- Vernon J.D.R. 1970. Food of the Common Gull on grassland in autumn and winter. *Bird Study*. 17. 36-38

## **RHUM AND CANNA MANX SHEARWATERS; Some introductory observations**

A. D. K. Ramsey

Canna and Rhum are important breeding stations of the Manx Shearwater. The islands lie approximately 15-20 miles west of the mainland. Canna has a colony of probably between 1200 and 2000 pairs while Rhum probably has 70,000-100,000 pairs (personal discussion with Peter Wormell who was on Rhum from 1947-1973). The two islands are about three miles apart but there is a very important difference between the two colonies. The Canna colony is found from 30-300 feet above sea level while the Rhum colonies are found above 1600 feet, the large majority of birds being found between 2,000 and 2,700 feet above sea level.

While a high percentage of Canna birds are now ringed only an insignificant number of the Rhum birds are — even on one intensively worked slope. We are particularly interested in the possibility of the two islands having different populations of Shearwaters. There is an excellent chance of catching any Rhum-ringed bird which regularly visits Canna on the latter island. However, the converse is not true. In 1973 two ringed birds from Copeland and Skokholm were caught on Canna. These are believed to be the first indication of inter-island visiting between the southern and northern British Colonies. The bird ringed on Copeland in murky, foggy weather in July 1972 was caught on Canna in both June and August 1973. It is possible that this bird is a Canna bird which was visiting Copeland as a non-breeder. The control from Skokholm is less easily explained. The

bird was ringed as a pullus in 1968 and was caught in August 1973 on Canna. The majority of five-year old birds on Skokholm do breed (Harris 1964, p.93). However this bird may either have been a non-breeder or a failed breeder. To illustrate the 'efficiency' of catching on Canna it is interesting to examine the recent retraps of birds ringed on Canna by P.R. Evans in 1961 and 1962 as adults. It has been shown by Harris (op. cit.) that the majority of breeding birds are not caught because they do not remain on the surface. However of 63 birds ringed by Evans 9 were caught 10 years later. Using Harris' minimum adult survival rate on Skokholm of 93% this would mean that about 27 birds from 1961-62 should be alive in 1972. Catching one third of these represents a high retrap rate for adults.

In March/April 1971 the means of weights of about 50 Shearwaters caught on each of Canna and Rhum showed significant differences ( $p = 0.01$ ). However, there were a number of problems. For example, the Rhum birds were only weighed after they had been carried 2,000 feet down Hallival. Consequently little confidence could be put on the reliability of the weights especially considering that the mean weight of Canna birds kept in dark boxes for 8-10 hours in June 1970 dropped by 11.8 grms. in a sample of 60. In 1973, however, a more standardised technique for weighing was used.

Birds were caught and weighed by the same observers on both Rhum and Canna. Weights were taken on 4th and 5th April (with all but three on the 5th) on Canna and on 6th and 7th April on Rhum. It was thought reasonable to assume that if birds on both islands were at the same stage of the breeding cycle (as later evidence showed to be the case) the average weight of samples from the two islands should be fairly close. This proved not to be the case. It is possible that one or both of the samples was in some way biased and more work is to be carried out. However, in view of the original difference established in 1971, it was felt worthwhile noting the results.

The average weights and ranges for the samples for the two islands are shown in table 1. The difference in the mean weights was 42 gms. A t-test showed that there was a very highly significant difference between the means ( $p = 0.005$ ). Could it be that the two groups are distinct populations or is there another explanation? It would be interesting to compare weights at various colonies.

In 1973 40 observation burrows were constructed on Canna in order to observe some aspects of the local Shearwater breeding biology. It is worth reporting a few observations regarding weights of breeding

Shearwaters. In June burrows were checked daily and birds were weighed every three days if the sitting bird remained on the nest for that time. (The movement in and out was checked by placing a cocktail stick at the entrance of each burrow). Table 2 shows the weights of 10 birds which remained on their nests from 23rd to 26th June. The mean decrease is almost exactly three times the mean weight of birds kept in boxes for 8-10 hours in June 1970. However these birds were kept in groups of three to one fish box. Most were probably not breeding birds as they were all caught on the surface.

**TABLE 1. Mean Weights of Rhum and Canna Shearwaters in April, 1973**

Sample	Mean Weight (gms)	Sample size	Range (gms)
Rhum	434	26	360-530
Canna	476	28	370-560

**TABLE 2. Weights of 10 Shearwaters sitting on eggs 23-26 June.**

Weight on 23rd	Weight on 26th	Decrease in Weight	Approx. % decrease
415	395	20	4.75
430	420	10	2.25
460	430	30	6.50
460	420	40	9.00
470	440	30	6.50
475	440	35	7.25
485	445	40	8.25
490	450	40	8.00
495	430	65	13.00
510	485	35	5.00
Mean	Mean	Mean	Aver.
WT.469	WT. 435.5	decrease 34.5	7.15

Very generally it can be seen from the above table that the heavier the bird the greater the percentage decrease in weight. It is perhaps surprising that the decrease was so low. Investigations will continue on both Canna and Rhum. Perhaps other workers on Shearwaters can be encouraged to undertake systematic weighing.

I am personally indebted to several companions on trips to both

islands. In particular I would like to mention two of the most frequent visitors to both islands, Robert L. Swann and Alan F. Leitch, without whose help the weighing of the birds would not have taken place.

### **Reference**

Harris, M.P. (1966). Age of return to the colony, age of breeding and adult survival of Manx Shearwaters. *Bird Study*, 13: 84-95

## **A BRIEF HISTORY OF THE STORM PETREL ON BURHOU.**

**Robert Burrow.**

Mention Burhou to anyone who has been there and the picture it instantly brings to mind is of the Puffins *Fratercula arctica* that use this small island for their summer home. However, Storm Petrels *Hydrobates pelagicus* also make use of Burhou as a summer residence. Being pelagic, they only come ashore to breed and then only on remote islands which makes Burhou an ideal site. Because of its nocturnal habits, information regarding its activities is comparatively scarce. A valuable study is that of P.E. Davies (1957) "British Birds" for 1957, pp 85 - 101 and 371 - 384.

Burhou is a small, low, uninhabited island, approximately 600 yards long by 200 yards wide, lying about one mile off the northwest coast of Alderney in the Channel Islands. It lies in the middle of some very strong tidal currents which can be dangerous to small craft, particularly when the tide is adverse to the wind, causing "overfalls".

The vegetation consists mainly of sea spurry which covers the island with a soft, spongy blanket, together with bracken, bluebells and sea campion. The surface is broken by rugged outcrops of red igneous rocks, in horizontal or slightly inclined strata, running centrally across the length of the island in a succession of peaks. Living in harmony with the birds is the island's only known mammal, the rabbit.

At the western end of Burhou, beyond a gully which is dry at low tide, is a smaller island, Little Burhou. On this small plateau, covered in Sea Campion, is a colony of Lesser Black-backed Gulls *Larus fuscus* and a few Herring Gulls *Larus argentatus*. To the northwest lies a series of reefs extending towards the gannetry on Ortac.

There follows a history of observations made between 1830 and 1973, which gives some insight into the status of the Storm Petrel during this

islands. In particular I would like to mention two of the most frequent visitors to both islands, Robert L. Swann and Alan F. Leitch, without whose help the weighing of the birds would not have taken place.

#### **Reference**

Harris, M.P. (1966). Age of return to the colony, age of breeding and adult survival of Manx Shearwaters. *Bird Study*, 13: 84-95

### **A BRIEF HISTORY OF THE STORM PETREL ON BURHOU.**

**Robert Burrow.**

Mention Burhou to anyone who has been there and the picture it instantly brings to mind is of the Puffins *Fratercula arctica* that use this small island for their summer home. However, Storm Petrels *Hydrobates pelagicus* also make use of Burhou as a summer residence. Being pelagic, they only come ashore to breed and then only on remote islands which makes Burhou an ideal site. Because of its nocturnal habits, information regarding its activities is comparatively scarce. A valuable study is that of P.E. Davies (1957) "British Birds" for 1957, pp 85 - 101 and 371 - 384.

Burhou is a small, low, uninhabited island, approximately 600 yards long by 200 yards wide, lying about one mile off the northwest coast of Alderney in the Channel Islands. It lies in the middle of some very strong tidal currents which can be dangerous to small craft, particularly when the tide is adverse to the wind, causing "overfalls".

The vegetation consists mainly of sea spurry which covers the island with a soft, spongy blanket, together with bracken, bluebells and sea campion. The surface is broken by rugged outcrops of red igneous rocks, in horizontal or slightly inclined strata, running centrally across the length of the island in a succession of peaks. Living in harmony with the birds is the island's only known mammal, the rabbit.

At the western end of Burhou, beyond a gully which is dry at low tide, is a smaller island, Little Burhou. On this small plateau, covered in Sea Campion, is a colony of Lesser Black-backed Gulls *Larus fuscus* and a few Herring Gulls *Larus argentatus*. To the northwest lies a series of reefs extending towards the gannetry on Ortac.

There follows a history of observations made between 1830 and 1973, which gives some insight into the status of the Storm Petrel during this

period. Apart from my own, these reports are taken from Dobson (1952) and from the records of the C.I. Bird Ringing Scheme, administered by the Ornithological Section of the Société Jersiaise.

- 1830. J. Jacobs in his "Annals of some British Normal Isles" describes the Storm Petrel breeding on Burhou.
- 1933. On August 15th, just over a century later, A. Le Sueur was shown two storm petrel eggs in the cottage, by an Alderney fisherman.
- 1935. Early June. H.J. Baal and his companions spent three nights on the island, sleeping in the small cottage and recorded twelve or more Storm Petrels breeding in the rafters. Unfortunately the cottage was destroyed by the Germans during the years 1940-1945 when they occupied the Channel Islands.
- 1937. Late May. C.H. Tomms reports a few nesting on the island.
- 1938. June 10th. G.F.B. de Gruchy found the Storm Petrel to be breeding in some numbers by finding no less than thirteen eggs.
- 1946. When R. Dobson visited the island, he found three or four pairs breeding in the ruins of the cottage and a few pairs in the remains of the stone wall amongst the boulders and stone heaps. Two birds were ringed.
- 1949. R.M. Lockley found the species breeding in fair numbers. One bird ringed.
- 1955. One bird ringed.
- 1957. Six birds ringed.
- 1958. R. Arnold and I. Sutherland spent four days on the island and estimated the population to be in the region of 10,000 birds. 164 birds caught and ringed.
- 1959. I Sutherland returned with J. Saunders and by sample counting "singing" birds in their nest holes, thought that the number of Petrels might now exceed 30,000. However, this figure was a very rough estimate. 186 Storm Petrels were caught and ringed along with one retrap.
- 1960. August 15th/16th. A ringing party caught and ringed 59 birds plus 4 retraps.

1962. J. & R. Arnold together with I. Sutherland, spent the first week of July on Burhou. At the end of this period they had caught and ringed 1,013 birds, plus 13 retraps, using three 60 ft. wader nets.
1963. July 3rd/8th. R. Arnold and M.K. Duquemin caught and ringed 889 Storm Petrels, plus 85 retraps, using one 60 ft. wader net.
1963. August 6th/8th. Ackworth School Natural History Society ringed 393 birds, plus 7 retraps.
1964. June - August. Ackworth School N.H.S. ringed 435 plus 42 retrap Storm Petrels. The discovery of rings in the pellets of the Great Black-backed Gull *Larus marinus* indicates that this bird is taking adult as well as young Storm Petrels.
1965. Ackworth School N.H.S. ringed 59, plus 10 retrap birds.
1966. July 1st/2nd. Ackworth School N.H.S. ringed 33 birds.
- " July 21st/23rd. Ackworth School N.H.S. ringed 22 birds. plus 12 retraps.
- " July 27th/28th. L.W. Cornelius ringed 18 birds.
1967. End of June. B.C. Potter spent five nights out of his eight day stay looking for Storm Petrels, but could find no evidence of their presence.
1970. June 11th/16th. 14 birds caught and ringed.
1971. June 6th/12th. R. Burrow ringed 72 and retrapped 13 birds. 660 ft. of net was used on each of two nights.
1972. June 3rd/10th. R. Burrow ringed 28 and retrapped 5 birds.
1973. June 7th/21st. R. Burrow and M. Hill ringed 48 and retrapped 12 birds. When weather permitted, the nets were used in such a way that the whole of the island was covered except for a small area on the East.



There follows a brief account of Storm Petrels which have been retrapped and controlled on/from Burhou 1959-1973.

		RETRAPS -- YEAR OF ORIGINAL RINGING													
YEAR	Number Ringed	1958	1959	1960	1962	1963	1964	1965	1966	1970	1971	1972	1973	TOTAL Remarks	
1946	2													-	
1949	1													-	
1955	1													-	
1957	6													-	
1958	164													-	
1959	186	1												1	
1960	59	2	2											4	
1962	1013	7	3	2										12	
1963	1282	3	2	3	82									90	
1964	435		2	1	14	24								41	
1965	59		1		1	2	6							10	
1966	73				2	5	3	2						12	
1970	12													-	
1971	71					6	3		2	3				14	
1972	28						1	1	1		2			5	
1973	48				1	1	2		1	3	1	3		12	

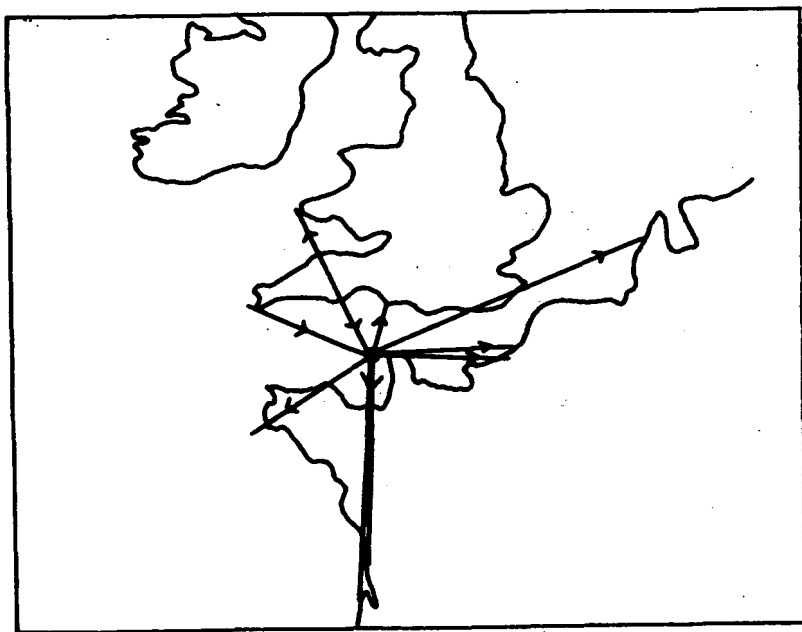
As the Storm Petrel only comes ashore to breed and then under cover of darkness, it is extremely difficult for anyone to make an accurate account. So far, the only information I have been able to gather about the Storm Petrel population on Burhou, is of doubtful value, being in the main, estimates or impressions of numbers. However, the figures of birds caught and ringed and of retraps are more positive, though their relationship to the breeding population is uncertain.

I commenced ringing during the second week in June 1971 and was able to continue my ringing and recording during the same period in 1973. Unfortunately, I was unable to continue my work during the

second week of June in 1972 and had to be satisfied with the first week. Thus I was not able to produce an exactly comparable record over three years which I hoped to do.

Whilst indications suggest a decline in the number of Storm Petrels breeding on Burhou, much information is required before any positive conclusions can be reached.

Much conscientious and hard work will be required to build up as accurate a picture as possible, of their numbers. Standardisation of the methods employed in counting, ringing and recording results of this work and in making other observations, is desirable.



Map showing movement of Storm Petrels to and from Burhou

## **Discussion.**

No positive reasons have yet been determined to explain the apparently diminishing numbers of Storm Petrels breeding on Burhou, though several possibilities suggest themselves. There is no evidence of predators such as rats or cats having been introduced to the island, nor are there any obvious signs of effects of pollution. There would perhaps have been a natural disaster such as disease or possibly the effect of severe winter weather to cause the apparently sudden decline in the early 60s. Long term oceanographic changes are known to have taken place in the Channel approaches this century and these may have influenced the food availability for the petrels.

It can be seen that the ringing has not been as extensive in recent years as it was in the late 50s and early 60s. This may suggest that there has been no decline but a misinterpretation of the figures available. However when one considers the number of birds caught in relation to the amount of net used it strongly indicates a decline in the species. Many of the birds caught may breed elsewhere as suggested by the recovery map and this aspect requires further study. It is possible that human interference may have played a part. The ringing expeditions of 1962 and 1963 may have disturbed the birds to such a degree that they left Burhou to breed elsewhere. One observation I feel is worthy of inclusion. It can be seen from the preceding list that all my ringing activities were carried out in early and mid-June when most nests contained eggs. Birds coming in from the sea regurgitated a considerable amount of oily food when handled in the net. Those caught flying from the land were always dry although they went through the motions of regurgitation. During July when eggs are hatching it seems essential that the young are not deprived of their first feeds. Stop the food due to netting and the result could prove fatal.

In concluding, it is not yet possible to identify any definite cause of the apparent decline of the Storm Petrel on Burhou. I feel that a careful watch should be kept on other colonies around our coasts to determine whether the decline of this species on Burhou reflects a more widespread decline.

## **References.**

- Davies, P.E. (1957) The breeding of the Storm Petrel.  
Brit. Birds 50:85-101, 371-384
- Dobson, R. (1952) The Birds of The Channel Islands. Staple Press.
- Potter, B.C. (1970) A Visit to Burhou, Channel Islands.  
Seabird Report 1970.

# DIURNAL VARIATION IN NUMBERS OF SEABIRDS AT COLONIES.

H E M Dott.

Numbers of adult seabirds which can be counted in breeding colonies vary according to both season and time of day. If there are species-specific patterns of variation during any one day, these may be affected by factors such as weather. Published records of seabirds counted at colonies throughout particular days are few, and those with weather records still fewer. This paper presents counts made from dawn to dusk and weather measurements from colonies of Kittiwakes *Rissa tridactyla*, Guillemots *Uria aalge*, and Puffins *Fratercula arctica*.

The work was done by A. Anderson, G.W.V. Birnie, M. Marquiss and myself at St. Kilda in July 1968 as part of the work of an Aberdeen University expedition (see Anderson et al 1969). Diurnal variation in numbers of Fulmars *Fulmarus glacialis* was also studied and is to be reported elsewhere (Dott in press), while different categories of Fulmars attending colonies are discussed by Dott (1973).

## Methods.

Two mixed colonies of seabirds were chosen. One contained Kittiwakes and Guillemots and was situated on the NW-facing cliff at Sgeir na Caraidh in Glen Bay. Observations were made from a promontary, separated from the cliff by an inlet of the sea, at a height a little above the highest birds in the colony and about 50 yards away. This colony was watched throughout 19th and 20th from as early and until as late as light permitted counting of birds. The four persons worked as two teams of two, in six shifts of about six hours each. At half hour intervals, light intensity was recorded from the scale of an exposure meter held facing the sky vertically. At the same times wind velocity was measured using a simple instrument which was held facing the wind at eye level for one minute, and the highest and lowest speeds were recorded. Non quantitative notes on wind direction, precipitation and visibility were made.

The second colony contained Puffins and Fulmars, and was situated on the vertical face forming the NW end of Dun. This colony was watched from dawn until dusk on 23rd by two pairs of observers working in five shifts and for some hours on 24th and 25th. Measurements of light intensity and wind velocity and notes on weather were recorded. Times of high and low water for St. Kilda were supplied by Battery Sergeant-Major P. Cheeseman.

Kittiwakes were counted at half-hour intervals; the numbers of adults alone on nests, pairs on nests, and adults on empty ledges being recorded separately. With Guillemots it was possible to separate apparently incubating adults. Activity throughout a five-minute period immediately after each half-hourly count, was recorded as the numbers of adults

to fly off or alight on the cliff during that five-minute period. Nests seen to contain eggs or young were marked on sketches of the cliff made progressively during the two days of study.

Puffin numbers were similarly recorded but the number of burrows could not be counted as most of the entrances were hidden in recesses. A method was tried out in an attempt to discover if there was any relation between the number of visible Puffins and the number of burrows currently in use. Part of the breeding area on the SE corner of Ruaival was delineated with string and pegs. The number of burrows which were in use was assessed by two methods. First the mouths were inspected for presence of guano or fish smell, and second, very thin splints of wood were laid across the entrances so that a Puffin could not enter without displacing one or more splints. This was done on the morning of 24th and observations were made on the evening of 24th and morning of 25th.

### **Kittiwake.**

The colony contained 59 Kittiwake nests. Of these, 9 contained two chicks, 35 had single chicks, 13 were empty and 2 contained eggs which were only attended occasionally and were presumably infertile. Figure 1 shows the numbers and activity of adult Kittiwakes throughout the two study days. Wind was mainly below 15 mph with breezes of up to 20 mph each lasting less than a minute recorded fairly frequently. Wind direction was always roughly parallel to the cliff, either from the NE or SW. A thick, wetting mist shrouded St. Kilda from the night of 18-19th until 21st. Though it varied in density, this mist never lifted throughout the two days of study, except briefly and incompletely at about 2000 on 19th. The mist altered to light rain at times, mostly on 19th and especially in the forenoon.

The attendance and activity of Kittiwakes shown in Figure 1 shows strikingly little diurnal variation. A large proportion of the arrivals and departures was due to birds which left the cliff and alighted again almost immediately. This was not the case with the other species studied. There was little indication of any change in activity at dawn and dusk, and some Kittiwakes could still be seen in flight when light was inadequate for counting. The average attendance on 20th was a little lower than on 19th and as the last counts on 19th were higher than the first on 20th, it appears that some changes in attendance took place after dark. No relationship was found between the numbers or activity of Kittiwakes with wind velocity, light intensity or visibility.

### **Guillemot.**

On 19th, there were 18 Guillemot chicks in the colony, but this number had decreased to 12 by 20th. There were also 5 eggs (3 of which were

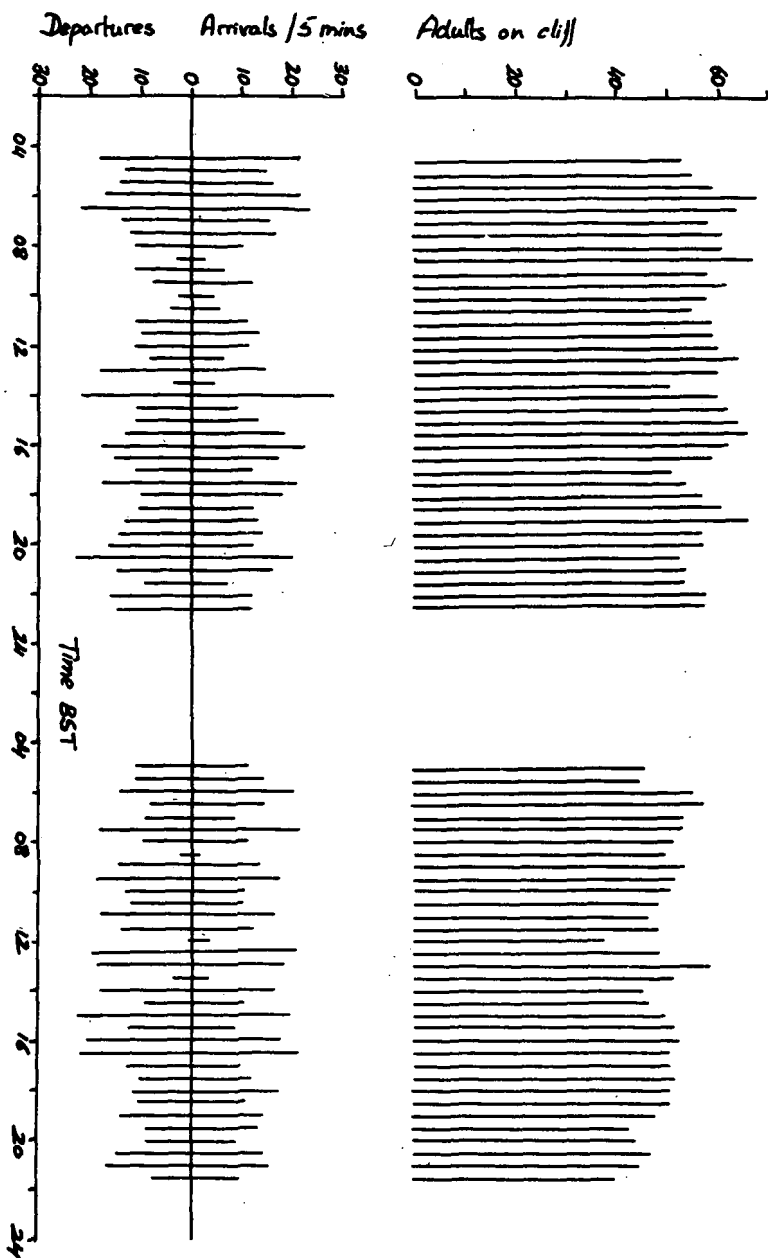


Figure. 1 Attendance and activity of adult Kittiwakes at colony 1 on 19th and 20th July.

brooded occasionally) which may have been infertile. Figure 2 shows the numbers and activity of adult Guillemots recorded on the two study days, and a single count made on the evening of 18th. The variation in diurnal attendance was large and of a quite different pattern on the two days. On 19th there were fluctuations in numbers until 1730 after which there was a steady and fairly rapid decline until darkness when attendance was about half the level of most of the day. At dawn on 20th numbers were slightly lower but increased until about 1430 by which time they had increased about threefold. Variation from then on was not marked but numbers again declined before dusk. Thus the major feature in attendance on 19th was an evening decrease and on 20th a morning increase. These changes cannot be related to any weather variable studied. The differences between the last counts on 18th, 19th and 20th are striking and the differences between these and the following dawn totals indicate that departures must have occurred during the hours of darkness.

The activity of Guillemots showed no diurnal pattern. The sharp peak at 2000 on 19th included several simultaneous departures. The only occasion on which the mist rose during the two days was at this time, but it is not known whether the sudden activity was related to this. Activity at dawn and dusk appeared to be slightly less than at other times. The figures for activity are small compared with those for attendance and are due almost entirely to departures for or arrivals from the sea, contrasting in this respect with the Kittiwake.

Adults in crouched positions (facing in all directions relative to the cliff) were counted as apparently brooding whether or not they were known to possess an egg or chick. It has been suggested (O'Connor 1968) that counting crouched Guillemots could be a useful method for estimating the number of breeding pairs in a colony. In this study the numbers of crouched adults varied irregularly and would have been an inaccurate means for estimating the number of breeding pairs. For example on 19th when the number of chicks in the colony was known to be 18, a sequence from the days records was:-

Time (BST)	Crouched ads.	Unattended juvs.
1530	15	6
1600	8	8
1630	12	5
1700	14	5
1730	23	1
1800	13	2
1830	21	3

Thus immediately prior to fledging, many chicks are unattended and the number of brooding adults is less than the number of successful breeding pairs.

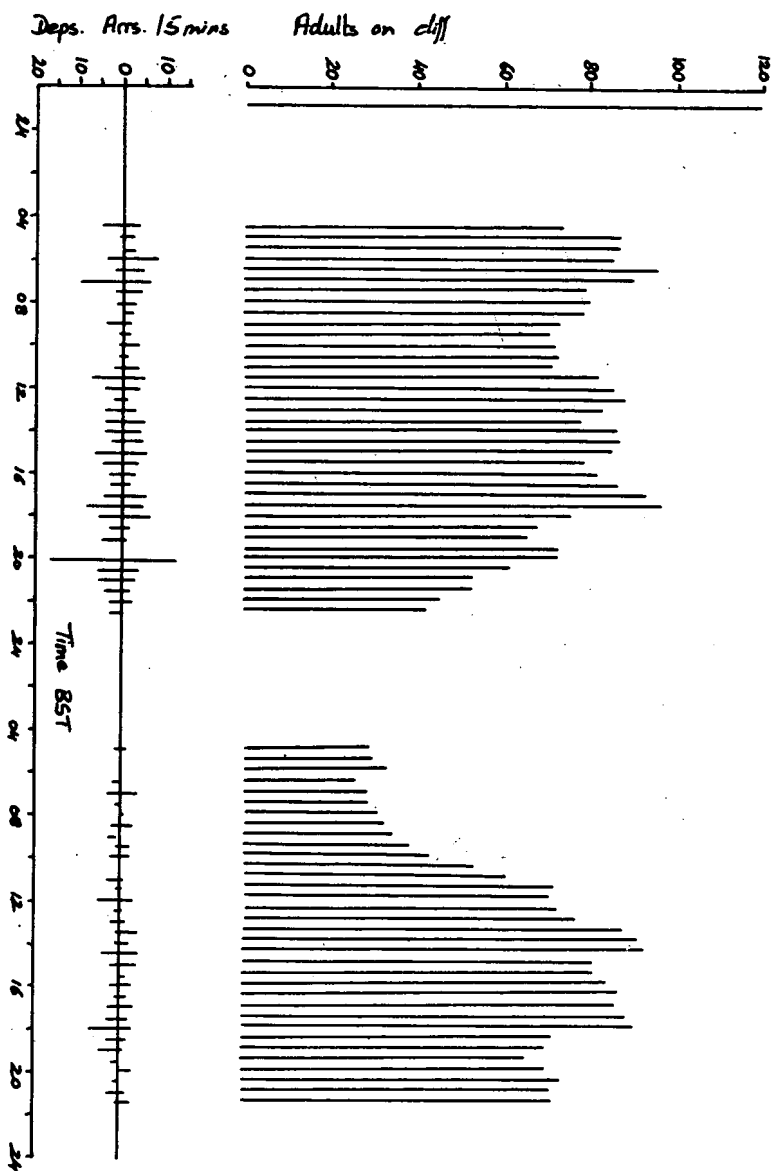


Figure 2. Attendance and activity of adult Guillemots at colony 1 on 18th, 19th and 20th July.



## Puffin

The numbers of visible adults and activity per five minute period are given in Figure 3. From dawn until 1930 wind velocity remained below 19 mph and mostly below 15 mph. From 2000 onwards wind almost ceased and readings were up to 5 mph. Wind direction was variable but mainly from N or NW. From dawn until about 0830 there were frequent showers of light rain. Between about 0830 and 1330 no rain fell, but heavy overcast conditions prevailed. From about 1330 until dusk the weather remained dry and sunny.

The numbers of Puffins counted showed diurnal variation. From dawn until 1515 numbers on land fluctuated from 2 to 37. From 1530 to 2000 there was an almost total absence of visible Puffins, only one being recorded in this time. Birds began to reappear at 2015 and a very rapid buildup commenced about 2130 and rose to a maximum of 133 Puffins counted at 2240 and again at 2248 after which the light became too dim for further counting. This colossal increase was due mainly to birds emerging from burrows rather than returning from the sea. Numbers on the sea below the colony were also high at this time. The diurnal changes showed no obvious relation to any weather factors.

The changes in arrivals and departures throughout the day showed some similarity to the changes in numbers visible on land. From dawn until 1515 arrivals and departures were fairly numerous. The preponderance of departures over arrivals during this time suggests that the number of Puffins in the colony decreased. From 1530 until 2000 the time during which almost no standing Puffins were visible, arrivals and departures continued at a lower rate. At dusk, activity increased to a level slightly below that of the morning. This increase was far less than the increase in visible Puffins on land which was due mainly to emergence from underground. Activity in Puffins was almost always due to flights between land and sea and very rarely to birds flying and immediately realighting. This resembles the Guillemot but differs from the Kittiwake and Fulmar.

On 24th there was again an evening peak remarkably similar to that of the previous day; 129 Puffins were counted at 2300. However on 25th it was obvious that some change took place. Between 0930 and 1130 numbers varied between 61 and 96, whereas on the previous two days only one morning count was over 30. Arrivals and departures were also more numerous on the morning of 25th and some hundreds of Puffins were on the sea at times when none were seen on the previous two days. The wind on 25th did not rise above 5 mph as was the case during the peak evening counts on 23rd and 24th.

On the small delineated area on Ruaival 14 burrows were judged to be in use though in some cases the judgement was of doubtful accuracy.

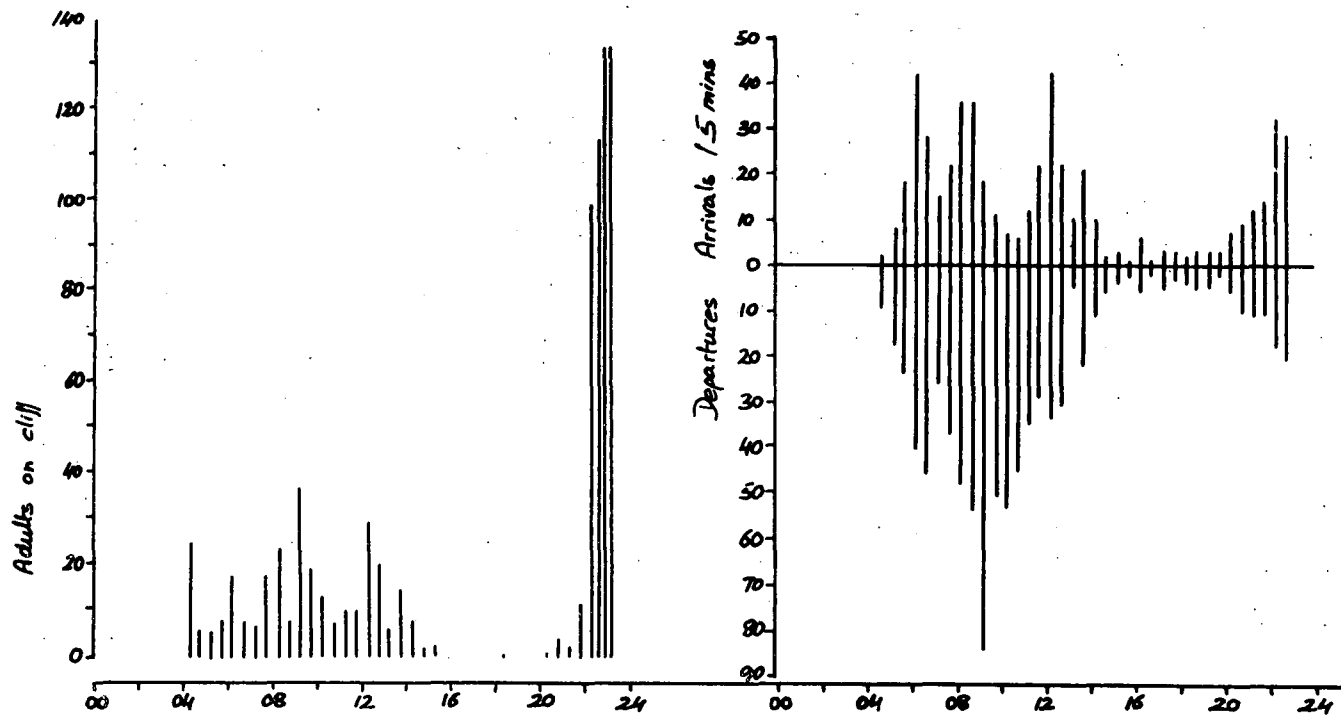


Figure. 3 Attendance and activity of adult Puffins at colony 2 on 23rd July.

During observations on 24th (evening) and 25th (morning) no Puffin was seen to displace the wooden splints at the burrow entrance, although at one burrow the splints were later found to have been moved. On several occasions Puffins were observed to approach an entrance, peer closely at the splints with signs of slight alarm and then turn away. Puffins counted standing in this area on the evening of 24th ranged from 9 at 2145 to 18 at 2222 and again at 2240 and falling to 2 at 2322. Thus the number rose above the number of burrows judged to be in use and this occurred at the same time as the peak recorded in the main study colony the previous day.

## Discussion.

It is shown by this study that the attendance of Kittiwakes at a colony between dawn and dusk can remain fairly constant in late July. This occurred during overcast conditions and slight wind but no relationship was shown between numbers of Kittiwakes and weather. The study was made late in the breeding season, but it was believed that no young Kittiwakes had begun to fly. There appears to be a lack of similar work on this species, except that Coulson and White (1956) found that in April Kittiwake numbers were highest in a colony between 1400 and 1600 and that winds above 9 mph caused a reduction in attendance.

Various studies of the attendance of Guillemots at colonies have been made, but no great consistency in the results is yet apparent. O'Connor (1968) reviewed work on this subject and showed that studies during the incubation and brooding periods have produced conflicting results; different workers found attendance to be lowest in the afternoon, lowest at night, and fairly constant throughout the day. Tuck (1960) published figures showing dawn to dusk counts in a colony of Brünnich's Guillemot *Uria lomvia* for three different days in June, July, and August. Like the present counts, they showed large fluctuations in numbers but always stable high numbers in the late evening. The present study was performed when young Guillemots had already begun to leave the cliff at a time when Tuck reported high numbers in colonies due to the arrival on non-breeders which were conspicuous in special loitering areas. No such loitering area was noted in the present study perhaps because the colony was much smaller than that studied by Tuck. O'Connor states that after the young begin to leave the cliff, about mid-July in Britain, it becomes difficult to find any consistent pattern of attendance among the adults, and the present findings fit in with this statement. Uspenski (1956) found that peak times of feeding flights showed no regularity in Russia and Pennycuik (1956) found no noticeable daily fluctuations in activity in Spitzbergen (both with *Ulomvia*). while Tuck (1960) found the same in Newfoundland but distinct peak periods of feeding activity in Akpatok Island and Digges

Sound. Tuck suggested that when a regular diurnal variation in feeding activity occurs this may be related to local phenomena such as tides or occurrence of schools of fish. In the present study, feeding of the young by parents had almost ceased and attendance did not relate to tide nor apparently to any weather factor. Tuck's dawn to dusk counts were not accompanied by weather measurements but he stated that during stormy weather attendance was more stable. O'Connor found that after egg-laying high attendances occurred during bad weather but before laying this was reversed.

The present results are in general agreement with Puffin behaviour so far as it is at present known. Reviewing previous studies, O'Connor found that during the incubation period very few Puffins were visible at colonies during the forenoon but numbers increased leading to evening assemblies on land. At about hatching time attendance could be irregular the pattern of an evening peak in Puffins visible on land continued during the period when young were in the burrows. This pattern however is subject to variation and evening assemblies on land may not occur for several days in succession (Brooke 1972). More Puffins are visible during the day after the eggs have hatched due to the traffic of adults bringing fish and probably also due to the arrival of non-breeding birds (O'Connor). Several studies have shown a morning and evening peak in the frequency of feeding flights (O'Connor, Corkhill 1973).

Before young Puffins leave land their parents cease to feed them. In the present study very few Puffins out of all those watched in flight were carrying fish, and it seems likely that fledging was soon to begin if it had not already done so. O'Connor states that after feeding of the young has ceased Puffins come onto land only for evening assemblies. The present results for 23rd and 24th July agree with this, although some Puffins were visible in the mornings, whereas on 25th large numbers were present on land in the morning. Thus the present study emphasises that an evening peak in Puffin attendance is not entirely regular and unexplained variations occur. As in most other studies, no obvious relationships with weather were found. Corkhill found no relation between feeding activity and tidal effects. Brook (1972) recorded various weather factors concurrently with Puffin counts but was unable to show any relation except a suggestion that low numbers occurred with low wind strength. The present results suggest the opposite. Extreme weather conditions do seem to influence Puffin attendance; stormy weather has been observed to coincide with high numbers of Puffins on land and so also has calm sunny weather. (O'Connor).

The method described here to find an index relating the number of occupied burrows to visible Puffins in a given area, might have met with more success earlier in the season. Recently however workers attempting to census Puffins have found fluctuations in numbers visible so great and irregular that they have chosen to base their counts on numbers of burrows (Brooke, Flegg 1972).

### **Acknowledgements.**

I extend a very special gratitude towards A. Anderson, G.W.V. Birnie and M. Marquiss who shared the long spells of fieldwork on St. Kilda. A. Anderson also helped with planning of the methods.

### **Summary**

This paper describes counts made from dawn to dusk of the numbers of Kittiwakes, Guillemots and Puffins present in breeding colonies and weather measurements made simultaneously during days in late July. The numbers of Kittiwakes showed little variation throughout two consecutive days, the Guillemot number showed large fluctuations which contrasted markedly on two consecutive days and the Puffin numbers showed an evening peak on two days but differed on a third day. In no case did numbers of birds relate to state of tide or obviously to any weather factor. It is suggested that much of our present knowledge of diurnal changes in numbers of seabirds at colonies is inconclusive and the methods used in the present study might usefully be repeated during different stages of the breeding season at other colonies.

### **References**

- Anderson, A., Birnie, G., Dott, H.E.M., and Marquiss, M. (1969)  
Aberdeen University fieldwork on St. Kilda in 1968.  
Scot Birds 5: 276-278
- Brooke, M. de L. (1972) The Puffin population of the Shiant Islands.  
Bird Study 19: 1-6.
- Corkhill, P. (1973) Food and feeding ecology of Puffins.  
Bird Study 20: 207-220.
- Coulson, J.C. and White, E. (1956) A Study of colonies of the  
Kittiwake *Rissa tridactyla*. Ibis 98: 63-79.
- Dott, H.E.M. (1973) Fulmars at land in summer and autumn.  
Bird Study 20: 221-225.
- Dott, H.E.M. (in press) Fulmars at colonies, time of day and weather.  
Bird Study.

- Flegg.J.J.M. (1972) The Puffin on St. Kilda 1969-1971. *Bird Study* 19: 7-17.
- O'Connor.R.J. (1968) A review of auk censusing problems. *Seabird Bulletin* 5: 19-26.
- Pennycuik.C.J. (1956) Observations on a colony of Brunnich's Guillemots *Uria lomvia* in Spitzbergen. *Ibis* 98: 80-89.
- Tuck. L.M. (1960) The Murres. Canadian Wildlife Series I. Ottawa.
- Uspenski.S.M. (1956) The bird bazaars of Novaya Zemlya. USSR Acad. Sci. Moscow.  
English translation: Translations of Russian Game Reports No.4. Canadian Wildlife Service. Ottawa 1958.

## SEABIRD MOVEMENTS IN SCOTLAND, AUTUMN 1973

A.C.B. Henderson

### Introduction

This report concerns seawatching carried out in Scotland in Autumn 1973, as part of an honours degree course in Zoology at the University of Aberdeen. Elkins & Williams (1970 and 1972) have published accounts of the movements occurring throughout the year off the Aberdeenshire coast. The present study is to some degree complementary, covering the period 18 August to 21 October 1973, but provides comparative data from the Isle of May, Shetland, Sutherland, and the Isle of Skye.

The aims were to determine the size, duration and direction of seabird movements off N.E. Scotland, and to a lesser extent off N. and W. Scotland, and to interpret the findings in the light of the distribution of the species concerned. Diurnal variation in numbers, group size of certain species, and meteorological influences were also considered.

### Methods

The study was divided into eleven six-day periods; Table 1 shows the location (see map) and duration of observations for each period.

Table 1: Locations and duration of observations.

Date:	Location:	No. of hours observation:
Aug.18-22	Aberdeenshire	15
Aug.24-28	Aberdeenshire	16

- Flegg.J.J.M. (1972) The Puffin on St. Kilda 1969-1971. *Bird Study* 19:7-17.
- O'Connor.R.J. (1968) A review of auk censusing problems. *Seabird Bulletin* 5:19-26.
- Pennycuik.C.J. (1956) Observations on a colony of Brunnich's Guillemots *Uria lomvia* in Spitzbergen. *Ibis* 98:80-89.
- Tuck.L.M. (1960) The Murres. Canadian Wildlife Series I. Ottawa.
- Uspenski.S.M. (1956) The bird bazaars of Novaya Zemlya. USSR Acad. Sci. Moscow.  
English translation: Translations of Russian Game Reports No.4. Canadian Wildlife Service. Ottawa 1958.

## SEABIRD MOVEMENTS IN SCOTLAND, AUTUMN 1973

A.C.B. Henderson

### Introduction

This report concerns seawatching carried out in Scotland in Autumn 1973, as part of an honours degree course in Zoology at the University of Aberdeen. Elkins & Williams (1970 and 1972) have published accounts of the movements occurring throughout the year off the Aberdeenshire coast. The present study is to some degree complementary, covering the period 18 August to 21 October 1973, but provides comparative data from the Isle of May, Shetland, Sutherland, and the Isle of Skye.

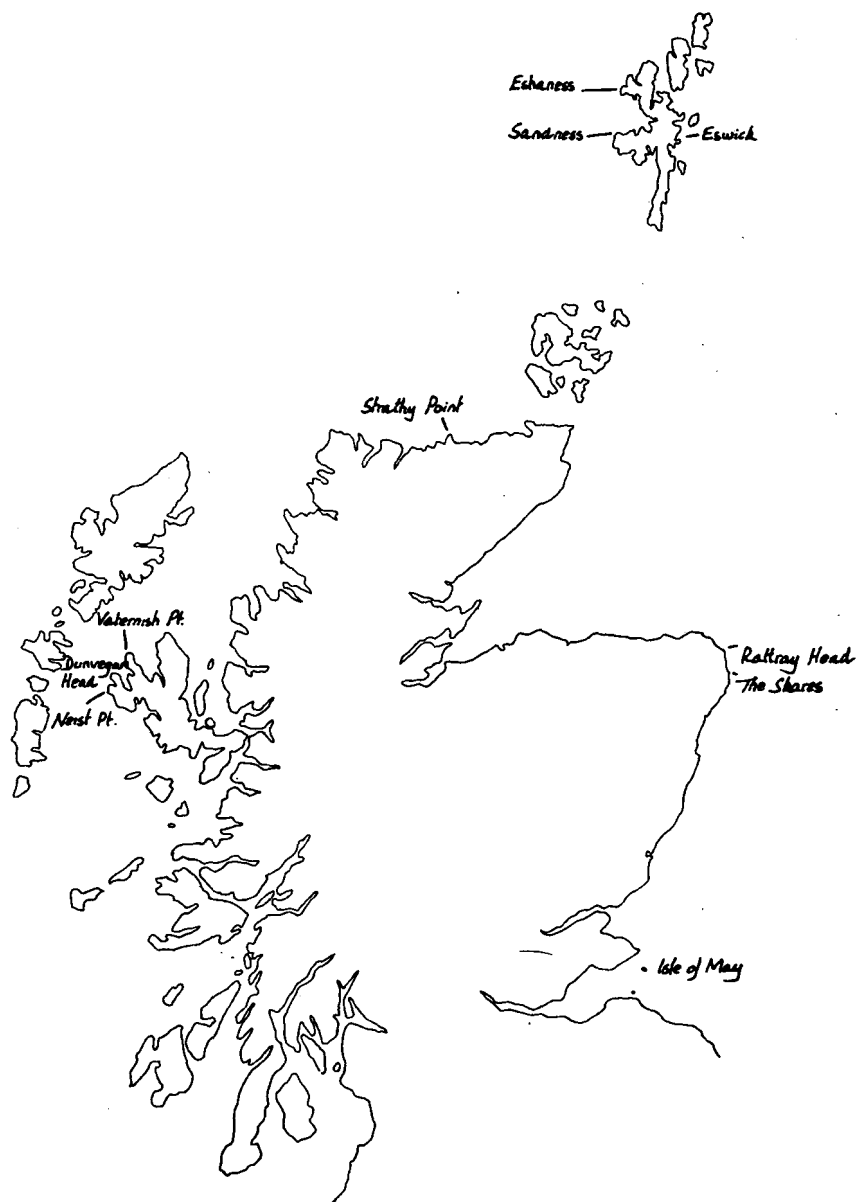
The aims were to determine the size, duration and direction of seabird movements off N.E. Scotland, and to a lesser extent off N. and W. Scotland, and to interpret the findings in the light of the distribution of the species concerned. Diurnal variation in numbers, group size of certain species, and meteorological influences were also considered.

### Methods

The study was divided into eleven six-day periods; Table 1 shows the location (see map) and duration of observations for each period.

Table 1: Locations and duration of observations.

Date:	Location:	No. of hours observation:
Aug.18-22	Aberdeenshire	15
Aug.24-28	Aberdeenshire	16



Map showing location of observation points



Aug.31—Sept. 4	Shetland; Eswick, Eshaness, Sandness	9
Sept. 5—10	Aberdeenshire	15½
Sept.11—15	Aberdeenshire	13
Sept.19—20	Isle of May	5
Sept.23—27	Aberdeenshire	15
Sept.29—Oct. 3	Aberdeenshire	13½
Oct. 5—6	Sutherland: Strathy Point	7
Oct.8—9	Isle of Skye: Vaternish, Dunvegan, Neist	3
Oct.13—15	Aberdeenshire	7
Oct.17—21	Aberdeenshire	8

Of those periods spent in Aberdeenshire, watching was from the Skares, near Cruden Bay, on 4 days, and from Rattray Head on one day. (No observations on the sixth day). At the Skares, observations were made for three hour periods, with a break of five minutes between successive hours: On successive days, the periods of observation were, respectively, late morning, early afternoon, late afternoon, and early morning, in order to give a balanced picture. At Rattray Hd. movements were recorded for one half-hour in each one and a half hours throughout the day. Elsewhere, observations were made at different times of day, in order to give comparable results.

Standardization of observation for seawatching is virtually impossible, but certain procedures were followed, and it is considered that counts were fairly accurate.

For most species, only the numbers passing in either direction were recorded. For Gannet, Shag, Cormorant and auks, group size was recorded; for Gannet, birds were also divided into three age classes.

Analysis of results was divided into four sections:

1. Changes in size of passage through the period of study.
2. Diurnal variation in size of passage.
3. Group size and age distribution.
4. Meteorological influences.

## Results and Discussion

The results for each species or group of species are analysed and discussed in separate sections. All text refers to movements off Aberdeenshire, and to overall movements. (i.e. the difference between numbers passing in either direction), unless otherwise stated. All figures are as rates per hour.

### Divers

Three spp. of diver were recorded, but Great Northern *Gavia immer* (6 individuals), and Black-throated *Garctica* (2), were far scarcer than Red-throated *G. stellata* (423).

Off Aberdeenshire, from mid August to the end of September, there was a gradually increasing southward movement, with a maximum count of 28 S./hr. on 1 October. After this, slight northward movement occurred.

Divers showed a strong tendency to move during the morning, and southward passage invariably occurred during anticyclonic weather, though not necessarily in head winds, as found by Elkins & Williams (1972).

The passage observed indicates a southward movement from mid August to late September, from breeding grounds in the North to wintering areas off the East coast. The picture is a little confused by the fact that the Aberdeenshire coast is itself part of this wintering area, and the northward movements in October were considered to be feeding movements of these birds.

### Fulmar *Fulmarus glacialis*

Northward passage occurred during the second half of August and early September. The peak count was 1441 N/hr. on 19 August. Numbers decreased through September, and few were seen after 26 September. There was no sudden drop in numbers comparable to that recorded by Elkins & Williams (1972), but it was noticeable that locally nesting birds disappeared between 17 and 26 September.

In Shetland, heavy southward passage was observed (max. 3436 S./hr on 2 September at Eshaness). On the Isle of May, passage was low, but predominantly southward (means 14.6 N/hr and 28.8 S./hr.). No Fulmars were seen from Skye, but in Sutherland, there were high numbers compared with Aberdeenshire at the same time (mean 41 W./hr.).

Movements were most pronounced at dawn and dusk. Off Aberdeenshire, the large movement took place in anticyclonic weather. The heavy passage in Shetland, however, followed the eastward passage of a cold front. Cessation of movement at the onset of heavy rain, as noted by Phillips & Lee (1966) and Elkins & Williams (1972), was not recorded.

These findings agree with those already published (Elkins & Williams 1970 and 1972; Gibbs et al. 1954; Downhill 1963; Phillips & Lee 1966; Ferguson 1967; Norman 1966), and indicate a movement out of the North Sea in August and early September, around the North of Scotland.

### **Shearwaters**

Two spp. of shearwater were recorded; Manx *Puffinus puffinus* and Sooty *P. griseus*, both in small numbers. The maximum were 40 Manx N./hr. and 6 Sooty N./hr. on 10 September; 20 Manx N./hr. were recorded on 22 August. The total numbers for the whole study were; Manx 97 N. and 2 S., Sooty: 28 N. and none S.

No shearwaters were seen on Shetland (except one dead Sooty Shearwater on the West coast), or on Skye. On the Isle of May, 3 Manx and 5 Sooty flew North and 1 Manx South. In Sutherland, 3 Manx and 7 Sooty flew West and 1 Sooty East.

No diurnal variation was apparent. Passage occurred chiefly in anticyclonic or high pressure conditions, and also in frontal conditions.

The pattern of shearwater movement is similar to that of the Fulmar, but is of longer duration (July to September), and also considerable numbers pass westward through the English Channel, especially in October (Oliver & Davenport 1970; Oliver 1971.) There are probably sizeable non-breeding populations of both shearwaters and the Fulmar in the North Sea in Summer.

### **Gannet *Sula bassana***

Passage was northward off Aberdeenshire, with maxima of 123 N./hr. on 27 August 141 N./hr on 26 September; 373 N./hr. on 13 October; 190 N./hr on 21 October. There was a peak in mean rate of passage between 13 and 21 October. coinciding with the main departure of adults from the Bass Rock (Nelson 1966).

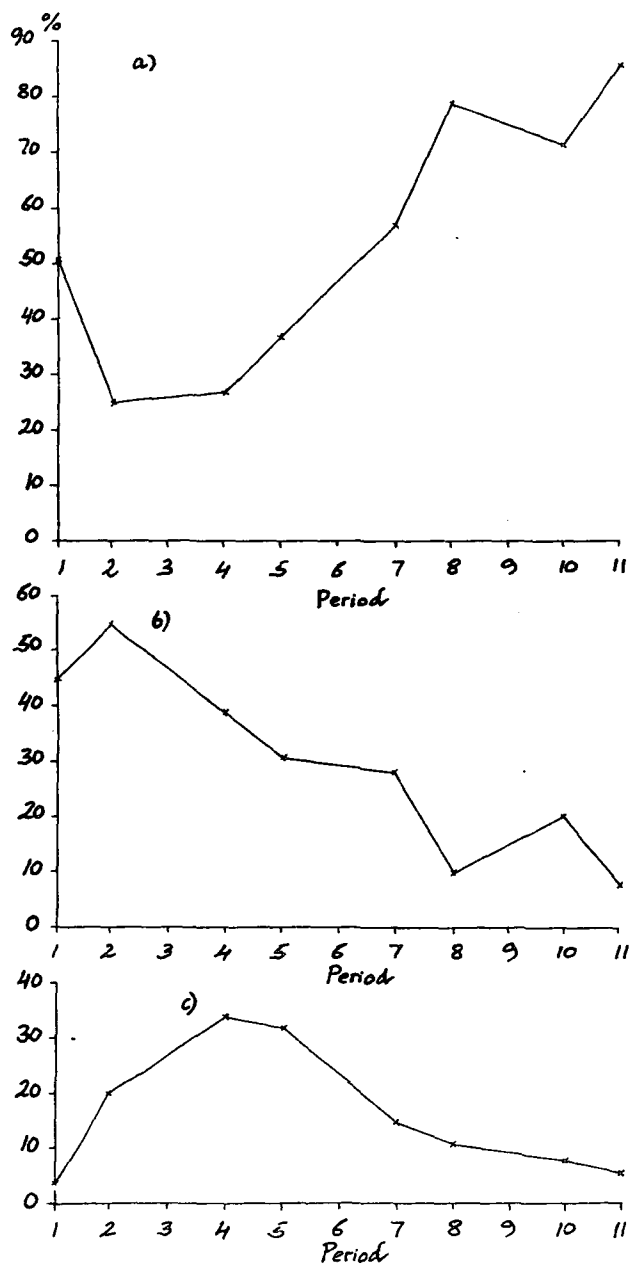


Fig. 1. Movements of Gannets off Aberdeenshire in six day periods between 18 Aug and 21 Oct. 1973. The graphs show the proportions of different age groups  
a) adult, b) sub-adult, c) first year.

In Shetland, movement was light, with breeding birds moving to and from the colonies. From the Isle of May, movement to and from the Bass Rock was observed, but more birds moved North by a ratio of 8:1. In Sutherland, equal numbers moved East and West (means 27.3 and 28.1/hr. respectively). 27% of those moving West were immatures, compared to 7% moving East. On Skye, small numbers moved South; most were fishing.

Morning passage predominated, with a smaller peak in the late afternoon and evening.

Table 2: Percentages of Gannets in groups of different sizes.

Group sizes:	1	2-5	6-10	11-20	20
%N :	38.5	40.5	13.4	6.9	0.7
% S:	75.4	21.6	3.0		

Table 2 shows that Gannets moving North did so in larger groups than those moving South. Fig 1 shows how the relative proportions of different age groups changed through the study. The non-breeding population leaves first, at the end of August, birds of the year peak in the second week of September. Adults leave mainly from the end of September, through October. This agrees with Nelson (1966).

Table 3: Nos of different aged Gannets, as percentages of the totals moving North and South.

	1st. year	Sub-adult	Adult	Total nos.
%N:	15.2	28.3	56.5	3540
%S:	41.9	14.5	43.6	227

Table 3 shows that first year birds have the greatest tendency to fly South, (by a ratio of 10:2:3 for 1st. year: sub-adult: adult). From the information concerning group size and age distribution, it is suggested that South-moving birds were fishing. Birds fish alone, thus South-moving Gannets were usually individuals. First-year birds have less well developed diving skills, and therefore would spend more time fishing. (There would, of course, be a component of the North-moving birds which were also engaged in fishing, as Gannets quarter the sea when hunting).

High pressure conditions often prevailed when passage was heavy. However, the largest movements were observed either in the calm air between two depressions, or in frontal conditions.

Gannets leave the North Sea mainly around the North of Scotland, though also through the English Channel, and thus show a similar pattern to the shearwaters.

#### **Shag *Phalacrocorax aristotelis***

Shag movements off Aberdeenshire have been described in detail by Elkins & Williams (1971). Small numbers breed on cliffs South of Peterhead, and large numbers roost there in winter. It was found that daily feeding movements occurred to and from the shallow water between Peterhead and Fraserburgh. The present study agrees with these findings: daily movements were observable from Rattray Head. At the Skares, however, there was no discernable pattern. No migration was apparent, and the gradual increase in numbers remains an unexplained anomaly.

The group size data for the Shag reveals no significant difference in group size between North and South-moving birds. This contrasts with the situation for the Cormorant.

#### **Cormorant *Phalacrocorax carbo***

Southward passage occurred from mid-August to mid September, with a peak of 161 S./hr. on 8 September. There was a small northward movement from mid September to mid October, though this was considered to be a feeding movement of locally wintering birds.

Fig 2 shows the diurnal variation for the first half of the study (18 Aug – 15 Sept.) at the Skares and Rattray Head. At the Skares, a large southerly movement took place in the morning, with a smaller northward movement in the evening. This is interpreted as daily feeding movement to and from the shallow water area between Collieston and Aberdeen, as well as a southward passage of migrating birds in the morning. At Rattray Head, there was a northward movement in the morning, as well as southward movements morning and evening. This suggests a daily feeding movement (as in the Shag) North in the morning and South in the evening, and also a southward passage of migrating birds in the morning. The data from the second half of the study gives a similar pattern, but without the component of migrating birds.

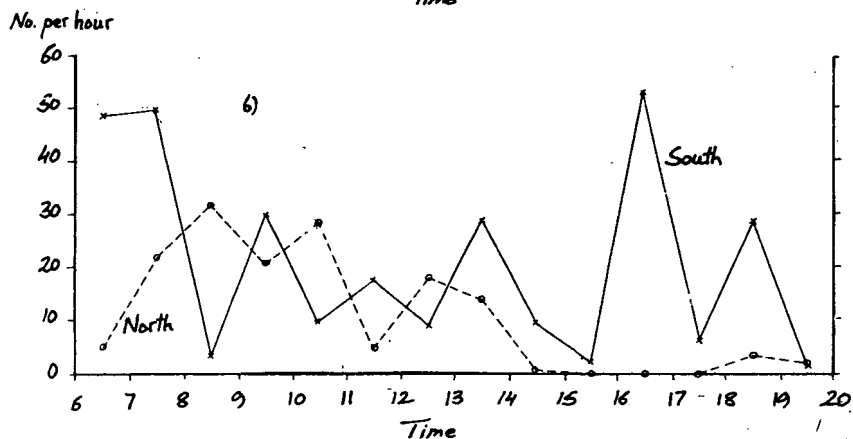
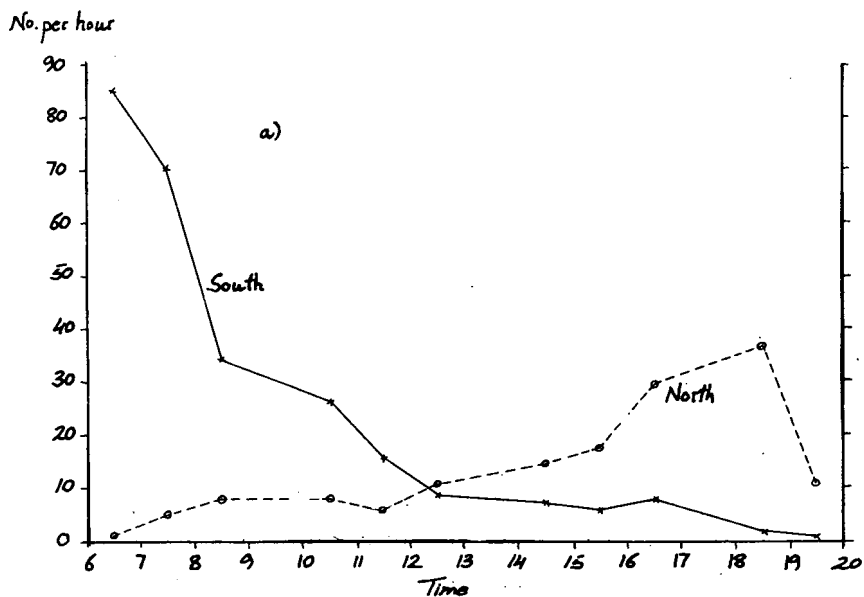


Fig. 2. Diurnal variation in numbers of Cormorants moving North and South per hour at a) Skares and b) Rattray Head between 18 Aug. and 15 Sept. 1973.

South-moving Cormorants travelled in significantly larger flocks than those moving North. This indicates that there is a tendency for migrating Cormorants to flock. The Shag, in which no dispersal took place, showed no such difference in group size.

Cormorants showed a clear preference for anticyclonic weather when migrating.

### **Skuas**

Great *Stercorarius skua*, Arctic *S. parasiticus*, and Pomarine *S. pomarinus* Skuas were seen. Pomarine Skuas were seen on five days only: 3 on 22 August (Ratray Head); 1 on 19 September (Isle of May); 1 on 5 October (Sutherland); 2 on 13 October (Skares); and 1 on 17 October (Skares).

Great Skuas showed a steady northward passage in small numbers (max. rate 4 N./hr. on 28 August, though fewer were seen in October than previously. In Shetland, a relatively heavy passage (mean rate 9.1 S/hr.) was observed. In Sutherland, 4 moved West, and 1 East.

Arctic Skuas also showed a northward movement, larger but not as definite as in the Great Skua. The maximum rates of passage were 40 S./hr. and 18 S./hr. on 28 August, and 11 S./hr. on 29 September. The northerly component of passage became more pronounced in early September, and it will be seen that this coincided with the main departure of terns. Only small numbers of Arctic Skuas were seen away from Aberdeenshire.

There was no obvious weather preference shown by any species.

Skuas seen to enter the North Sea to feed during early Autumn, and leave either around the North of Scotland, or through the English Channel. It is suggested that the latter route is taken only by birds which remain in the southern North Sea late in the season, and that it is not the main route as Landsborough Thomson (1966) concluded.

### **Kittiwake *Rissa tridactyla***

Northward passage took place in large numbers, especially in September and October, with peaks of 1038 N./hr. on 15 September; 952 N./hr. on 3 October. and 857 N./hr. on 13 October.

On the Isle of May, there was a small passage North (Mean rate 80 N/Hr.) In Sutherland, easterly passage predominated (mean rates 48 W. / hr. and 96 E./hr.). In Skye, a southerly passage was recorded (Mean rate 252 S./hr.). In both Skye and Sutherland, considerable numbers were seen fishing offshore



Diurnal variation showed peak passage in the evening, and this indicates that nocturnal migration may occur, as suggested by Owen (1963).

A clear preference for high pressure conditions was apparent. This contrasts with Hayward (1967), who found the most extensive movements taking place in front of advancing depressions.

The direction of dispersal seems to match that of the Gannet, with most North Sea birds leaving around North Scotland, but with some leaving through the English Channel, especially in October, (Oliver 1971; Owen 1963).

### **Terns**

Sandwich *Sterna sandvicensis* Common *S. hirundo* and Artic *S. paradisaea* Terns were recorded. The latter two species were not distinguished, and were classed as "Commic Terns".

"Commic" Terns showed a southward migration in gradually decreasing numbers; a peak of 208 S./hr. was recorded on 22 August. After 10 September, only a few occurred, and the last was seen on 2 October.

Sandwich Terns also showed a predominantly southward passage, but at first, northward movement was recorded (up to 145 N/hr. on 19 August). Peaks in southward movement were 193 S./hr. on 6 September and 192 S./hr. on 7 September. Few were seen after 23 September, and the last were seen on 2 October.

No clear pattern of diurnal variation was discernable, but there tended to be more movement in the morning and evening. Elkins & Williams (1972) found distinct dawn and dusk movements. Anticyclonic weather was preferred.

The terns thus show a marked southward migration, presumably through the English Channel. Initial northward post-fledging movements have been recorded in all three species (Langham 1971; Elkins & Williams 1972).

### **Auks**

Four species of auk were recorded: Razorbill *Alca torda*; Guillemot *Uria aalge*; Black Guillemot *Cephus grylle*; and Puffin *Fratercula arctica*. The second two were rarely seen, and are not discussed further; Razorbills and Guillemot were not distinguished, and are referred to as "auks".

Little movement was observed before 23 September, except for two flocks of 60 and 30 which drifted South on the tide on 19 August. After 23 September there was a considerable northerly passage, with peaks of 665 N./hr. on 26 September; 728 N./hr. on 15 October; 508 N./hr. on 21 October. In Sutherland, passage was light but easterly (mean rate 24E./hr.) From Skye, heavy southerly passage was observed, with up to 2400 S./hr.

Passage occurred almost wholly in the morning (mean rates, before 13.00 hrs. c.200 N/hr; after 13.00 hrs. c.30 N/hr; between 08.00 hrs. and 09.00 hrs almost 400 N./hr.)

Group size data shows that birds moving North do so in larger flocks than those moving South. This suggests that auks, like Gannets and Cormorants, tend to move in larger flocks when migrating than when making random feeding movements.

The largest movements ( $>500$ /hr.) took place in clearing conditions. However, sizeable passage also occurred in anticyclonic weather. Auks showed a strong preference for head winds, and it is suggested that this is necessary to obtain sufficient lift to maintain flight. Despite being in this way somewhat inefficient fliers, auks can maintain good speeds in the right conditions.

The observed auk movements suggest that large numbers leave the North Sea in late September and October. Owen (1963) says that "good numbers" move westward through the English Channel in October and November. Elkins & Williams (1970 and 1972) observed northerly passage off Aberdeenshire during October, but smaller and more irregular than in 1973.

Analysis of ringing recoveries by Landsborough Thomson (1953) (with limited data) indicated a reverse pattern, with birds from all of Britain wintering to some extent in the eastern North Sea. Some birds were thought to move South to the Bay of Biscay, but the most relevant populations of E. and N.W. Scotland gave recoveries almost entirely from the North Sea. It is suggested that these results were biased by the prevalence of auk shooting in the eastern North Sea, and that after an initial post-breeding dispersal, there is a more definite migration South to the Bay of Biscay or beyond.

### **Discussion and Conclusions:**

Species can be grouped on the basis of similarity in the pattern of movements. The shearwaters, Fulmar, Gannet, skuas, Kittiwake and auks all moved northward off Aberdeenshire, suggesting a departure from the North Sea around the North of Scotland, to wintering areas in the Atlantic. This pattern is supported by observations made elsewhere in Scotland. At Strathy Pt. in Sutherland, however, westward passage was unexpectedly low, and there was some eastward passage. This may be explained in that birds moving out of the North Sea swing around North Scotland in a wide arc, passing between the Orkneys and Fair Isle, or filtering through the Orkneys themselves. This theory was put forward by D. Wooldridge (pers. comm.), who observed sizeable westward movement from North Ronaldsay in Autumn 1973. The literature also suggests that a small proportion of these species leave the North Sea by way of the English Channel.

The terns, divers and Cormorant are more restricted to inshore waters. Off Aberdeenshire movement was southward, though complicated in the cases of divers and Cormorant in that considerable numbers were already present, or arriving to winter, in the area. The terns leave the North Sea entirely through the English Channel. The Shag was not seen to make any passage other than daily feeding movements.

Extensive passage was visible off Aberdeenshire in anticyclonic and clearing conditions, both of which involve good visibility. This differs from the situation elsewhere in the country, where clearing conditions are normally the most productive. It seems that the East coast is an extensive barrier, at right angles to the preferred direction of broad front migration. Migration will occur whenever there is good visibility, but in fine, anticyclonic weather will be observed only along a major leading line, such as the East coast.

### **References**

- Downhill, I.R. (1963) Notes from Island Roan, Sutherland.  
**Scot. Birds** 2: 351–357.
- Elkins, N. and Williams, M.R. (1970) Seabird movements in  
N.E. Scotland, 1968 and 1969. **Seabird Report** 1969: 31–39
- Elkins, N. and Williams, M.R. (1971) Winter movements of Shags in  
N. E. Scotland. **Bird Study** 18: 35–38
- Elkins, N. and Williams, M.R. (1972) Aspects of seabird movements off  
N.E. Scotland. **Scot. Birds** 7: 66–75

- Ferguson, A. (1967) Atlantic Seawatch Scheme: Fulmar movements in 1965. *Seabird Bulletin* 3: 63-68.
- Gibbs, A., Nisbet, I.C.T., and Redman, P.S. (1954) Birds of North Donegal in Autumn 1953, *Brit. Birds* 47: 217-228
- Hayward, P.J. (1967) Atlantic Seawatch: Kittiwake movements in 1965. *Seabird Bulletin* 3: 58-63
- Henderson, A.C.B. (1974) Seabird movements in Scotland, Autumn 1973. Unpublished BSc thesis; University of Aberdeen
- Langham, N.P.E. (1971) Seasonal movements of British terns in the Atlantic Ocean. *Bird Study* 18: 155-175.
- Nelson, J.B. (1966) The breeding biology of the Gannet (*Sula bassana*) on the Bass Rock, Scotland. *Ibis* 108:584-626.
- Norman, R.K. (1966) Seawatching on the East coast in the Autumn of 1965. *Seabird Bulletin* 2: 37-40.
- Oliver, P.J. (1971) Sooty Shearwaters in the English Channel. *Brit. Birds* 64: 56-60
- Oliver, P.J and Davenport, D.L. (1971) Large passage of Seabirds at Cap Griz Nez. *Seabird Report* 1970: 16-24
- Owen, D.F. (1953) Migration at the Kentish Knock lightship. *Brit. Birds* 46: 353-364
- Phillips, J.H. and Lee, S.L.B. (1966) Movements of Manx Shearwaters off Erris Head, Western Ireland in the Autumn. *Bird Study* 13: 284-296
- Thomson, A. Landsborough (1953) The migration of British Auks (*Alcidae*) as shown by the results of marking. *Brit. Birds* 46: 3-15
- Thomson, A. Landsborough (1966) An analysis of recoveries of Great Skuas ringed in Shetland. *Brit. Birds* 59: 1-15.

## **MOVEMENTS OF SEABIRDS AT CLOHER HEAD,**

**CO. LOUTH 1971 - 1973.**

**C.C. Moore.**

Observations in the autumn of 1970 led to the investigation of the head as a possible seawatch point. Since 1971, fairly regular seawatching has been carried out. This paper seeks to place on record observations made between Sep. 1971 and Oct. 1973. It does not particularly aim to answer the questions raised by Gibbs (1969) but

- Ferguson, A. (1967) Atlantic Seawatch Scheme: Fulmar movements in 1965. *Seabird Bulletin* 3: 63-68.
- Gibbs, A., Nisbet, I.C.T., and Redman, P.S. (1954) Birds of North Donegal in Autumn 1953, *Brit. Birds* 47: 217-228
- Hayward, P.J. (1967) Atlantic Seawatch: Kittiwake movements in 1965. *Seabird Bulletin* 3: 58-63
- Henderson, A.C.B. (1974) Seabird movements in Scotland, Autumn 1973. Unpublished BSc thesis; University of Aberdeen
- Langham, N.P.E. (1971) Seasonal movements of British terns in the Atlantic Ocean. *Bird Study* 18: 155-175.
- Nelson, J.B. (1966) The breeding biology of the Gannet (*Sula bassana*) on the Bass Rock, Scotland. *Ibis* 108:584-626.
- Norman, R.K. (1966) Seawatching on the East coast in the Autumn of 1965. *Seabird Bulletin* 2: 37-40.
- Oliver, P.J. (1971) Sooty Shearwaters in the English Channel. *Brit. Birds* 64: 56-60
- Oliver, P.J and Davenport, D.L. (1971) Large passage of Seabirds at Cap Griz Nez. *Seabird Report* 1970: 16-24
- Owen, D.F. (1953) Migration at the Kentish Knock lightship. *Brit. Birds* 46: 353-364
- Phillips, J.H. and Lee, S.L.B. (1966) Movements of Manx Shearwaters off Erris Head, Western Ireland in the Autumn. *Bird Study* 13: 284-296
- Thomson, A. Landsborough (1953) The migration of British Auks (*Alcidae*) as shown by the results of marking. *Brit. Birds* 46: 3-15
- Thomson, A. Landsborough (1966) An analysis of recoveries of Great Skuas ringed in Shetland. *Brit. Birds* 59: 1-15.

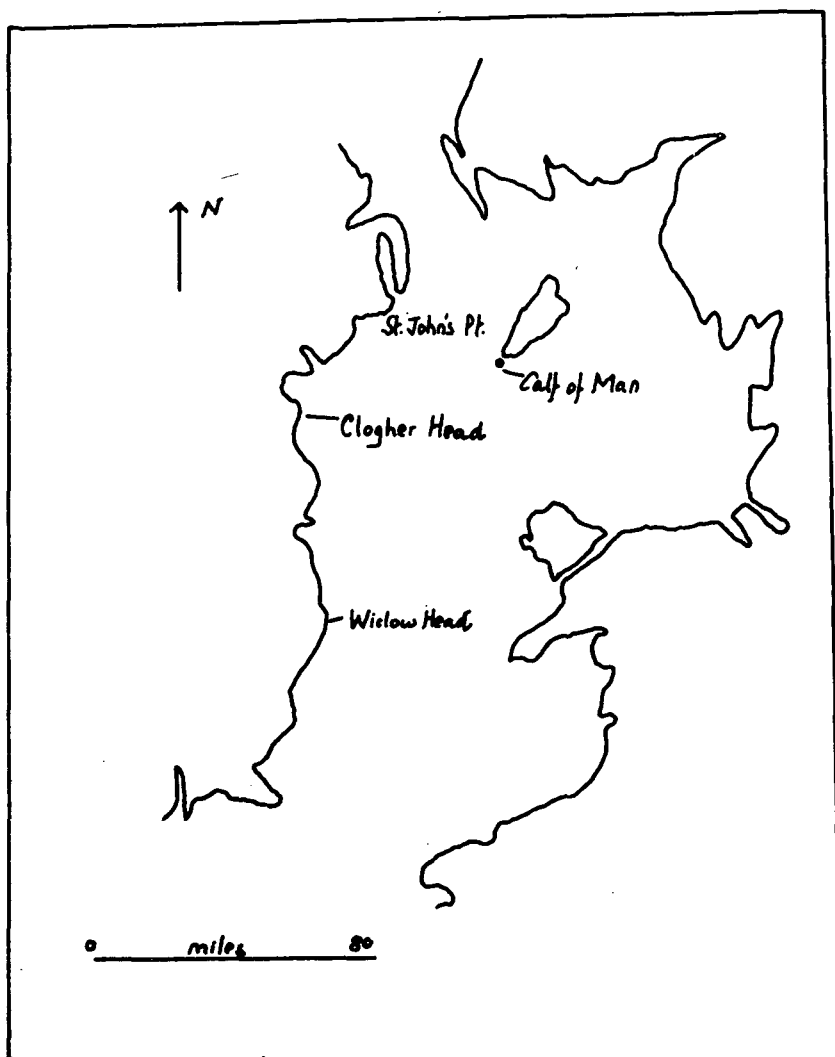
## **MOVEMENTS OF SEABIRDS AT CLOGHER HEAD,**

### **CO. LOUTH 1971 - 1973.**

**C.C. Moore.**

Observations in the autumn of 1970 led to the investigation of the head as a possible seawatch point. Since 1971, fairly regular seawatching has been carried out. This paper seeks to place on record observations made between Sep. 1971 and Oct. 1973. It does not particularly aim to answer the questions raised by Gibbs (1969) but

indicates that movement off this coast takes place on a heretofore unexpectedly large scale.



Map to show location of Clogher Head and its relationship with other Irish Sea-watching stations.

## Methods.

All seawatching was carried out from the rocks at Port Oriel (about 50 ft. above HWM) with an unbroken view from NE through E to SSE. The accompanying sketch map illustrates this. Most watches were made in the morning since less movement seems to occur in the afternoon. Records were collected in the following periods :-

	Dates	Days.	Hours.
Autumn 1971	11 Sep - 10 Nov.	12	28
Winter 1971/72	29 Dec - 9 Jan.	6	7½
Spring 1972	12 Mar - 21 May.	9	7
Autumn 1972	15 Aug - 14 Oct.	16	20½
Winter 1972/73	31 Dec - 1 Jan	2	2
Spring 1973	11 Mar - 24 Jun.	11	11
Autumn 1973	18 Aug - 7 Oct	12	27

An attempt was made to count most species of seabirds either on the water or flying. Razorbills and Guillemots were lumped as auks and Common and Arctic Terns as Commic Terns. An attempt was made to separate adults from immatures when possible.

## Divers.

There have been four records of Black-throated Divers all after periods of E or SE winds. The two common species of divers occur from August to May, passage south predominating in autumn and passage north in spring. Spring passage from March to May is usually heavier than autumn passage from August to October. Heavy movement is also recorded in spring at St. John's Point Co. Down (Gibbs 1969). Some random movement occurs throughout the winter though only a few winter offshore.

Table 1 Maximum rate of passage and number offshore of Great Northern and Red-throated Divers.

Red-throated Diver	1971		1972		1973	
	spring	autumn	spring	autumn	spring	autumn
Peak month	-	Oct	Apr	Oct	Apr	Oct
Passage/hr	-	18	5	18	70	3
No. offshore	-	9	35	25	110+	40

Great N. Diver.	1971		1972		1973	
	spring	autumn	spring	autumn	spring	autumn
Peak month	-	Sep	Mar	Sep/Oct	May	Sep
Passage/hr	-	2	1	2	21	3
No. offshore	-	2	20	6	5	5

### Grebes.

Three records of Slavonian Grebes, all in SE winds. Odd records of Great Crested Grebe mainly in autumn. None noted regularly offshore.

### Fulmar, Shearwaters & Petrels.

Fulmars are present offshore in small numbers (Peak 110 in Aug. 1973) throughout the year though little appreciable movement has been noted. Manx Shearwaters appear in spring (Apr/May) summer and autumn (Aug/Sep) though whether on passage or simply feeding is not known.

Table 2 Maximum rates of movement of Manx Shearwaters

	1971		1972		1973	
	spring	autumn	spring	autumn	spring	autumn
Peak month	-	Sep	May	Aug	Apr	Aug
Passage/hr N	-	30	-	12	-	25
S	-	10	40	3050	70	1050

Very few are noted at any other time of year. The majority appear to move south, though the significance of this is not understood. Balearic Shearwaters have been seen once in May and once in Sep and three Sooty Shearwaters were seen in Sep/Oct. Storm Petrels occur offshore in late July and August in small numbers (max 30 birds); no passage of this species has however been detected.

### Gannet.

The Gannet is present throughout the year in small numbers as shown in Table 3.

Table 3 Mean monthly peak counts of Gannets 1971 - 1973.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	?	15	30	25	10	?	150	35	30	15	6

The number of immature birds increases suddenly in spring and by Aug



they constitute 50% of the total. By late autumn immatures only represent 10% of the total. This agrees with findings at Cape Clear (Sharrock 1965).

#### Scoters and mergansers.

Both Common Scoter and Red-breasted Merganser are present throughout the year. This makes analysis of passage difficult.

Table 4 Mean monthly peak counts of Common Scoter and Red-throated Merganser.

1971-1973.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
R-b Merganser	30	?	30	200	25	25	?	90	30	30	30	30
Common Scoter	50	?	150	30	30	20	?	10	60	200	200	70

It is probable that in Sep/Oct 1971 and 1973 genuine passage of Common Scoter did occur. In four days between 28 Sep and 2 Oct 1971 (9½ hrs), 206 mostly males flew purposefully south. There have been four records of Velvet Scoters all in autumn.

#### Great, Pomarine and Arctic Skuas.

A total of 157 skuas has been recorded all but seven in autumn. Arctic Skuas constitute 68%, Great Skuas 11% of the total recorded.

Table 5 Records of skuas Aug-Oct 1971-1973

Species	North	South	Total
Great Skua	6	10	16
Pomarine Skua	0	7	7
Arctic Skua	21	81	102
Arc/Pom Skua	13	12	25

Derivation of a pattern from the data may be biased as 38 Arctic, 2 Great and a Pomarine Skua flew south in four hours on 21 Aug 1973 in strong ESE winds.

#### Gulls.

Eighteen Little Gulls all but one in autumn, have been recorded, twelve of these being immatures mainly first-year. Movement of Lesser Black-backed Gulls is occasionally heavy, especially in autumn. Large

scale movement southwards occurred in Aug 1973 when with anticyclonic conditions pertaining over most of Europe, passage was continuous from dawn to dusk between 19th-25th at least. Some 2500 birds were recorded. An individual of the Scandinavian subspecies was seen on 14 Oct 1972. A small northward movement of Common Gulls is recorded especially in Spring. Throughout the year Kittiwakes may be found offshore in varying numbers depending on weather conditions. Passage is noted in Autumn.

Table 6            Peak passage of Kittiwakes/hr.

	1971	1972	1973
Aug N	?	16	40
Aug S	?	116	60
Sep N	5	?	30
Sep S	57	?	20
Oct N	1	500	40
Oct S	22	350	750

Glaucous Gull, Iceland Gull and Mediterranean Gull have also been seen.

### **Terns.**

A total of 23 Black Terns has been recorded all in autumn. Without exception they have arrived in anticyclonic weather or in SE winds. An adult White-winged Black Tern was also noted in autumn 1971. Sandwich Terns pass north in spring in large numbers especially in late April and early May often at a rate of 200/hr. Return movement south is less well defined. In contrast, passage of Commic Terns is only noted in autumn and can often involve several thousand birds per hour. Analysis of movement of Commic Terns in autumn is rendered difficult by the fact that passage movement appears to consist of a slow progression south from roost to roost at least in anticyclonic conditions. Pettitt (1973) has collected data from several points on the east coast of Ireland and he suggests that movements in Dublin/Wicklow in Aug are distinct from movements further north at least in the case of Common Terns.

**Table 7** Rates of movement/hr of Commic Terns  
Aug-Oct 1971 - 1973

		1971	1972	1973
Aug	N	?	70	38
Aug	S	?	330	210
Sep	N	-	?	-
Sep	S	20	?	10
Oct	N	-	-	-
Oct	S	1	2	4

Very little movement of Roseate Terns is recorded, and Little Terns have only been seen twice.

### **Auks**

Puffins and Black Guillemots are noted infrequently. Razorbills and Guillemots are extremely numerous especially in autumn when thousands raft offshore from Aug. to early Oct. Well defined southerly movement takes place in Oct and probably Nov. In 1972 passage south peaked at 898/hr in moderate south winds on 8 Oct.

### **Discussion**

Clogher Head lies on the south periphery the extremely large catchment area of Dundalk Bay; it therefore reflects movements south after displacement into the bay in S.E. or E. winds. There is also evidence to suggest some through passage to and from the north Atlantic via the North and St. Georges Channels, on the West side of the Irish Sea at least. However the largest sources of birds recorded are probably the local littoral feeding areas within thirty miles of the head.

Evidence suggests that visible movements along this coast are fairly dependent upon wind direction and strength. With skuas as with many other seabirds there is a fairly close correlation between wind direction and numbers recorded.

Table 8 Rates of movement of skuas/hr related to wind direction.

Direction of Movement	N	N	S	S
Great Skua	0.1	-	0.25	0.1
Pomarine Skua	-	-	0.2	0.1
Arctic Skua	0.35	0.1	1.3	0.2
Pom/Arc Skua	0.4	-	0.1	0.2
on days with wind	E	W	E	W

It seems likely that many more birds are seen under easterly conditions simply because they then come within sight of land. Passage seems especially strong after long periods of such winds.

Strong E. or SE winds in autumn (much less so in spring) almost invariably produce large movements of gulls, terns, and sometimes Manx Shearwaters (in August). This trend, though very variable is noted along the entire Irish east coast (R.F. Rutledge pers comm). More often however, and especially in anticyclonic overcast conditions, movements offshore appear to consist entirely of feeding parties of auks, terns and Gannets in intimate association with Kittiwakes.

In calm conditions widespread rafting occurs, though rarely of Manx Shearwaters. Auk movement seems best developed in slightly windy conditions and good visibility. In stormy conditions in Oct. movement also occurs in contrast to the findings of Sharrock (1960) at Cape Clear. Perhaps this indicates that of the two conditions suggested as necessary for auk migration, visibility is the more important.

In recent years Little Gull influxes have increased greatly south of Dublin; the birds often remain several days (Hutchinson 1972). Such influxes have not been witnessed in Co. Louth and it appears that their occurrence here and that of Black Terns is somewhat more dependent on the position of the European autumn anticyclonic complex and its western or northern periphery. Having headed south from the Baltic (Erard 1960) many Little Gulls on reaching the southern Irish Sea basin probably move west and north. At Clogher, Little Gulls and Black Terns (displaced in SE winds or drifting in overcast conditions) have almost always turned on reaching the head

and moved back towards the south, retracing their paths. At which headland they will begin to retrace their flight depends perhaps on temperature or proximity of frontal troughs approaching from the Atlantic. A White-winged Black Tern seen continuing north in Sep. 1971 probably did not stop as the area was east of the high/low periphery and the temperature over the period was many degrees higher than usual.

To conclude, it is clear that movements of seabirds at Clogher Head are complex and not explicable in terms of a single factor. The area reflects onward passage of several species and the displacement effects of E and SE winds. However many species are present throughout the year and much recorded movement is undoubtedly associated with feeding excursions and post-breeding dispersal of adults and immatures of at least ten species. The occurrence of Little Gulls and Black Terns warrants further study in the north Irish Sea.

### Acknowledgements

I am indebted to those who supplied information and especially Major R.F. Rutledge, Garth Pettitt and R.G. Wheeler for records and helpful suggestions.

### References

- Erard C. (1960) Sur L'aire de reproduction, les zones D'hivernage et les migrations de la Mouette Pygmee *Larus minutus*. *Alauda* 28: 198 – 228.
- Gibbs, R.G. (1969) Irish Sea Sea-Watching. Seabird Report 1969: 26 – 30
- Hutchinson C. (1972) The increasing occurrence of the Little Gull *Larus minutus* in Dublin and Wicklow to 1970. Dublin and Wicklow Bird Report 1971.
- Pettitt, R.G. (1973) Movements of terns observed in August 1972. Dublin and Wicklow Bird Report 1972.
- Rutledge, R.F. (1966) Ireland's Birds. London.
- Sharrock, J.T.R. (1960) A Sea-watch analysis. Cape Clear Bird Observatory Report. 2: 23 – 26.
- Sharrock, J.T.R. (1965) The status of immature Gannets off Cape Clear Island. *Brit Birds*. 58: 216 – 217.

## **OBSERVATIONS OF SEABIRD MOVEMENTS AT BARFLEUR, NORMANDY, IN THE AUTUMN.**

**D.B. Wooldridge.**

The Cherbourg peninsula provides an outstanding position for observations of seabird movements in the centre of the north coast of France, easily accessible to English observers by ferry from Southampton. In the Seabird Bulletin 2:26-28 some preliminary observations were reported which showed that passing birds are best observed from the Cap de la Hague at the north-west corner of the peninsula in the spring, and at the Pointe de Barfleur at the north-east corner in the autumn. This note summarises a longer series of autumn observations by a number of observers, covering the periods 5-11 September and 7-10 October 1965, 18 August - 8 September 1966 22 August - 13 September 1970, and 28 October - 10 November 1971.

Observations were usually made from the old Barfleur lighthouse, which is built on a low rocky islet joined to the mainland by a narrow causeway about 3 km. north of Barfleur village. The surrounding land is low-lying, with small fields, hedgerows, and a rocky shore, giving way to long, sandy beaches to the north-west. The general character of the seabird movement in the autumn, when birds moving south-west down the English Channel tend to stream round the point, is indicated in table 1, summarising observations in 1966.

A concentrated passage of Kittiwakes, Gannets, Great Skuas, Balearic and Sooty Shearwaters during a period of strong to gale force north-west winds of the sort also seen the previous year at Cap Gris Nez (P.J.Oliver and D.L.Davenport, Seabird Report 2:16-24) was also encountered on 7-10 November when observations were made late in the season in 1971, as shown in table 2. Easterly winds at both the Cap de la Hague in the spring and Barfleur in autumn produce an extremely poor migration.

Table 1: Observations of passing seabirds at the Pointe of Barfleur, 1966

	August												September										
Date	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	
Wind	var	NE	var	var	NNW	E	N	ENE	E	NE	SE	SSE v NNW	W	WNW	SW	SW	W	SW	WSW	—	—	—	
Force	1	1	1	1-2	2-4	3	1	3	4-5	4	2-3	2	4-1	3	3-4	5	2	4	3	calm	calm	calm	
Manx Shwtr.																		1		2	1		
Balearic S.	5	3	9 +1E	8	3	2		1	17	32	7	1	6	18	2	6	28	4 +3E	92	44	9	12	
Sooty Shwtr																				1	1		
Common Scoter	21	45		17	233	25					11	14						3		6			
Oystercatcher			4		60				3E	5E													
Whimbrel												14		1				2	1	1	2		
Arctic Skua	4				4	15	1	4	11	7				1	6		21	9		20	8	2	
Great Skua	1	1			2	2	1	1	3	4		1					1						
Pomarine Skua																				1	1		
G.B.B.Gull					27	1				4													
L.B.B. Gull					67	37		9		69	6									2			
Imm. H/L B.B.G.				35							10				10								
Kittiwake					2	2	1	5	5	4													
Black Tern				1	5	4		2		2	4		3	5	4		1	5					
"Comic" Tern	165	8		14	301	68		79	144	29	57	81	20	145	95	52	185	251	61	183	20	14	
Little Tern			5	4	6										4								
Sandwich Tern	65	5	17	34	195	71	36	64	98	26	68	27	2	38	101	63	156	135	77	219	223	117	
Auk sp.														1			2		1				

Birds travelling west unless indicated otherwise. A diver was also seen on 30 August, a Fulmar on 26 August, and 6 Eiders on 18 August. Some 20-30 Black-headed Gulls were always present, and showed no obvious movement. For Gannet, see table 2.

**TABLE 2.** Seabirds moving west at the Pointe de Barfleur with north-west winds in November 1971.

Date.	Shearwaters			Skuas			Kittiwakes (and % adult)
	Sooty	Balearic	Manx	Great	Pomarine	Arctic	
7	1			16	5	1	2,740 (60%)
8	13			10	1	2	2,000 (50%)
9	68	35	2	84	2	3	4,000 (50%)
10	12	14		63	2	1	865

The migration ceased when the wind veered from north-west to north-east at midday on 10 November.

While many seabirds clearly pass round the Pointe de Barfleur on migration, it also seems possible that some may pass overland across the base of the Cherbourg peninsula. Thus such species as Common/Arctic and Black Terns have often been seen flying very high, and may pass inland. These birds and various waders were also often seen or heard passing the lighthouse to the west or south at night; thus Curlew were heard in the small hours on a number of occasions in 1966, very many Black Terns and also Redshank and Spotted Redshank moved west at 0330 hrs. on 21 August, more Black Terns passed west at 2200 hrs. on 22 August, and many Common/Arctic Terns at 0300 hrs. the following morning and again at 2255 hrs. on the evening of the 24th.

It is notable that comparatively few wildfowl have been seen moving west at Barfleur in the autumn, when many Common Scoters in particular pass Cap Gris Nez to the east, and thousands can be seen returning east past the Cap de la Hague on the other side of the peninsula in the spring.

#### **Species observed.**

Single divers were seen twice in late August, but otherwise they did not occur until October. The largest totals then were twelve flying west on 6-10 October, 18 on 7 November, eight next day, 17 the day after, and 26 on 10 November. Most appeared to be red or Black-throated but there were two Great Northern on 9 November.

The shearwaters normally passed close inshore. Balearic Shearwaters



**P.p. mauretanicus** were seen much more frequently than the nominate race of Manx Shearwaters **P.p.puffinus**. Maximum numbers of the first race included 92 on 5 September 1966 and 44 next day, 21 on 6 September and 35 on 9 November 1970 with ten more next day. They varied greatly in the colour of their underparts, through all shades of pale off-white and light grey to uniform darker grey-brown. Manx Shearwaters also regularly pass west from the end of August until at least 9 November, with a maximum of 26 on 6 September 1960. Larger numbers of Sooty Shearwaters passed from early September until at least 10 November, with maxima of 56 on 6 September and 5 on 13 September in 1970, and 13 west on 9 November. 68 next day, and 12 the day after in 1971. Two Cory's Shearwaters flew east on 2 October 1965.

The Fulmar was extremely scarce; only four singles were seen on 26 August 1966 and 28 August, 4 and 8 September 1970.

The number of Gannets fluctuated a great deal, as shown for 1966 in table 3. Birds moving west normally predominated in the mornings. It will be noted that with west winds, eastward movements developed later in the day on 22 August and 4 September. The eastward and westward movements appeared to consist of different birds, those travelling west tending to sweep out north-west while those travelling east followed the shore. Taking the period 18 August-10 November as a whole, the number seen daily averaged about 200-300, with peaks of 549 on 22 August 1966 and 783 on 9 November 1971. The ratio of fully adult birds to immatures of all ages varied during the three main periods of observation, the proportion of immatures rising markedly at the end of the season, as in table 4 :-

TABLE 4. Proportion of adult Gannets during main periods of observation.

	18 Aug.- 8 Sept. 1966	23 Aug.- 13 Sept. 1970.	28 Aug.- 10 Nov. 1971.
% adult	92	98	78
% immature	8	2	22

Wildfowl were comparatively scarce, as already remarked. Small numbers of Common Scoter passed west from August onwards, but the only

Table 3: Observations of Gannets at the Pointe de Balfleur, 1966

Date	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8
<b>0600-900 hrs GMT</b>																						
Adults West	95	96	61	40	297	165	16	139	42	121	12	26	49	256	100	—	283	38	193	—	—	—
Immatures West	36	21	5	8	16	9	2	15	8	31	—	2	5	7	10	—	13	2	8	—	—	—
Adults East	64	23	9	21	18	10	—	1	—	—	—	—	35	27	80	—	19	—	17	—	—	—
Immatures East	21	3	1	2	6	—	—	—	—	—	—	—	2	5	5	—	2	—	1	—	—	—
<b>Total</b>	<b>216</b>	<b>143</b>	<b>76</b>	<b>71</b>	<b>337</b>	<b>184</b>	<b>18</b>	<b>155</b>	<b>50</b>	<b>152</b>	<b>12</b>	<b>28</b>	<b>91</b>	<b>295</b>	<b>195</b>	<b>(30)</b>	<b>317</b>	<b>40</b>	<b>219</b>	<b>No movement</b>		
<b>After 0900 hrs GMT</b>																						
Adults West	2				44	50		69		84	30	53	20				84	30	47	60		300
Immatures West	2				4	3				14	3	4	1				4	5	12	5		50
Adults East	4				132	59		5		20	—	—	5				5	200	—	10		—
Immatures East	7				32	5				—	—	—	—				25	—	—			—
<b>Total</b>	<b>15</b>				<b>212</b>	<b>117</b>		<b>74</b>		<b>118</b>	<b>33</b>	<b>57</b>	<b>26</b>				<b>93</b>	<b>260</b>	<b>59</b>	<b>75</b>		<b>350</b>
<b>Total West</b>	<b>135</b>	<b>117</b>	<b>66</b>	<b>48</b>	<b>361</b>	<b>227</b>	<b>18</b>	<b>223</b>	<b>50</b>	<b>250</b>	<b>45</b>	<b>85</b>	<b>75</b>	<b>263</b>	<b>110</b>		<b>384</b>	<b>75</b>	<b>260</b>	<b>65</b>		<b>350</b>
<b>Total East</b>	<b>96</b>	<b>26</b>	<b>10</b>	<b>23</b>	<b>188</b>	<b>74</b>	<b>—</b>	<b>6</b>	<b>—</b>	<b>20</b>	<b>—</b>	<b>—</b>	<b>42</b>	<b>32</b>	<b>85</b>		<b>26</b>	<b>225</b>	<b>18</b>	<b>10</b>		<b>—</b>
<b>Total Adults</b>	<b>165</b>	<b>119</b>	<b>70</b>	<b>61</b>	<b>491</b>	<b>284</b>	<b>16</b>	<b>214</b>	<b>42</b>	<b>225</b>	<b>42</b>	<b>79</b>	<b>109</b>	<b>283</b>	<b>180</b>		<b>391</b>	<b>268</b>	<b>257</b>	<b>70</b>		<b>300</b>
<b>Total Immatures</b>	<b>66</b>	<b>24</b>	<b>6</b>	<b>10</b>	<b>58</b>	<b>17</b>	<b>2</b>	<b>15</b>	<b>8</b>	<b>45</b>	<b>3</b>	<b>6</b>	<b>8</b>	<b>12</b>	<b>15</b>		<b>19</b>	<b>32</b>	<b>21</b>	<b>5</b>		<b>50</b>
<b>Total for day</b>	<b>231</b>	<b>143</b>	<b>76</b>	<b>71</b>	<b>549</b>	<b>301</b>	<b>18</b>	<b>229</b>	<b>50</b>	<b>270</b>	<b>45</b>	<b>85</b>	<b>117</b>	<b>295</b>	<b>195</b>	<b>(50)</b>	<b>410</b>	<b>300</b>	<b>278</b>	<b>75</b>	<b>(95)</b>	<b>350</b>

large passage was of 697 on 9-10 October 1965. Velvet Scoter were only seen occasionally, the maximum number being 55 passing west on 28 October 1971. Pochard also occurred occasionally, with 22 passing west on 10 November 1971 and 15 a week later. Eider were equally scarce, with five passing west on 24 August and eight next day in 1970, and 20 west on 28 October with 28 two days later in 1971. Brent Geese may occur regularly on passage in the late autumn, and 45 were seen flying west on 10 November 1971.

Arctic Skuas are regular and common on passage from August to at least 10 November. They sometimes occur in large numbers, as for example in early September 1970, when 106 passed west on the 4th., 243 on the 6th., and 93 on the 13th., though no more than three occurred in a day in the concentrated seabird passages of November 1971. Great Skuas also occurred regularly on migration after mid August, and commonly in the November 1971 movements, as shown in table 2. Pomarine Skuas were also seen occasionally from 6 September onwards, but only in small numbers.

Lesser Black-backed Gulls regularly passed west in August and September, and a few Little Gulls in October and November. Few Kittiwakes were seen before November, but they were then very numerous in the concentrated westward passages in 1971, as shown in table 2.

Common/Arctic Terns passed daily in August and September, the total reaching 2,000 between 8 August -8 September 1966 and 3,400 between 23 August 13 September 1970. Sandwich Terns occurred with them between mid-August and mid-September, the total reaching 2,000 in both years. Black Terns occurred between the third week of August and the end of the first week of September, often moving high or by night, as already observed. Little Terns were scarce, though small numbers occurred in the latter part of August. One Caspian Tern flew south-east on 9 September 1965, and one Gull-billed Tern west on 4 September 1970.

Auks were scarce in August and September, and no totals of over 500 were recorded during the period under review.

## PURPLE SANDPIPERS - OFFSHORE MIGRANTS?

H.P.K. Robinson

Many sea-watching stations are situated on rocky headlands and these frequently have wintering flocks of Purple Sandpipers which makes it impossible to identify migrants. In south-east England the headlands are often low with shingle beaches, a habitat which is not favoured by Purple Sandpipers. At these sites any Purple Sandpipers seen would be migrants. It is therefore interesting to note that this species is uncommon at Dungeness (Kent), Selsey Bill (Sussex) and at sea-watching stations in Hampshire. This paper uses the records from Selsey Bill in an attempt to see why it is so rare at these headlands on passage when it is a regular winter visitor to suitable sites in this part of the Channel.

Selsey Bill is a low flat headland in western Sussex with a shingle shore line. Between the years 1959 to 1970 some 12,000 hours were spent recording visible migration. In all this time only 45 Purple Sandpipers were seen. There were very few spring records with singles in February, March and April, and 4 in May. In autumn records were from September to November with most in the latter month.

There is information on the prevailing weather conditions at the time 33 of the birds were seen. As can be seen from Table 1 most birds occurred in force 4 and above winds from the west or south-west. 2 birds were seen on north-east force 4-6 winds but unlike the others they flew east. Thus it seems that at least 90% of these birds occurred during strong winds. A number of those recorded during light winds were resting, sometimes following strong winds a few days previously when the area was not covered. It seems that off passage birds can stop for up to 10 days before moving on.

It is suggested that this species normally moves down Channel well offshore, only coming inshore/onshore in bad weather.

**TABLE 1.** Occurrence of Purple Sandpipers at Selsey Bill in relation to wind speed and direction.

### SPRING.

Wind	0	NE 5/6	SW5	W5
Records	(1)	1E	2W	(3)

## **AUTUMN.**

Wind	SW2	SW4	SW5	SW6	SW8
Records	(2)	(1),2W	(8),4W	1W	(2)

Wind	NE4	SE5	W5	W8
Record.	1E	1W	(2),1W	(1)

Records in parenthesis are of birds not clearly moving.

## **SEVENTH REPORT OF THE SEABIRD GROUP, 1971-1972.**

The year has been mainly devoted to the preparation of the results of the national census of breeding seabirds, "Operation Seafarer", in 1969, and the development of standing enquiries. The preparation of the book reporting the results of the census has proved a major task, but the Organiser, David Saunders, has now virtually completed his share, and it should shortly be ready to go to the publisher, who assures us that it will then take only another nine months to appear. Crispin Fisher is drawing the maps, maintaining family participation in the enterprise started by his father. The RSPB/Seabird Group Beached Bird Survey and the sample census of breeding seabirds continue to make progress in the hands of Colin Bibby, and it is pleasing to be able to report that we are now beginning to receive reports of results obtained elsewhere in Europe for the former. The response to a request for assistance with collecting observations of birds at sea has not been large, but we have received useful offers of help from several people with exceptional opportunities for observation, and hope that the number will grow in time.

Popular accounts of the work of the research unit (including some maps of results, notably of the distribution of auks in the Minch at different seasons) have been published in *Birds* (4:46-49) and the *Scottish Fisheries Bulletin* (37:28-33). The work has continued on established lines, Bill Bourne making cruises up the west coast of Scotland and Tim Dixon up the east coast at regular intervals making systematic observations of bird distribution, while the former has also made flights in light aircraft in the Shetlands and down the east coast, in the

## AUTUMN.

Wind	SW2	SW4	SW5	SW6	SW8
Records	(2)	(1),2W	(8),4W	1W	(2)

Wind	NE4	SE5	W5	W8
Record.	1E	1W	(2),1W	(1)

Records in parenthesis are of birds not clearly moving.

## SEVENTH REPORT OF THE SEABIRD GROUP, 1971-1972.

The year has been mainly devoted to the preparation of the results of the national census of breeding seabirds, "Operation Seafarer", in 1969, and the development of standing enquiries. The preparation of the book reporting the results of the census has proved a major task, but the Organiser, David Saunders, has now virtually completed his share, and it should shortly be ready to go to the publisher, who assures us that it will then take only another nine months to appear. Crispin Fisher is drawing the maps, maintaining family participation in the enterprise started by his father. The RSPB/Seabird Group Beached Bird Survey and the sample census of breeding seabirds continue to make progress in the hands of Colin Bibby, and it is pleasing to be able to report that we are now beginning to receive reports of results obtained elsewhere in Europe for the former. The response to a request for assistance with collecting observations of birds at sea has not been large, but we have received useful offers of help from several people with exceptional opportunities for observation, and hope that the number will grow in time.

Popular accounts of the work of the research unit (including some maps of results, notably of the distribution of auks in the Minch at different seasons) have been published in *Birds* (4:46-49) and the *Scottish Fisheries Bulletin* (37:28-33). The work has continued on established lines, Bill Bourne making cruises up the west coast of Scotland and Tim Dixon up the east coast at regular intervals making systematic observations of bird distribution, while the former has also made flights in light aircraft in the Shetlands and down the east coast, in the

latter case in company with Harry Milne who is carrying out a parallel investigation of the distribution of sea duck there. He also visited Bear Island with Professor Einar Brun of Tromsø University during the summer in order to make comparative observations in the Barents Sea, while we received a visit from Dr. Eric Tull, who is working with Professor Paul Germain on data-processing techniques in eastern Canada, when he came over to join the Scottish research ship "Scotia" to continue his studies of the loss of Brünnich's Guillemots in salmon-nets in the Davis Strait; Colin Bibby, David Melville, and Sandy Macleod have also continued investigations of the smaller auk losses in our own salmon-nets. Reports on the organochlorines found by Dr. Jim Bogan of Glasgow Veterinary School in bird bodies collected during the course of this work will shortly be published in "Nature" and the "Marine Pollution Bulletin".

Several members of the Group participated in a meeting convened by the Nature Conservancy to discuss seabird research needs on 7 February, as a result of which it was agreed that the Conservancy and RSPB would each appoint a member of staff to study the decline of the Puffin, the first in Scotland and the second in Pembroke. Dr. M.P. Harris has been appointed to the first post, and we are already making progress with arrangements for collaboration in research with him. We hope that the Conservancy will be able to arrange for more collaboration of this sort in the future, especially over work at the breeding-stations. Miss Ruth Ashcroft will be carrying out the work in Pembroke with Chris Perrins. This growing attention to seabirds seems particularly timely in view of the possible implications of the recent discovery of oil in the North Sea and further proposals for exploration off the west coast. Members of the Group contributed six out of fifteen letters on the need for more conservation measures in Scotland published in the "Times" during the summer, among other achievements, and use was also made of this opportunity to draw attention to the bad effect that increasing disturbance is having on tern colonies, which are clearly now often in need of more protection. We have approached the people studying the possible effect of reclamation in the Thames Estuary, Wash and Moray Firth area over this among other matters, and hope that seabirds will receive more attention in the course of such work in future.

The Executive Committee remained unchanged during the year, but the Census Committee was disbanded following the completion of Operation Seafarer, and we wish to express our thanks to them and look forward to further work with them on a less formal basis in the future. As

usual, we remain grateful to a wide variety of individuals and voluntary or official bodies for assistance during the year, including most of those already listed in the past. We regret that the publication of the last Report was delayed by a printing strike, and trust that the next will appear sooner. We apologise if pressure of business has prevented much communication with members during the year, and since it is becoming increasingly clear that further development of our work will depend on recruitment of new people with new ideas and the time to put them into practice we are now looking round hopefully for volunteers.

W.R.P. Bourne  
Honorary Secretary.

## **THE SEVENTH ANNUAL GENERAL MEETING OF THE SEABIRD GROUP**

The seventh Annual General Meeting of the Seabird Group was held at the Hayes Conference Centre, Swanwick, Derbyshire at 17.30 on the 6th January, 1973, during the course of the Ringing and Migration Conference. Mr. S. Cramp took the chair and about forty members were present. The Secretary was absent owing to illness.

1. The minutes of the 6th Annual General Meeting held at Swanwick on 15th January 1972 were unanimously approved.
2. The 7th Annual Report which had been circulated with notice of the meeting was accepted without comment.
3. The Treasurer commented on the draft accounts for 1971/72. These were not audited so could only be considered informally and would come up for formal adoption at the 8th AGM in 1974. Mr. P. Bonham enquired whether the expenditure for paintings in the Seafarer book was good economy but it was felt that this was very reasonable for a first class artist. The book would be more saleable if attractively presented and the Seabird Group would benefit - an initial printing of about 8,000 copies was expected. The meeting agreed that the draft accounts were fit to proceed for auditing and formal consideration in 1974.



usual, we remain grateful to a wide variety of individuals and voluntary or official bodies for assistance during the year, including most of those already listed in the past. We regret that the publication of the last Report was delayed by a printing strike, and trust that the next will appear sooner. We apologise if pressure of business has prevented much communication with members during the year, and since it is becoming increasingly clear that further development of our work will depend on recruitment of new people with new ideas and the time to put them into practice we are now looking round hopefully for volunteers.

W.R.P. Bourne  
Honorary Secretary.

## **THE SEVENTH ANNUAL GENERAL MEETING OF THE SEABIRD GROUP**

The seventh Annual General Meeting of the Seabird Group was held at the Hayes Conference Centre, Swanwick, Derbyshire at 17.30 on the 6th January, 1973, during the course of the Ringing and Migration Conference. Mr. S. Cramp took the chair and about forty members were present. The Secretary was absent owing to illness.

1. The minutes of the 6th Annual General Meeting held at Swanwick on 15th January 1972 were unanimously approved.
2. The 7th Annual Report which had been circulated with notice of the meeting was accepted without comment.
3. The Treasurer commented on the draft accounts for 1971/72. These were not audited so could only be considered informally and would come up for formal adoption at the 8th AGM in 1974. Mr. P. Bonham enquired whether the expenditure for paintings in the Seafarer book was good economy but it was felt that this was very reasonable for a first class artist. The book would be more saleable if attractively presented and the Seabird Group would benefit - an initial printing of about 8,000 copies was expected. The meeting agreed that the draft accounts were fit to proceed for auditing and formal consideration in 1974.

In further comment, the Treasurer reported that the Group would need an income of about £350 p.a. for future years, in order to publish a Report and pay the very minimal administrative expenses, but not to cover research and expeditions for which the Group should look to the sponsoring and other bodies for grants. He urged more members to pay by bankers order and hoped to issue Covenant forms to increase the Group's income. He reported having made enquiries about the possible effects of V.A.T; these were expected to be little. Mr. T.R.E. Devlin, the previous treasurer, and Mr. D. Saunders were both complimented for their good economy which had kept the funds in good order and very close to initial estimates of expenditure.

The Chairman reported that Mr. D. Saunders had virtually completed his part of the book and if final contributions to be written by Dr. W.R.P. Bourne were received soon, the copy could be delivered by the end of January. Collins hoped to publish the work in nine months, so if all contributions were received on time it should be available for the Christmas 1973 market.

4. In the absence of alternative nominations for election to the Executive Committee, Messrs. C.J. Bibby, W.R.P. Bourne, G.M. Dunnet, D. Melville, O.J. Meine and J.L.F. Parslow were declared elected.
5. In the absence of further business the meeting was closed at 18.00.

Before the official business there were talks by Dr. C.M. Perrins on research on Manx Shearwaters on the Pembroke Islands, and Mr. C.J. Bibby on the sample census of breeding seabirds.

#### **EIGHTH REPORT OF THE SEABIRD GROUP, 1972-1973.**

This year has seen the completion of Operation Seafarer, the national census of breeding seabirds, when the book reporting the results went to press in the spring for publication early in 1974. We are now considering plans and accumulating funds for further activities. Terns, which are suffering increasingly from disturbance at the breeding places, have been added to the species covered by the sample breeding census.

In further comment, the Treasurer reported that the Group would need an income of about £350 p.a. for future years, in order to publish a Report and pay the very minimal administrative expenses, but not to cover research and expeditions for which the Group should look to the sponsoring and other bodies for grants. He urged more members to pay by bankers order and hoped to issue Covenant forms to increase the Group's income. He reported having made enquiries about the possible effects of V.A.T; these were expected to be little. Mr. T.R.E. Devlin, the previous treasurer, and Mr. D. Saunders were both complimented for their good economy which had kept the funds in good order and very close to initial estimates of expenditure.

The Chairman reported that Mr. D. Saunders had virtually completed his part of the book and if final contributions to be written by Dr. W.R.P. Bourne were received soon, the copy could be delivered by the end of January. Collins hoped to publish the work in nine months, so if all contributions were received on time it should be available for the Christmas 1973 market.

4. In the absence of alternative nominations for election to the Executive Committee, Messrs. C.J. Bibby, W.R.P. Bourne, G.M. Dunnet, D. Melville, O.J. Meine and J.L.F. Parslow were declared elected.
5. In the absence of further business the meeting was closed at 18.00.

Before the official business there were talks by Dr. C.M. Perrins on research on Manx Shearwaters on the Pembroke Islands, and Mr. C.J. Bibby on the sample census of breeding seabirds.

#### **EIGHTH REPORT OF THE SEABIRD GROUP, 1972-1973.**

This year has seen the completion of Operation Seafarer, the national census of breeding seabirds, when the book reporting the results went to press in the spring for publication early in 1974. We are now considering plans and accumulating funds for further activities. Terns, which are suffering increasingly from disturbance at the breeding places, have been added to the species covered by the sample breeding census.

The scope of the beached bird survey has been enlarged by sending expeditions to the west coast of Denmark and the approaches to the Mediterranean. The first revealed an alarmingly high bird mortality, mainly of sea duck, whereas although large amounts of solidified tanker residue were found on the beach in the second area, few birds appeared to be affected by the oil.

The Natural Environment Research Council's grant to the Research Unit was renewed for a further two years in January, and its work has been continuing on the same lines. In addition to what are now routine surveys around Scotland, Dr. W.R. P. Bourne invited Dr. M.P. Harris, now investigating the status of Puffins with the Nature Conservancy, to accompany him on a cruise to Madeira and Gibraltar in February and March when although they only saw three Puffins they observed the previously undescribed spring migration of Cory's Shearwater through the Straits of Gibraltar. A fuller account of seabird movements there, which do in fact include a large Puffin passage later in the spring, has been contributed by Earnest Garcia to the Third Seabird Report. In August Bill Bourne was also invited by Dr. Alan Longhurst of the Institute for Marine Environmental Research to accompany him on another cruise north to the approaches to the Denmark Strait and south to the Bay of Biscay, where he found a southward migration of Puffins and Marx Shearwaters in the first area, and a northward invasion of Great Shearwaters in the second.

Analyses of organochlorines and mercury in Atlantic seabirds carried out in the first case by Dr. Jim Bogan and the second Dr. I.M. Dale and Mr. M.S. Baxter of the Departments of Veterinary Pharmacology and Chemistry at Glasgow University have now been published in the Marine Pollution Bulletins for November 1972 and May 1973. In general polychlorinated biphenyls (PCBs) and smaller amounts of the DDT breakdown product DDE were found in all the birds examined, the amount declining only slightly even in the Arctic, where Bill Bourne found a Glaucous Gull which had been feeding on other birds' contaminated eggs in convulsions with high levels on Bear Island. High mercury levels were only found in birds from estuaries, especially sea duck and divers, the highest level, in a Red-breasted Merganser from Aberdeenshire, being five times that considered toxic at the time of the 1969 Irish Sea birdkill. Fortunately, we have seen less oil pollution, but we are continuing to watch the developing North Sea oilfields apprehensively. So far their main effect has been to lead to increased disturbance, and partly in consequence of this where there were some 2,400 pairs of

Sandwich Terns breeding along the east coast of Scotland in 1969 the number had been reduced to 400 pairs in 1973 as the birds departed for better-protected English reserves. We helped to prepare background information for the successful defence of the Loch of Strathbeg in the spring (Nature 242:93-95), and are now collecting it for the next area threatened by development, Shetland.

In view of an increasing number of complaints that they are causing damage sometimes associated with demands for "culls" we are paying more attention to two increasing groups of species, the gulls and skuas. The Third Seabird Report also contains an account of the number of other seabirds that have managed to survive and breed in the closest proximity to a vast, rapidly increasing colony of Greater Black-backed Gulls on the rock Am Balg off west Sutherland, which suggests that the anxiety often expressed about the impact of gulls on other birds may be exaggerated; in that area at least they appear to feed mainly on fish-offal from trawlers. We are joining with several other organisations to set up a working party to study gulls, and organising further studies of the distribution of the skuas, whose main breeding areas lie so close to the area of maximum oil development. We are also initiating a further survey of the distribution of the storm-petrels and shearwaters, inadequately covered previously.

The Executive Committee remained unchanged during the year, and the third Seabird Report was published at the end of it. We are pleased to be able to acknowledge a donation of £500 from the Fisher Memorial Fund, which together with the royalties from the Seafarer Book we are using to start a research and exploration fund to help finance future activities. We shall be offering grants to members interested in participating in our new surveys.

W.R.P. Bourne,  
Hon. Secretary.

## THE EIGHTH ANNUAL GENERAL MEETING OF THE SEABIRD GROUP

The Eighth Annual General Meeting of the Seabird Group was held at Swanwick, Derbyshire at 1730 on 12 January 1974. Mr. John Crudass took the Chair, and thirty five members were present.

1. The minutes of the seventh Annual General Meeting held at Swanwick on 6 January 1973 were approved unanimously.
2. The Secretary commented briefly on the eighth Annual Report, which had been circulated with notice of the meeting. Publication of the book reporting the results of Operation Seafarer, due in March might be delayed by the three day week; we were enquiring into reduced price for members, Acceptance of the report was proposed by Mr. Eatough, seconded by Mr. Howard and agreed unanimously.
3. The Treasurer commented on the draft accounts for 1973-74, which together with those for the previous year were still awaiting audit. He explained that owing to the large sums handled in connection with Operation Seafarer, professional auditors were considered desirable, but that in order to obtain the best terms we allowed them to deal with them when they could make time. In reply to questions, he explained that the items dealing with toxic chemical analysis involved a grant from the Royal Society for the Protection of Birds to the Group which was passed on to the analyst. Similarly, expenditure on influenza research came from a grant received several years ago from the World Health Organisation. Mr. Bonham commented on the comparative cost of illustrations maps and typing for the Seafarer book, and the Secretary remarked that we were indebted to Mr. Crispin Fisher and Mr. Bonham for the amount of work that they had done for us at uneconomic rates. It had been decided to close the Number 2 Account, which had caused much confusion, with the termination of Operation Seafarer. The adoption of the accounts subject to audit was proposed by Mr. Headlam, seconded by Mr. Eatough and agreed unanimously.
4. In the absence of valid alternative nominations Messrs. C.J. Bibby, W.R.P. Bourne, G.M. Dunnet, N. Hammond, D. Melville and O.J. Merne were declared elected to the Executive Committee. The Secretary remarked that the provision in the constitution

for a postal ballot was likely to prove expensive if an election were to be contested, and that it needed to be reconsidered. The Treasurer also commented that at the present time we were unable to afford committee expenses (formerly covered by the national ornithological societies), and were indebted to members who had managed to cover them in other ways.

5. In the final discussion Mr. Bibby reported that he still only had six contributions for the next Report, two of which still required much work, and that he hoped for more. It was requested that a date of publication should be put on the Reports in future.
6. The meeting closed at 18.00

Before the meeting Miss C. Lloyd and Mr. A.J.M. Smith gave talks on their respective investigations of Razorbills and Sandwich Terns.

### **THE SEABIRD GROUP**

The Seabird Group was founded in 1966 in order to circulate news of research in progress on seabirds and promote co-operative research on them. It is run by an Executive Committee composed of three members nominated by the British national ornithological societies, The British Ornithologists' Union, the British Trust for Ornithology and the Royal Society for the Protection of Birds and six elected annually by the membership. Its activities include:-

#### **Work at the breeding stations**

This includes a national census of breeding seabirds, **Operation Seafarer**, in 1969 the results of which are due to be published as a book in June 1974. Sample counts have subsequently continued at a number of representative sites and surveys are continuing on the distribution of problem groups such as terns, petrels, and shearwaters. The Group is able to award small grants to assist expeditions pursuing these aims.

#### **Investigation of the distribution of birds at sea**

These include observations of passing birds from the shore (sea-watching), enquiries into invasions of such species as the Great Shearwater, in the past a series of trial voyages to investigate the distribution

of birds at sea and currently a study of the ecology of birds at sea supported by the Natural Environment Research Council and based at Aberdeen University. It is hoped that this will lead to a further programme of cooperative investigation of the life of birds at sea.

#### **Surveys of bird mortality on beaches**

Since bird bodies float and are comparatively durable, their appearance on beaches provides good evidence of the hazards affecting birds at sea. The Group cooperates with surveys of oil pollution and bird mortality along the shore, organised by the Royal Society for the Protection of Birds, which now cover most of the coasts of Britain and Ireland simultaneously with other observations along the continental coasts. These surveys provided the main evidence for the number of birds killed in the Torrey Canyon disaster, the birdkill in the Irish Sea in autumn 1969 which helped direct attention to the increasing pollution of the sea with polychlorinated biphenyls and other toxic chemicals and numerous other incidents. The results are reviewed annually in the R S P B Journal *Birds*.

#### **The Seabird Report and Circular and the Annual General Meeting**

The work of the Group was originally reported in seven cyclostyled Seabird Bulletins. Serious contributions are now published in a single annual printed report, and current news in duplicated circulars. The editors welcome appropriate contributions. The Annual General Meeting is normally held at the British Trust for Ornithology's Annual Ringing and Migration Conference in January, where members contribute some of the talks.