SEABIRD REPORT
1975 – 76

The Seabird Group Five 1976

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The Seabird Group

THE SEABIRD GROUP 1974-1975

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Numbers and Distribution of Gulls in the Wash in the Winters 1972/73 and 1973/74

G E Jackson

Gulls *Larus* spp. as a group are attracting increasing interest because of their rising numbers and impact on man but historically they have been under-studied so that there is a shortage of data on their past status. Comparisons with the past are thus difficult or impossible. Previous studies have mainly concentrated upon the breeding biology and populations (e.g. Harris 1970) or dispersal and long-distance movements (e.g. Radford 1960; Harris 1962 (a), 1962 (b), 1964; Vernon 1969). Attempts to study gulls in winter have covered (i) the Lesser Black-backed Gull *Larus fuscus* (Barnes 1961); (ii) the total inland wintering population in 1952/53 (this study was expanded to cover some coastal areas including the Wash for which useful details were published) (Hickling 1954); (iii) the total inland wintering population in England in 1963/64 (Hickling 1967). Norfolk was not counted during the latter study but was considered likely to have a large inland roosting population. Finally, a short paper summarised the winter status of gulls in Lincolnshire in the winter of 1971/72 (Needham and Wilson 1972). Hence there is little information, especially for the last 20 years, about wintering gulls either on the coast or in the Wash.

Status of the Wash as a Gull roosting area

In January 1953 the total number of gulls roosting inland in Britain was of the order of 350,000 (Hickling 1954). This did not include the birds then on the Wash but many which had been roosting there earlier in the winter had moved to the Ouse Washes and were included. Indeed there had been about 130,000 birds in the Wash and some 100,000 apparently moved to the Ouse Washes. If these two areas are regarded as forming a single population it can be taken that at that time, before the large London reservoir roosts had become established, they held between a third and a half of the inland wintering population of the whole country.

As no accurate count of the number of gulls wintering on the coast has ever been made it is not possible to calculate the proportion which use the Wash. However, in January 1953 when the numbers on the Wash had risen to 55,000 (following the December exodus to the Ouse Washes there had only been 30,000) the sixteen largest coastal roosts in England held about 164,000 birds.

In December 1963 the total inland wintering population in England was 504,000 (Hickling 1967) but there was no coverage of coastal roosts at all. At this point in the winter no birds had moved to the Ouse Washes. If the Wash held up to 150,000 birds (which was the average annual maximum at that time) and the expected 100,000 were likely to move to the Ouse Washes, the area continued to accommodate about 20 per cent of all the gulls wintering inland in England.

Relationship between the Wash and the Ouse Washes

Evidence from the two surveys of gulls roosting inland (Hickling *op. cit.*) and a short series of counts by Cambridge Bird Club members (Cambridge Bird Club Report 1952) indicate that there is a consistent pattern of interchange of birds between the Wash and the Ouse Washes in Cambridgeshire, once the latter area becomes flooded each winter. For some purposes it is thus advantageous to regard these areas as having a single homogeneous roosting population.

The Ouse Washes are flooded each winter usually in December and gulls which have been roosting in the Wash change to roosting on the Ouse Washes very rapidly; about 100,000 birds are generally involved.

The Cambridge Bird Club observers (C B C Report 1952) found that in the early winter birds were flighting inland up to 30 miles (as far south as Ely) from the Wash, to feed. One cannot accept, however, that the birds move simply to be nearer their feeding areas since in January 1953, following the East Coast floods, an area of fenland behind Kings Lynn was inundated; this floodwater was immediately used by a 'large number' of roosting gulls with an apparent corresponding reduction on the Ouse Washes (Hickling 1954). These birds would still have had a long flight to their feeding area but moved to roost nearer the coast on a similar expanse of water to the Ouse Washes.

Methods

In order to assess the numbers of gulls using the Wash it was decided to attempt to count the birds arriving at roosts, all roosts to be counted simultaneously if possible. Preliminary surveys were carried out to locate the roosts so that on count days observers could be placed in the most suitable positions. In order to give some indication of seasonal changes, two counts were planned for each winter, in late September/early October and mid-January.

Observers were supplied with a standard form for recording their results and it was hoped to include:— species and age; times of arrival; numbers of birds not identified; any other relevant information such as flight lines, weather conditions, etc.

On the first (September/October 1972) count the tide was low at dusk; on the January 1973 and September 1973 counts it was high and on the final (January 1974) count it was fairly low but rising. When the tide was low it was found that the birds did not utilise the areas of mud to start the roost assembly but were inclined to settle directly on the water. Indeed, it became clear very quickly that the comment by Hickling (1967), 'winter gull counting is difficult, arduous and often unpleasant' is an understatement. Observers faced difficulties as a result of mist, poor light, the great distances involved (birds were sometimes roosting almost out of sight), the great height at which birds flew over to drop rapidly into the roost and not least the sheer numbers of birds passing over at main arrival times.

Some observers were able to age a proportion of the birds they saw but most merely gave species totals; indeed under the worst conditions there were serious difficulties with identification, giving rise to some large 'unidentified' sub-totals.

The distinction between 'small unidentified' (Black-headed Gull *Larus ridibundus* plus Common Gull *Larus canus*) and 'large unidentified' (Great Black-backed Gull, *Larus marinus*, Lesser Black-backed Gull, and Herring Gull, *Larus argentatus)* which some observers were able to make, proved useful in subsequent analysis.

As additional sources of data, information from the BTO/RSPB/Wildfowl Trust 'Birds of Estuaries Enquiry' monthly counts for the Wash area and figures available for the Ouse Washes gull roost, were also examined.

Results

The locations of observers and the figures obtained at each count are shown in Table 1. Sites have been numbered starting at Gibraltar Point and working anticlockwise around the coast to Holme. The approximate positions can be seen in Figure 2.

TABLE 1. Numbers of gulls recorded at nocturnal roosts

	30 SEPTEMBER/1 OCTOBER 1972							21 JANUARY 1973						
	Black-headed	Common	Herring	Lesser Black-backed	Great Black-backed	Unident	TOTAL	Black-headed	Common	Herring	Lesser Black-backed	Great Black-backed	Unident	TOTAL
1 Gibraltar Point	681	876	1213	7	635	–	3412	159	234	9	–	5	158	565
2 Wainfleet	1950	–	2137	–	–	–	4087	1416	7	182	–	6	21	1632
3 Friskney	763	11	282	–	–	3559	4615	297	–	–	–	–	–	297
4 Wrangle	761	–	202	–	9	20	992							
5 Butterwick	6575	15	–	3	22	–	6615	167	34	–	–	–	4	205
6 Witham	405	20	18	7	15	377	842	5156	1741	74	–	161	4289	11421
7 Frampton	48	51	130	38	6	4914	5187							
8 Johnson's Creek	3396	127	22	–	60	–	3605	667	1	4	–	6	–	678
9 Shep White's	1775	167	8	–	15	145	2110	122	29	7	–	–	–	158
10 Fleethaven	2000	850	9	–	4	–	2863	1408	126	8	1	3	155	1701
11 Gedney	631	346	10	–	8	–	995	–	–	–	–	–	–	0
12 Nenemouth W.	–	–	1000	–	–	–	1000	14	7	2	–	–	–	23
13 Nenemouth E.	8689	51	342	–	29	–	9111	1921	3829	2196	1	9	–	7956
14 Border	5737	289	1560	–	–	–	7586	7	125	43	–	3	–	178
15 Terrington Admiralty Point	25	25	600	150	100	–	900							
16 Terrington Ongar Hill	544	6	60	6	2	–	618	5154	63	320	3	–	25	5565
17 Lynn Point	65	–	–	–	3	7660	7728							
18 N. Wootton	3018	250	66	–	221	5400	8955	175	90	–	–	–	375	640
19 Houseboats	1707	262	36	–	153	–	2158	900	60	15	–	–	1000	1975
20 Wolferton	1243	49	53	–	7	–	1352	78	54	50	–	–	142	324
21 Snettisham S.	5628	1240	54	–	28	–	5950							
22 Snettisham N.	491	97	1063	–	20	5	1676							
23 Heacham	342	175	37	–	15	–	569							
24 Hunstanton														
25 Gore Point	219	30	16	–	6	97	368							
25a Holme														
	45693	4937	8918	211	1358	22177	83294	17641	6400	2903	5	200	6169	33318

	30 SEPTEMBER 1973							13 JANUARY 1974						
	Black-headed	Common	Herring	Lesser Black-backed	Great Black-backed	Unident	TOTAL	Black-headed	Common	Herring	Lesser Black-backed	Great Black-backed	Unident	TOTAL
1 Gibraltar Point								1017	1158	–	–	–	–	2175
2 Wainfleet														
3 Friskney								26	–	–	–	1	–	27
4 Wrangle								347	103	2	–	–	large 5 small 3487	3944
5 Butterwick								1260	1340	–	–	8	small 800	3408
6 Witham								885	267	129	2	119	7000	8402
7 Frampton														
8 Johnson's Creek								282	34	2	–	2	254	574
9 Shep White's														
10 Fleethaven														
11 Gedney	870	–	67	–	47	–	984	–	–	–	–	–	–	
12 Nenemouth W.	3108	1168	155	7	–	–	4438	2238	164	5	–	2	–	2409
13 Nenemouth E.														
14 Border	10000	80	2700	9	–	–	12789	197	6	62	2	3	–	270
15 Terrington Admiralty Point														
16 Terrington Ongar Hill	3900	514	1165	3	80	–	5662							
17 Lynn Point								2030	140	112	–	11	–	2293
18 N. Wootton								1223	–	20	–	8	–	1251
19 Houseboats								2133	17	36	–	15	–	2201
20 Wolferton								104	–	–	–	6	–	110
21 Snettisham S.	16448	3092	449	–	418	–	20407	2702	1492	72	–	125	–	8891
22 Snettisham N.	253	256	296	–	74	–	879							
23 Heacham														
24 Hunstanton								954	50	158	–	71	–	1233
25 Gore Point	–	200	250	–	400	–	850	34	480	6	–	11	–	531
25a Holme	260	30	20	–	40	–	350	850	330	36	–	12	–	1228
	34839	5340	5102	19	1059	–	46359	20782	5581	640	4	394	11546	38947

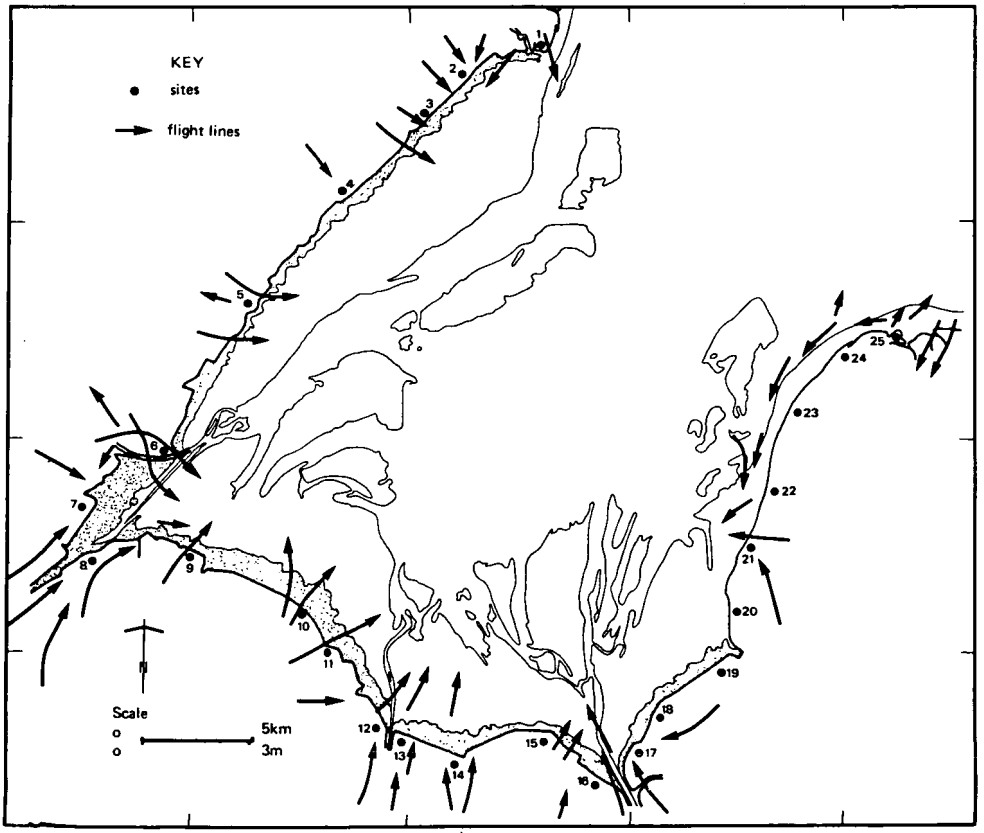

Figure 2 Flight lines of gulls recorded by observers at nocturnal roosts.

Nil counts are shown by 0 in the total columns; a blank total implies that the site was not covered. In the case of sites 12 and 13, and 15, 16 and 17, the figures given by individual observers are shown if possible; however, the sites have usually been marked with a bracket as it seems likely that one large roost at the respective river-mouth is involved. At times though the Nenemouth W roost is on the sea, towards Lutton and in such cases is separate from the rivermouth roost.

In spite of the difficulties of observation and the proximity of some roosts it is thought unlikely that there was any overlap in the birds seen. On the contrary, many birds were undoubtedly missed and the figures given may be regarded as absolute minima. The proportions of species shown in the totals are likely to be fairly accurate.

The gaps in coverage, especially on the second and third counts, are unfortunate but do not conceal the fundamental trends. In both seasons the October count was higher than January, in the first year considerably so. The fall in numbers occurs in all species except the Common Gull which maintains an approximately constant total throughout. The Black-headed Gull is much the most frequent gull throughout the Wash and maintains this position through the winter – see Fig. 1 for the relative proportions of each species and the proportions of 'large' and 'small' gulls recorded at each nocturnal roost count.

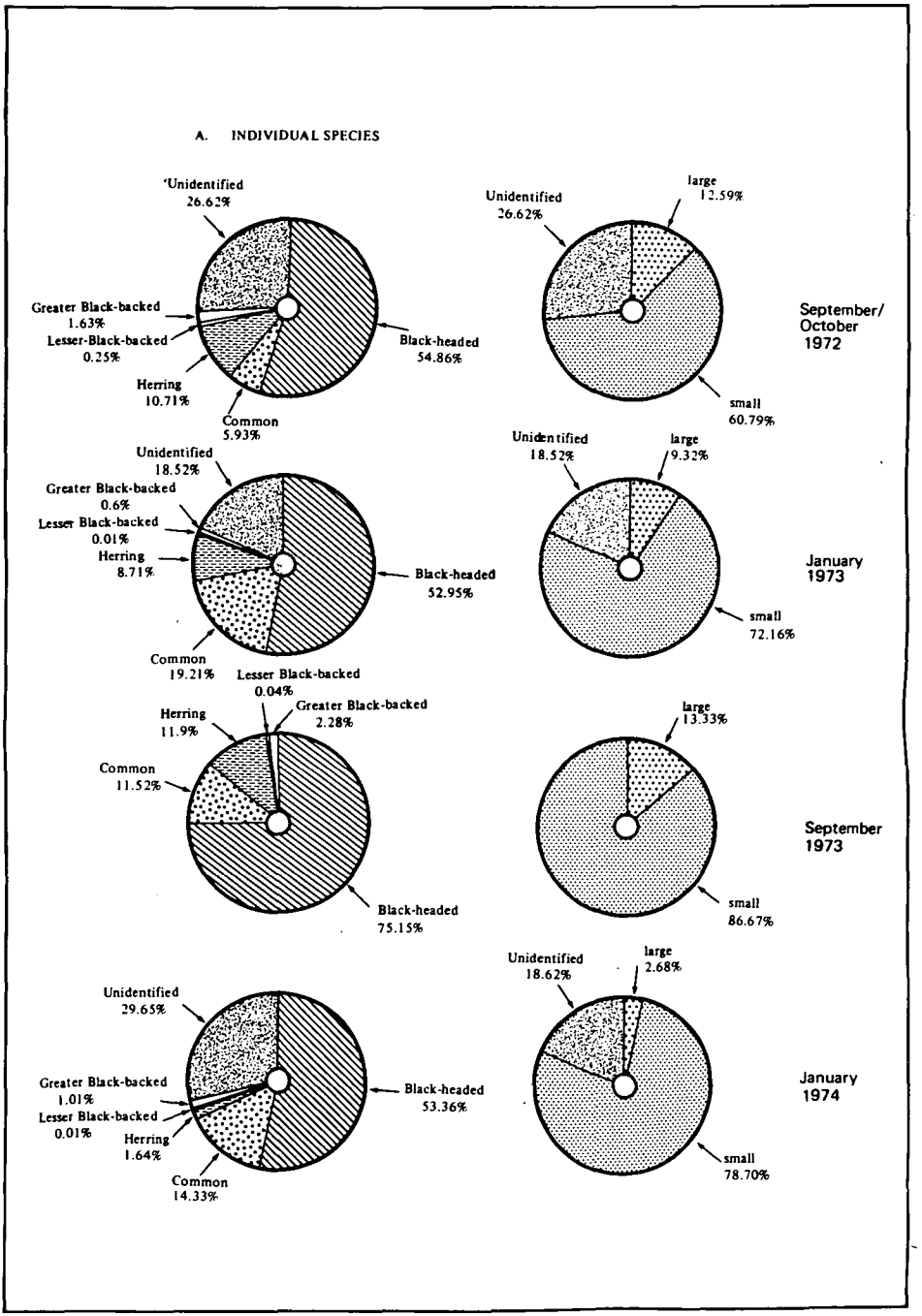

Figure 1 Relative proportions of gull species at nocturnal roosts.

It was found by correlation that the large and small gulls tend to roost together and that they use all roosts in approximately equal proportions ($r = +0.38$). Following the January 1973 count many observers of the west coast roosts (sites 1-6 in Fig. 2) mentioned an unexpected absence of large gulls. The same feature can be detected in the January 1974 results, however. Possibly the mild weather during the two winters caused unusual behaviour but it does appear that the large gulls tend to be a feature of the larger, more widely separated roosts of the south and east Wash, rather than the smaller, closer roosts of the west Wash. This difference is not evident in the September/October counts.

For the purpose of further analyses the numbers of birds recorded in October 1972, January 1973 and January 1974 were considered together (the October 1973 results were not included here because of the larger number of sites which were not covered).

There is a significant difference between the total numbers of birds recorded in October 1972 and the two January counts ($F = 3.875$, $p < 0.05$) which indicates that birds leave the Wash and are not all replaced as the winter progresses. However, despite the qualitative differences between the roosts on the west and east Wash, mentioned above, the difference in the total number of birds at individual sites is not large enough to be statistically significant ($F = 1.893$, $p > 0.05$). Similarly, there is no tendency for any one species to occur in significantly high numbers at individual sites ($F = 1.38$, $p > 0.05$); it is rather that birds of the four main wintering species spread out in similar proportions at all the roosts. Also, in respect of the separate species there is no significant difference between the numbers of birds recorded between different dates ($F = 2.39$, $p > 0.05$). This implies that the fall in numbers from October to January involves birds of all species.

Complexities of gull behaviour and variation in results

The behaviour of gulls both within and between species is by no means well understood particularly when movements are considered in detail. An explanation of the effects of weather, changing food supply, changing numbers of birds in the whole area, etc cannot yet be attempted. However, all these factors in combination mean that numbers of birds recorded at roosts may change even from day to day and certainly results at single sites are likely to vary from year to year. It is important to consider the whole of the Wash, the surrounding feeding areas and perhaps the Ouse Washes as a single entity in which even apparently large changes in numbers at some sites do not necessarily imply a change in the population of the whole area.

In the earlier counts simultaneous coverage of sites was good but in the last two counts some sites were covered on evenings following the main count. Two events occured which illustrate how variation in results can occur. Firstly, at Nenemouth (Site 13) in January 1973, a flock of about 10,000 Black-headed Gulls flew out of the roost up the Nene at about 08.00. They were not seen to return in the evening when the count was taking place and presumably they either remained inland or returned to the Wash after dark. The second anomaly arose when two different, experienced observers inadvertently made counts on consecutive nights at points close to the Snettisham N site (Site 22). Considerable differences were obtained for all four species using the roost, resulting in a 250 per cent variation in total numbers. Again birds may have roosted away from the shore for one evening, or there may be considerable mobility between roost sites (radar observations at the London reservoirs have shown that gull flocks continue to move well after dark (W R P Bourne, *pers. comm.*).

Needham and Wilson (1972) believed that some areas which appear to be used as roosts may only be collecting areas for birds which really roost at other localities. It is also relevant that in spite of the large increase in numbers of gulls wintering inland the tendency has been for fewer, larger roosts to occur (Hickling 1967). Hence a site could be used by gulls for several years but may change its status and importance to the birds.

Meteorological records show that the weather during the two winters of the counts was particularly mild and this could mean that numbers in future years will not correspond well. Vernon (1972) showed that the weather has a marked effect upon feeding areas of Common and Black-headed Gulls. Mild weather feeding on farmland and rural areas might result in fewer birds returning to roost on the coast. There have, however, been records of Black-headed Gulls feeding on the shore at night in the vicinity of roosts (Vernon 1972).

Despite the mild winters the weather probably had little effect upon the normal mortality rate. Most recent studies have concluded that mortality is low in winter – this is so for the Black-headed Gull (Flegg and Cox 1972) and Herring Gull (Harris 1964) – and for all species improved food supply in winter leading to lower mortality may be contributing to the population increase (Harris 1970).

In addition to the high winter survival rate is the fact that the gulls as a group tend to be long-lived – ringing recoveries already show individuals of the common species aged 11.4 years (Common Gull) to 19.11 years (Black-headed Gull) with the other species between (Mead and Hudson 1973). It is recognised that individual birds return to their natal colony to breed each year (Flegg and Cox 1972; Harris 1962 (b) and 1970) and Harris (1964) showed that particular breeding colonies have particular dispersal zones to which the birds are faithful; a view supported by Radford (1960) who further postulated from ringing recoveries that birds may have an attachment to a specific wintering area. If this is indeed so there seems every possibility that the large gull roosts of the Wash will be maintained at least at their current numbers.

Flight lines

Many observers at the nocturnal roosts recorded flight lines and the collected data from the four counts are shown in Figure 2. Certain trends are discernible although the picture is less clear on the coast than that found by Needham and Wilson (1972) for the whole of Lincolnshire where there was flight line evidence of 'dividing lines' between different roosts' collecting areas.

Along the west shore from Gibraltar Point to the R Witham birds came from inland and crossed the coast at right angles, coming straight into the roosts. There was hardly any movement along the coast.

On the south shore most birds flew in along the rivers and dropped into the roosts at the river mouths though at low tide they sometimes flew out a great distance to roost on or near the water's edge. Some birds still flew in directly to the roosts, not necessarily along the rivers and there was a little evidence of coasting after these birds had crossed the sea walls. It is noteworthy that the roosts between the river mouths, eg Gedney (Site 11) and Border (Site 14) which are initially fairly large, tend to disappear during the winter.

Along the eastern shore from Lynn Point to Snettisham birds still come from inland but north of Snettisham there is an abrupt change with no movements from inland

and everything passing southwards down the coast probably to the Snettisham mud-flats.

Finally around Gore Point and Holme there is a confused picture as birds sometimes roost on the fresh marshes behind the coast but there is also a large roost between Holme and Thornham at the mouth of the River Hun.

It is significant that there are no records of birds flying into roosts from the sea because some birds almost certainly feed during the day out in the Wash (see 'Birds of Estuaries' Enquiry data, below). These birds may have been missed by observers but it is possible that they do not leave the central Wash except in bad weather. Fishermen at Brancaster, to the east of Holme, describe (R Chestney *pers. comm.*) how they frequently encounter gulls at dusk or during the night which are roosting on the open sea. The numbers of birds involved may apparently be large with reports of the whole surface of the sea white with birds. It is only under conditions of very strong winds or when the sea is very turbulent that gulls are likely to be completely absent.

Two flight lines shown in Figure 2 appear to be contrary to the main trends. These involve Black-headed and Lesser Black-backed Gulls moving inland from Sites 5 and 6. presumably going to feed or moving away from the area.

Data from the 'Birds of Estuaries' enquiry

Most of the Wash has been covered in the monthly counts made by observers participating in the above enquiry and their results provide valuable supplementary data to the nocturnal roost counts.

The 'Birds of Estuaries' counts are made at high tide and are particularly useful in indicating numbers of large gulls. Black-headed and Common Gulls which feed inland are unlikely to be recorded on the shore during the day whereas the large gulls are more inclined to feed in the Wash itself and are therefore likely to be present on the shore at high tide during the day. Conversely, some large gulls could have been missed from the nocturnal roost counts if they remained in the Wash at dusk. Table 2 shows the total numbers of birds of each species recorded during the period of the survey of the nocturnal roosts.

Numbers of Great Black-backed Gulls identified at nocturnal roosts were higher than those recorded in the corresponding month's Estuaries count except in January 1973. There is evidence of an influx of birds during the autumn but the majority are not present by mid-winter, which corresponds with the decline at the nocturnal roosts between October and January. The fall in numbers appears to have occurred earlier in the winter and much more abruptly in 1972 than in 1973.

Problems in understanding the migratory habits of Lesser Black-backed Gulls are discussed in the 'Origins and Movements' section. There is a large difference between the nocturnal roost and Estuaries count only in October 1972 when a single, large, migrating flock is considered to have been present at the nocturnal roost. A similar flock, albeit rather late in the year, seems to have occurred in December 1972 giving rise to the month's very high total since the 200 birds recorded were all at one site. During the summer the numbers of this species are considerably higher (from June to August in 1973). This seems too early for migrating birds and as the species does not breed anywhere near the Wash (Cramp *et al.* 1974) immature or non-breeding birds are undoubtedly involved.

TABLE 2: Monthly records of large gulls at high-tide roosts from "Birds of Estuaries" enquiry counts in the Wash

	Great Black-backed	Lesser Black-backed	Herring
October 1972	1111	9	1180
November	150	8	409
December	247	200	879
January 1973	357	8	2604
February	251	0	704
March	134	5	144
April	30	8	59
May	196	10	296
June	279	37	516
July	117	97	2304
August	956	84	1657
September	992	15	3744
October	1268	5	1832
November	831	19	639
December	482	0	811
January 1974	348	7	272
February	92	6	1045
March	105	30	909
April	80	5	338
May	48	19	573

Most of the Herring Gulls which give rise to the species' consistently high summer totals (see Table 2) are also non-breeding sub-adults (C J Cadbury *pers. comm.*) and by November the total numbers have fallen to the level of the wintering population. There is more variation between the numbers of Herring Gulls recorded at the nocturnal roosts and in the 'Birds of Estuaries' counts than there was for either of the other large gull species. It may be that a larger proportion of the Herring Gulls using the Wash move away from the shore to feed and are therefore absent during the day. The same explanation may also serve to account for the relatively large fluctuations in numbers from month to month in the 'Birds of Estuaries' results. There is evidence of an annual decline in numbers in March and April as the wintering birds move out of the area but before the summering sub-adults have arrived. Cadbury (1971) remarked upon such a decline at the Terrington Marsh roost in 1970 and 1971 and it is clearly discernible in 1973 in Table 2.

In the observations at Terrington Marsh it was also noted that following the lifting of crops from arable land, the day-time high-tide roosts of the large gulls moved from the saltings in June, on to fields up to a mile inland in the autumn and early winter. This contrasts with the nocturnal winter roosts which are on the shore.

Origins and movements

A broad outline of recoveries of ringed birds for the area is given in the Norfolk Bird Report and copies of this report for the years 1960-1972 were examined for some indication of the origins of the gulls wintering in the Wash. Also, a large number of gulls have been ringed by W A Cook in the winters of 1963-1973 in areas of Lincolnshire close to the Wash (particularly Deeping St James, Benington and

Wrangle). Recoveries from these birds yield further information about the movements of the birds using the Wash.

Black-headed Gulls recovered in the Wash area in winter had been ringed at breeding colonies in:— Sweden; Finland; Norway; Byelorrussia, Estonian and Latvian SSR; Denmark; Poland; Germany; Holland; Belgium; USSR; Czechoslovakia; Wales (Radnorshire); England (Suffolk, Kent). Those ringed on the Wash in winter were subsequently reported from:— Sweden; Finland; Norway; Denmark; Holland; Belgium; Germany; USSR; Czechoslovakia and England (Northumberland, Durham, Yorkshire, Derbyshire, Staffordshire, London, Surrey, Kent). There are just two recoveries (one each from Holland and Essex) of birds found on the Wash in one winter and elsewhere in a different winter.

The majority of birds involved in these records were 1st Winter with a few 2nd Winter and even fewer adults. This corresponds with the pattern of dispersal and recovery distances from natal colonies given by Flegg and Cox (1972), except that more 2nd Winter birds may have been expected; this could be due to a difference in mortality, however.

Reference to Table 1 shows clearly that the numbers of Black-headed Gulls changed considerably during each winter. There was a large decrease from October to January and this is similar to the fluctuation in numbers recorded in a feeding area on the tidal reaches of the Tyne and Wear by Fitzgerald and Coulson (1973) where there was an autumn peak. The Wash birds have obviously moved, to roost elsewhere, presumably inland and in view of the records from the Ouse Washes mentioned above this may be the locality many of them adopt, though some may scatter elsewhere inland.

Common Gulls found in the Wash apparently originate in:— Southern Norway; Finland; Sweden; Denmark; Germany (Heligoland and the Baltic); Estonian SSR; USSR. Winter birds from the Wash moved to:— Sweden; Denmark; Holland; England (Suffolk). These areas correspond with those found by Radford (1960) and Vernon (1969). Again, most of the birds were in their 1st or 2nd Winter with a very few older ones.

The movements of the Common Gull have been studied in detail by Radford and by Vernon (*op. cit.*) and it is possible that occasional passage birds could occur for short periods in the Wash. The figures in Table 1 do not suggest that there are many birds present in September/October which are moving through. The number of Common Gulls recorded in this study seems very stable throughout the winter and this differs from the fall in numbers found in the Northumberland feeding area by Fitzgerald and Coulson (1973).

Herring Gulls were found to originate in:— Norway; Holland; Eastern Scotland: birds moved to:— England (Essex, North Yorkshire); Scotland (Fife). The numbers of Herring Gulls recorded at the roosts fell considerably from October to January in both winters. The reason for this is unknown although it is again a different situation from that found by Fitzgerald and Coulson (1973) whose numbers of birds feeding remained constant through the winter.

The only Great Black-backed Gulls recovered were from breeding areas in Norway and Sweden. Table 1 indicates that relatively small numbers of this species were

identified at roosts. This fits in with the finding by Harris (1962 (b)) that less than 50 per cent of 1st year birds move away from their native colonies but, as with the Herring Gull, there was an appreciable decline in numbers from October to January in both seasons.

Although the numbers of Lesser Black-backed Gulls recorded were very small, this species presents interesting problems, being highly migratory. A single ringing recovery shows an immature bird in the Wash in November found in Aberdeenshire 3½ years later, in May. There was a large difference between numbers counted in October and in January and this is a strong indication that the high October figures are caused by migrating birds. In addition, Table 1 shows that the October totals comprised birds at a few roost sites rather than birds evenly spread; this again indicates migratory flocks.

The number of Lesser Black-backed Gulls actually wintering (ie the January total) seems very low. As long ago as 1960 Barnes (1961) had recorded a ninefold increase in the numbers of this species wintering since 10 years previously and Hickling (1967) said the wintering population had increased 'enormously' since Barnes' paper. These increasing numbers in winter are apparently not reflected in the Wash and it appears that the species still prefers to roost on inland waters as stated by Barnes. The latter also stated that the greater incidence of wintering was probably linked to increasing feeding on refuse and that the species does not feed much on the shore. One might speculate, however, that if gulls are faithful to traditional wintering areas, as suggested above, the habits of the species are militating against an increase in the population wintering in the Wash.

Prediction of effects of building a water-storage reservoir in the Wash

The behaviour of gulls, especially regarding their choice and use of roost sites, is complex and not well understood, making a confident prediction about the effects of constructing a fresh-water storage reservoir in the Wash very difficult.

An attempt to estimate the number of gulls which might roost at the various possible sites for a reservoir was made on the basis of the data in this paper. These figures have been submitted to the Central Water Planning Unit and the official predictions and implications of such a reservoir will be made by NCC and NERC. These will appear in the official report on the Wash Feasibility Study to be published by the CWPU during 1976, but see Table 3.

TABLE 3: Maximum and minimum numbers* of gulls recorded at roosts encompassed by alternative sites for a reservoir

Alternative Site	Roosts Encompassed**	Numbers of Gulls recorded in 1972/73 and 1973/74. Maximum	Minimum
(1) Bulldog	17; 18; 19	18,800	5,600
(2) West Stones	15; 16	5,500+	1,500
(3) Breast	14; 15	12,700+	300
(4) Wingland	13; 14	16,000+	2,500

* Numbers derived from counts shown in Table 1.

** See Table 1 and Figure 2 for names and locations of roost sites.

Summary
There is an absence of historical data on the numbers of gulls on the coast in winter and especially in the Wash. The status of the Wash as a gull roosting area and its complex relationship with the Ouse Washes are described and it is suggested that it may be advantageous to regard these two areas as having a single, mobile population.

Numbers of gulls roosting were assessed by counting the birds arriving at nocturnal roosts; two such counts (in September/October and January) were made in the winters 1972/73 and 1973/74. Overall coverage varied from very good to poor. A maximum of over 83,000 birds was recorded but numbers fell considerably in the second half of the winter. The Black-headed Gull is the most frequent species at all times but the decline in numbers through the winter involves all species except the Common Gull. Large gulls were lower in number than expected and hardly any Lesser Black-backed Gulls seemed to be wintering in the area. The difficulty in understanding gull behaviour is described and the constraint this imposes on using the results is pointed out.

Flight line observations indicate that most birds approach the Wash along the lines of the south coast rivers. In the west, birds fly from inland and form small roosts where they cross the shoreline. Very few birds come from inland in the east where there is much coasting to the Snettisham mudflats.

Counts of large gulls obtained in the BTO/RSPB/Wildfowl Trust 'Birds of Estuaries Enquiry' provide information on the population using the Wash for feeding and are compared with numbers at the nocturnal roosts. The seasonal variations are discussed and shown to agree generally with the nocturnal roost counts.

Ringing results are used to indicate the natal and breeding areas of birds wintering in the Wash — most foreign birds are from the expected areas of Scandinavia and NW Europe. It is considered likely that birds are faithful to the Wash as a wintering area which indicates future stability of numbers.

An attempt to predict how gulls will be affected by the creation of a reservoir in the Wash encounters numerous problems but it is considered inevitable that such a reservoir will be used as a roost.

Acknowledgements
I am most grateful to the numerous individuals who gave up their time to count the birds arriving at the nocturnal roosts, often under very arduous conditions. P Wilson, Dr C J Cadbury and J Reynolds organised the field-work on the west, south and east shores of the Wash respectively. Dr C J Cadbury kindly made the 'Birds of Estuaries' results available to me; W A Cook placed his ringing results at my disposal and R A O Hickling supplied results of counts made by the RSPB at the Ouse Washes.

I offer particular thanks to my fellow members of the Ornithological Working Group of the Wash Feasibility Study who have given much encouragement, help and advice during the writing of the paper. Finally, I should like to thank Dr W R P Bourne, R Chestney MBE and Mrs P M Jackson for helpful comments and assistance and, not least, Mrs K Sievewright who typed the manuscript.

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Evaluating Sea-Bird Movements

G Upton

At coastal bird observatories, a daily log of observations on the movements of the more interesting bird species is usually maintained. Often, such movements are almost entirely in one direction – for example, Manx Shearwaters *Puffinus puffinus* moving north along the east coast of England in autumn – and, in these cases, the number of birds involved is known fairly precisely. Sometimes, however, the pattern of movement is less clear; this is particularly true when the birds involved are feeding rather than migrating. With very localised feeding movements, eg Roseate Terns *Sterna dougallii* flying up and down a Northumbrian bay, the actual numbers of birds involved may be very small, but nevertheless the observer may easily become confused about how many are present.

Large scale bird movements are usually summarised by a phrase such as 'A total of 300 N and 200 S passed the observatory during a 5 hour period'. An example of this form of summary was provided by Phillips and Lee (1966), where their observations were aggregated in morning and evening totals over a number of days. Most of their observations, which related to Manx Shearwaters and Fulmars *Fulmarus glacialis*

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passing Erris Head, Western Ireland, were of migrating birds, but on a number of days the shearwaters passed in considerable numbers in both directions. The authors, recognising the possibility that they were seeing the same bird more than once, quoted the net movement. Thus if x birds passed one way, north say, and (x-d) passed south, then the net flow of birds was recorded as d (or 1, if d equals 0) passing north. The total of x + (x-d) being an indicator merely of the amount of activity noted.

This procedure can lead to a serious underestimate of the number of birds involved. For example, consider the situation in which a party of 300 birds flies past the observatory going north and then turns around and comes past flying south. The aggregate flows for the sea-watch of 300 N and 300 S suppress the information that this was a single party of birds, and application of the subtraction routine described in the previous paragraph leads us to the uninformative conclusion that at least one bird was involved! Without the more detailed information about the composition of the aggregate flows we cannot know that the movements consisted of (300N, 300S) rather than (1N, 1S, 1N, . . . , 1N, 1S). An example of this type of aggregate daily movement was provided in the paper by Elkins and Williams (1971), concerned with the movements of Shags *Phalacrocorax aristotelis* off north-east Scotland. Their Figure, relating to movements throughout the day in December, showed that some 300-400 Shags headed north each morning to feed, and returned again in the afternoon. Aggregate daily movements would be most uninformative.

The intention of this note is to provide a simple method of determining the minimum number of birds that could possibly be involved in a particular sea-bird movement, based on the individual movements rather than on the aggregate.

The accounting procedure

The method involved is simpler to use than to describe. It is based on the two-sided control charts familiar to those involved in the statistical aspects of industrial quality control.

Three columns are required for each observation. The actual observation, 50 north say, is inserted in the first column. The second and third columns are, roughly, running totals of the flow of birds north and south, respectively. Thus the entry in the second column corresponding to the movement of 50 north would be 50 greater than the previous entry in that column. Similarly the entry in the third column would be 50 less than the previous entry, *except* that if this would mean entering a negative value then zero is entered instead. Thus there are no negative numbers in the table.

The implication of this procedure is that the last number in the second column is the number of birds which have flown past heading north and which have not as yet returned. The number in the third column has a corresponding interpretation in terms of south-flying birds.

Example

Suppose that the following observations are made: 50 N, 20 S, 10 S, 15 S, 20 N, 40 N, 30 S, 70 S, 100 N, 30 N, 25 S, 30 S, 60 N. This corresponds to an aggregate flow of 300 N and 200 S. Clearly at least 100 birds are involved, but this is an underestimate.

The mechanics of the accounting procedure for these data are shown in Table 1.

TABLE 1: Example of the accounting procedure

Observation	North total	South total
50 N	50	0
20 S	30	20
10 S	20	30
15 S	5	45
20 N	25	25
40 N	65	0
30 S	35	30
70 S	0	100
100 N	100	0
30 N	130	0
25 S	105	25
30 S	75	55
60 N	135	0

The table shows that at least 135 birds were involved in these movements, since 135 is the largest entry in either of the last two columns, though it is not easy to see how this number has arisen. The first observation, 50 N, immediately implies the involvement of at least 50 birds. Similarly the successive observations 30 S, 70 S imply the involvement of 100 birds, since none of the 30 flew north before the observation of 70 flying south. These cases are easy to understand: the table merely formalises the same logical argument and removes the need for thought.

There are a number of easy checks on the arithmetic. The sum of the entries in columns two and three for a particular row is always at least as large as it was for the previous row, and furthermore is always equal to the largest previous entry so far obtained in either of these two columns. The largest entry always occurs opposite a zero in the other column.

The minimum number of birds involved in the movement is given by the sum of the last two entries in columns two and three, or equivalently by the largest single entry. The value of 135 in the example derives from the last three observations where 190 flew north of which only 55 could have flown south.

Summary

A simple method, based on a two-sided control chart, is suggested as a means of determining the minimum number of sea-birds involved in a sequence of consecutive observations. The method is also appropriate in determining the minimum number of birds involved in in-shore fishing movements where only small numbers are concerned.

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Seabirds in the Wash

W R P Bourne

This was a statement prepared for the Wash Reservoir Feasability Study Ecological Report, Scientific Study N.

There are vast populations of landbirds distributed across Britain inland from the Wash, but only limited numbers of the wildfowl and shorebirds that frequent its coasts. Similarly there are considerable numbers of the more marine seabirds out at sea, but only small numbers of inshore species occurring in its coastal waters. They are moreover hard to enumerate because they are seldom easily visible from the shore, and they move about freely, not only within the Wash but along the adjacent coasts of Norfolk and Lincolnshire with local conditions, the weather and the tide. Unfortunately, while observations of landbird migrants have been made intermittently at the lightships offshore for nearly a century, less attention has been paid to seabirds there, and few ornithologists have been out in boats in this area. No special attempt was made to investigate the status of seabirds during this enquiry, so for information on them it is necessary to fall back on personal observations and those published in the Norfolk, Lincolnshire and especially Cambridge Bird Reports over the last quarter of a century, on the census of breeding species organised by the Seabird Group in 1969 (Table 1), observations from the shore during the estuarine bird enquiry, and comparisions with the situation elsewhere.

It seems likely that owing to past human predation and the loss or disturbance of breeding sites the breeding bird population of the area is far from reaching its full potential, though the situation has improved greatly in recent decades, and if the birds breeding in the north Norfolk reserves which often appear to feed in the Wash are included it is of international importance. The 5,500 pairs of Black-headed Gulls breeding round the Wash and 2,000 pairs of Common Terns, 400 pairs of Little Terns and 4,000 pairs of Sandwich Terns breeding there or in north Norfolk in 1969 represented a fifteenth, a seventh, a quarter and a third of the total breeding round the coasts of Britain and Ireland, and the Sandwich Terns a sixth of the total for north-west Europe, while the Little Terns may have represented a considerable part of the north European total as well. It seems likely that while the Common Terns may be reaching their ceiling (Chestney 1970) with protection the populations of the other species might continue to grow, and additional ones be attracted as well; Fulmars have recently started to breed on the Hunstanton cliffs and Kittiwakes and Common Gulls in the north Norfolk reserves, while Little Gulls have been seen in the vicinity of the Wash gull colonies and Mediterranean Gulls started to breed at a similar colony in Hampshire.

The breeding gulls feed partly inland and partly along the shore. A certain number of immature gulls of the larger species frequent the Wash in summer, and larger numbers arrive in time for the autumn moult and stay for the winter, some feeding inland and others out at sea, notably at the sprat fishery offshore (Johnson *n.d.*). The terns feed offshore on a variety of marine animals (Collinge 1926); a good many north Norfolk birds appear to fly round to feed in the Wash while they are breeding, and they doubtless form part of the large flocks that gather there afterwards, sometimes running into thousands, though these also include Arctic and Black Terns on migration. The tern flocks are often parasitised by Arctic Skuas at this season, and towards the end of the summer both terns and skuas may sometimes be seen flying south overland from the Wash, presumably on migration (Easy *n.d.*; Vine and Easy 1965). These movements are most prominent with the strong cold northerly

TABLE 1: Seabirds recorded breeding between Gibraltar Point and Salthouse in 1969 (pairs)

Grid squares TF/TG		Black-h. Gull	Sandwich Tern	Common Tern	Arctic Tern	Little Tern	Others and comments
569586	Gibraltar Point					15	
565575	Gibraltar Spit					6	
554578-530563	to Wainfleet	15					adult Little Gull
530563-498532	to Friskney	10		2			
498532-468509	to Horseshoe	150		20			
468509-448489	to Sailors Home	120					
431468-413447	to Butterwick	200		6			
ca 4144	Butterwick Low	1000		35			Another observer
413447-397424	Butterwick-Freiston	20		5			
397424-397393	to Witham Mouth	2					
397393-365383	to Wyburton Lane	500		10			
365383-356365	to Sandholm Farm	1500		20			Two other counts 2000, 2500 gulls
356365-345341	to Welland Mouth	700		30			10, 80 terns here
340337-492264	Welland to Nene	4		2			another count, nil
Nene to Snettisham nil (up to 3000 pairs gulls and 100 pairs terns on Wolferton Saltings until they were reclaimed in mid 1960s)							
641290	Snettisham Pits	44		32			
644341-664380	to Heacham					(1?)	
673415-678424	Hunstanton Cliffs						ca 13 pairs Fulmars
734454	Thornham Beach					18	
758451	Titchwell Beach			1		5	
785454	Brancaster Beach					4	
805465	Scolt Head	650	3850	500	1	72	3 Kittiwakes
847448-899460	Burnham Overy-Wells					34	
ca 9246	Bob Halls High Sand			10		12	
965458	Stiffkey Binks	15	96	130	(10?)	25	
005468	Blakeney Point	4		1200	3	200	2 Common Gulls
ca 0545	Cley	400	1	31		3	
066448	Salthouse	200					
Total		5534	3947	2034	4	394	

airstream behind an eastward-moving depression, when a wide variety of more marine species may also be seen coasting in either direction past the mouth of the Wash at any season, though fewer of them fly inland.

Other species occurring inshore include small numbers of all the normal British grebes and divers, either with the sea-duck in the north-east Wash, or Cormorants along the outer channels of the fen rivers, which are also visited by Shags in the years when there is an invasion (Potts 1969). Some birds are present throughout the year, though the numbers recorded tend to be greatest in the winter, when for example the maximum counts of 250 Great Crested Grebes, 35 Black-necked Grebes and 24 Red-throated Divers were obtained at a time when it seems possible there was an influx of fish off Hunstanton in December 1961; the estuarine bird survey also yielded maxima of 131 Cormorants and 138 Great Crested Grebes in January and March 1973. While these totals are not particularly impressive compared with those for the wildfowl and waders, the counts are probably incomplete and these are comparatively scarce species, so the populations concerned may be important.

The birds occurring further out to sea have been described by Wolfe Murray (1966) on the basis of eight years' experience with the fishing fleets. Fulmars were the only species seen throughout the year, and were most numerous in January and February. They were joined by Kittiwakes with their young and very variable numbers of the larger gulls from August to March, the Lesser Black-backed, Common and Black-headed Gulls, and also Arctic and Pomarine Skuas and the terns occurring mainly at the seasons of migration. Guillemots were the commonest auks, also appearing with their small young in August, while varying numbers of Gannets and a few Great Skuas were seen mainly in the winter. Shearwaters and storm-petrels occurred occasionally, but never in large numbers. All these species sometimes participate in westward coasting movements at Hunstanton with onshore winds associated with the meteorological situation already described, though it is uncertain how far they enter the Wash. However, Barry *(n.d.)* saw numbers of the larger auks and some Gannets around the Lynn Well lightship when he visited it in October 1956, and vast numbers of Kittiwakes were seen in the distance in the centre of the Wash at the time of the influx of diving species on 24 December 1961, probably feeding on sprats.

Many of these birds are unlikely to be affected by development of the inner Wash, except insofar as the provision of sheltered water-bodies may provide a new habitat for them, or their breeding-sites may be affected. The most serious hazard at present may be toxic chemical or oil pollution brought down by the fen rivers, which might affect the more aquatic species as seriously as it has done in the Dutch Waddensee or Danish archipelago (Koeman 1972; Joensen 1973). It is notable that birds have already been found carrying considerable loads of mercury and organochlorines in some other British estuaries, some of them remote (Dale *et al.* 1973; Lloyd *et al.* 1974; unpublished results), though no results appear to be available for aquatic species from the Wash yet. Oil pollution might present a particularly serious hazard to any aquatic species which become flightless in moult such as the sea duck, grebes, divers and auks that gather to moult in the Wash, about which position nothing appears to be known yet, although they often gather in such situations elsewhere.

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Observations on the Establishment of a Herring Gull and Lesser Black-Headed Gull Colony

M E Greenhalgh and M S Greenwood

Introduction

Studies on the recent increases of British breeding gulls have concentrated on colonies where the founding and initial growth occurred before each study and therefore the actual year of founding, censuses and data on breeding output over the first few years were often lacking (e.g. Brown 1967, Harris 1970, Greenhalgh 1974a, 1975). It was fortunate therefore that when Herring Gulls *Larus argentatus* and Lesser Black-backed Gulls *L. fuscus* founded a colony on the Ribble Estuary saltmarshes Lancashire, data on breeding biology were being collected for most saltmarsh species and these two gulls were included. Each year the number of breeding pairs was counted and an estimate of the numbers of young fledged obtained. Data on food were also obtained from the analysis of pellets produced by the adult gulls, regurgitated food from the pulli, remains at the nests and other observations. All methods of quantitatively assessing diet are open to different degrees of error (Goss-Custard 1973), so only general trends in the composition of the diet have been considered.

Populations and breeding output

Breeding populations and breeding output in terms of the number of young fledged are given in Table 1. Neither species bred before 1967 though in the summers of 1965-66 a flock of up to 80 non-breeders of these species occurred in the area which was eventually colonised. During the first six years for Herring Gull and the first four

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TABLE 1: Breeding populations and numbers of young fledged of Herring and Lesser Black-backed Gulls on the Ribble saltmarshes, 1967-75

	HERRING GULL		LESSER BLACK-BACKED GULL	
	No. pairs	No. young fledged	No. pairs	No. young fledged
1967	1	0	0	0
1968	2	1	0	0
1969	2	0	1	0
1970	1	0	1	0
1971	1-2	0	2	0
1972	2	2	2	1
1973	21	12	13	5
1974	39	29	25	11
1975	84	84	53	45

years for Lesser Black-backed Gull the populations remained at one or two pairs. Then, in 1973 a large increase occurred which has been continued: overall from four pairs in 1972 to 137 pairs in 1975.

Initially breeding success was very poor, only one young Herring Gull being fledged before 1972. Since then, success in terms of overall numbers of young fledged in the colony and the mean number fledged per pair has increased so that breeding success in 1975 was close to that observed at other larger colonies. For Herring Gulls in 1973 a mean of 0.57 young, in 1974 0.73 young and in 1975 0.95 young were fledged per pair on the Ribble whilst in the Lesser Black-backed Gull the corresponding figures were 0.38 in 193, 0.44 in 1974 and 0.83 in 1975. Harris (1964) found that at least 0.9 Lesser Black-backed Gulls and 0.6 Herring Gull young fledged per pair on Skomer Island, S. Wales, Brown (1967) found that the Herring and Lesser Black-backed Gulls on Walney Island, Cumbria fledged about one young per pair and on the Pennine moorland colony Lesser Black-backed Gulls reared at least 0.8 young per pair in 1975 (personal data). As yet none of the young produced in the Ribble colony will have bred owing to the three of four years of immaturity. Thus all the increase to date has been a consequence of immigration, probably from the huge Walney and Pennine moorland colonies (two Lesser Black-backed Gulls found breeding on the Ribble in 1974 had been ringed as pulli in 1964 on Walney).

The number of summering non-breeding Herring and Lesser Black-backed Gulls, mostly in immature plumage, has also increased with up to 3500 based on the saltmarsh gullery in 1975. It may well be that, as these mature, they will settle to breed in the new gullery thus continuing the increase.

Foods

Using pellets as a source of data on foods of the adult Herring and Lesser Black-backed Gulls on the Ribble colony meant that the data had to be pooled for both species as the pellets could not be identified as belonging to either species. It was neither possible nor desirable up to 1975 to collect gut contents.

From Table 2 it appears from the pellet analysis that the dominant food was the mussell *Mytilus edulis* with the shore crab *Carcinus maenas* (frequently caught by both species of gull in the larger saltmarsh creeks) and fish also being important throughout the breeding season. Most, if not all, of the fish remains in the pellets were from smaller species probably caught in the shallow estuary waters or from shrimping and inshore fishing boats. The edible shrimp *Crangon crangon* was an

TABLE 2: Analysis of pellets of adult Herring and Lesser Black-backed Gulls from the breeding colony on the Ribble Estuary

	APRIL		MAY-Mid JUNE		Mid JUNE-JULY	
	No.	%	No.	%	No.	%
Carcinus maenas	17	27.8	91	21.2	78	23.4
Crangon crangon	0	0.0	108	25.1	95	28.4
Mytilus edulis	29	47.5	302	70.3	174	52.2
Cardium edule	2	3.3	27	6.3	11	3.3
Macoma balthica	3	4.9	7	1.6	3	0.9
Fish	8	13.1	70	16.3	69	20.7
Eggs of birds	1	1.6	57	13.2	14	4.2
Bird bones	0	0.0	1	0.2	6	1.8
Mammal bones	0	0.0	4	0.9	2	0.6
Cereal seeds	9	14.8	0	0.0	0	0.0
Total Pellets	61		430		334	

important component of the diet through the middle and later parts of the season, its possible absence in the diet early in the season being due to the majority of the shrimp population being offshore and not yet migrated into the estuary waters (which they do in late April and May). Another seasonal food was cereal seed; large areas of farmland around the Ribble being sown with barley in spring.

In May and June many pellets were found to contain flat, white, rubbery strips and chalky granules – the remains of eggs many identified as from Black-headed Gulls *L. ridibundus*. The larger gulls also predated the eggs of other species, Shelduck *Tadorna tadorna* (at least one nest), Mallard *Anas platyrhynchos* (2 nests), Oystercatcher *Haematopus ostralegus* (1 nest), Redshank *Tringa totanus* (at least 2 nests) and Common Tern *Sterna hirundo* (at least 6 nests) being recorded in the years 1973-75. Similarly, young Black-headed Gulls and Common Terns featured in the diet in late June and July: both species of large gull were seen to take them and

TABLE 3: Regurgitations by pulli Herring and Lesser Black-backed Gulls on the Ribble Estuary

	No. regurgitations	%
Sprat *Clupea sprattus*	11	9.8
Sand Eel *Ammodytes lancea*	4	3.6
Flounder *Pleuronectes flesus*	6	5.4
Eel *Anguilla anguilla*	2	1.8
unidentified fish	23	20.5
TOTAL FISH	46	41.0
Crangon crangon	19	16.9
Carcinus maenas	12	10.7
Mytilus edulis	16	14.3
Nereis diversicolor	4	3.6
TOTAL MARINE INVERTEBRATES	51	45.5
Earthworms *Lumbricidae*	7	6.2
Bread	1	0.9
Chicken fragments (bone, skin)	5	4.5
Cereal grains	2	1.8
TOTAL REGURGITATIONS	112	

remains were found by nests and in pellets. Mammal bones in pellets were probably mostly those of the rabbit *Oryctolagus cuniculus* though old meat bones found in the colony had probably been acquired from nearby rubbish tips.

Marine invertebrates comprised over half of the food of the pulli (Table 3) as shown by regurgitations, the species being the same as found in the pellet analyses except that *Nereis diversicolor* was regurgitated but not found in pellets. Polychaetes would have been missed in pellets as microscopic examination was not made and no large hard parts are left after digestion of polychaetes.

Fish assumed a greater proportion of the pullus diet though possibly this difference merely reflected a difference between the two sampling methods. It is interesting to note that the four species identified (most were too digested to be identified) were the commonest of estuary fishes in summer. There was the possibility that some fish had been obtained from shrimping boats etc. whilst both Harring and Lesser Black-backed Gulls were seen to rob terns of fish. However, Lesser Black-backed Gulls are known to be easily capable of capturing eels *Anguilla anguilla* (Wilson and Greenhalgh 1965) and both species frequently fished in nearby Southport Marine Lake and in the estuary channel and low water pools where sprats *Clupea sprattus*, small flounders *Pleuronectes flesus* and eels were certainly taken (personal observations).

It would thus seem likely that some of the fish food was caught by the breeding gulls. There is certainly no evidence that any of the gulls in northwest England obtain their fish foods from Fleetwood Fish Dock as was suggested by Brown (1967), for all waste is passed into a fishmeal factory and is not available for gulls (Greenhalgh 1974). Furthermore very few gulls feed in that area.

That some food fed to the chicks was obtained on fields is indicated by the presence of earthworms *Lumbricidae* and cereal grains in the pullus diet. The former were probably a common food of the adult gulls though not revealed by pellet analysis. Chicken fragments possibly came from local rubbish tips.

Rubbish tips at Freckleton, Lytham and Little Hoole (4 miles, 3 miles and 3 miles away respectively) were important food sources for gulls and some foods found on the 'clubs' had their origins there as had more unusual items: tin cans, paper and plastic bags, a door handle, a toy soldier etc. However, observations suggested that these had been brought to the gullery by the immature gulls which obtained the bulk of their food at these sites whereas the adult gulls spent little time feeding on rubbish tips. Certainly pellets found near nests, regurgitations and observation of the adult gulls showed that only a minor fraction of their diet came from rubbish tips.

Effects of large gulls on other breeding birds

The most noticeable effect of the Herring and Lesser Black-backed Gull colony was on the Black-headed Gulls which founded a small colony on the Ribble in 1954 which had grown to 7200 pairs in 1973 and 9200 pairs in 1974 (Greenhalgh 1971, 1975). The larger gulls (breeders and non-breeders) concentrated in the centre of the main concentration of Black-headed Gulls which in 1975 abandoned that part of the marsh and their overall population declined by 3700 pairs to 5500. However, connected with this decline were increases in the Black-headed Gull populations nesting to the west of the new larger gull colony (west of point A in Figure 1 2650 pairs nested in 1974 and 4150 pairs in 1975).

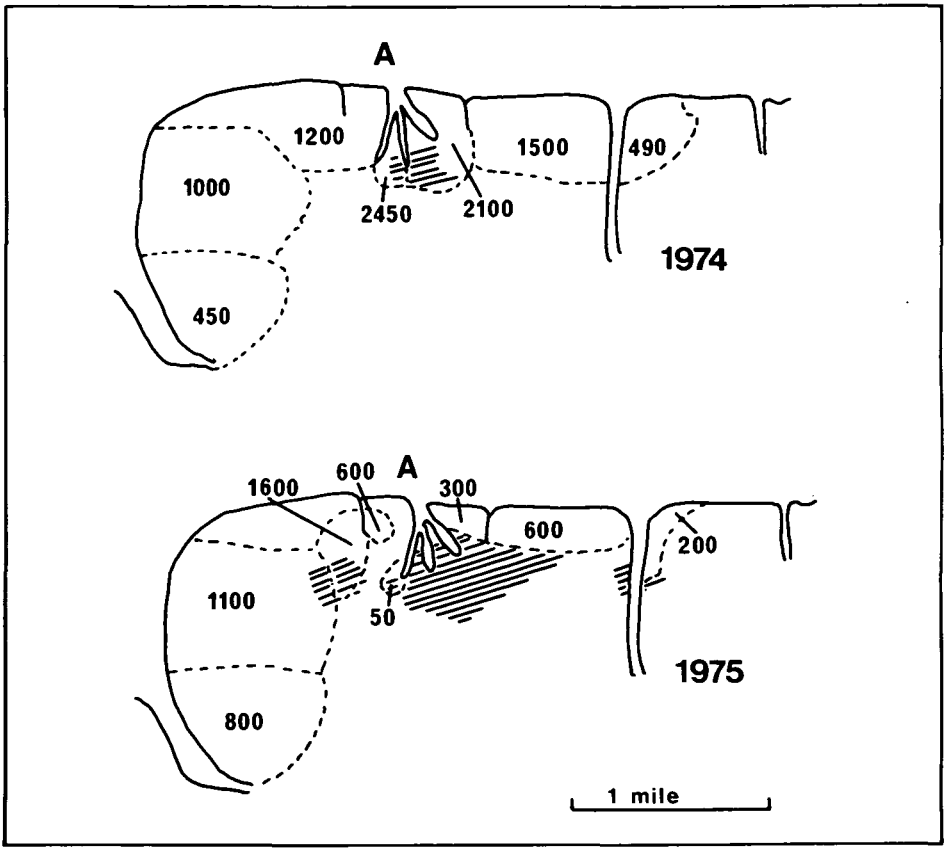

Figure 1 Distribution of Black-headed Gull nests (numbers over different parts of the colony are given) and Herring and Lesser Black-backed Gull colony (cross hatched) on the Ribble Estuary in 1974 and 1975.

That some of the deposed Black-headed Gulls moved across the Ribble to join the smaller (up to 1000 pairs) colony of Warton Marsh was probable for this increased to over 3000 pairs in 1975. Similarly, small numbers of Black-headed Gulls, which may have originated from the Ribble, founded a new colony on the Shotton Pools (Dee Estuary) tern rafts in 1975 (P J Morgan *pers. comm.).*

Common Terns which used to nest in and around the area colonised by the larger gulls also moved slightly, becoming more concentrated in the west of Banks Marsh and on Hesketh Out Marsh to the east (see Greenhalgh 1974 (b)).

As with the Black-headed Gull, the Common Tern population suffered from much disturbance in 1974-75 from the larger gulls besides losing some clutches and broods to them. Black-headed Gulls however, had very little adverse effect on the terns; indeed the two increased in parallel during the two decades 1954-74 whilst we have only one case of egg theft by Black-headed Gulls of Common Terns. The Black-headed Gulls likewise had very little adverse effect on the large breeding duck and

wader populations which certainly lost eggs and young to Herring and Lesser Black-backed Gulls.

Discussion

In two areas of northwest England, Herring and Lesser Black-backed Gulls have formed immense colonies: on the Bowland Fells, and at Walney Island where the effects of the increase were remarkably like that on the Ribble. Originally, Walney had a large Black-headed Gull colony probably of over ten thousand pairs in size ("many pairs which were unable to obtain a footing at the congested sites on the island were compelled to breed on the Furness coast" (Oakes 1953)). Similarly, there was a large Common Tern colony (935 young were ringed in 1935) and also Sandwich Tern *S. sandvicensis* colony (535 ringed in 1930). The larger gulls arrived in about 1928 and by 1934, 35 pairs of Herring and over 200 pairs of Lesser Black-backed Gulls were nesting. Oakes (1953) refering to Walney recorded:

Sandwich Tern "in 1932 the main colony was almost wiped out by Herring and Lesser Black-backed Gulls;"

Common Tern "decreased . . . though not to the same extent as the neighbouring Sandwich Terns;"

Black-headed Gull "Herring and Lesser Black-backs gradually ousted the Black-heads, and a considerable decrease from this cause was apparent in 1930."

These decreases occurred at Walney in the period 1930-35 when the large gull colony was still relatively small (235 pairs, or about twice the size of the Ribble 1975 colony). It would seem that a similar pattern may be about to occur on the Ribble and to avoid this and retain the present duck, wader, tern and Black-headed Gull populations it will be necessary to exclude the larger gulls before the situation gets out of hand. We hope that this will be carried out in 1976.

Summary

An increasing colony of Herring and Lesser Black-backed Gulls on the Ribble Estuary saltmarshes appears to be having adverse effects on the other major saltmarsh breeding bird populations. Should this continue then another Walney situation, where these two large gulls caused a major decline in the Black-headed Gull and tern populations, might result. An attempt is to be made in 1976, to remove these large gulls from the site.

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An Ornithological Survey of Sule Skerry 1975

A C Blackburn and D Budworth

Sule Skerry is a small island lying about 35 miles northwest of Hoy Head, Orkney, and 30 miles north of Whiten Head on the Sutherland coast. It is about half a mile by a quarter giving a total area of almost 35 acres. Of this some 12 acres are densely covered by sea mayweed *Tripleurospermum maritimum,* varying in height from 3 to 18 inches.

The perimeter of the island is deeply incised with geos and at one point this is complete, creating the small islet known as the 'North Pole'. This rocky coastline varies from about 15ft high on the sheltered eastern side to some 35ft on the exposed western side. The lighthouse is situated near the centre of the island where the land rises to about 45ft. At high water there are still a few outlying rocks visible at the southwest and northwest corners, but the nearest land of any size is Stack Skerry which lies about 4 miles to the southwest.

The 7 man survey team landed on the island at 1700hrs on 17 July 1975 after a six hour journey from Scrabster on the fishing boat 'Malden'. The objectives of the visit were as follows:

(a) to estimate the size of the Puffin breeding population.
(b) to determine the distribution of the Storm Petrel over the island.
(c) to verify the suspected breeding of the Leach's Petrel.
(d) to ring and colour-ring a sample of adult and pullus Puffins.
(e) to record the breeding status of all other seabirds.

The period of stay was for one complete week and over this period the weather was very amicable. The only heavy rain occurred during one night and the generally westerly winds did not prevent the use of mist nets. It is noted that the weather conditions which prevailed during this summer had been exceptionally good; so much so that fresh water pools had dried out and were supporting a growth of short vegetation.

The survey work on the Puffin colony was carried out continually during the period and mist nets were set almost to bisect the island. These were used periodically at fixed sites, chosen so as to create least damage yet to be as high as possible to intercept flying birds. One line was along the south going railway track and the other along a high bank running north of the lighthouse. Initially the netting of Storm Petrels was arranged to be random so as to establish the main concentrations, but the

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final effort was maintained at the sites which has been worked in previous years in order to catch retraps.

The timing of the visit suitably coincided with the last two years of manning the lighthouse. It is expected that by 1980 the light will be controlled automatically and by then the breeding birds will have had at least two years with the island free from Man's influence. The party therefore hopes to make a return visit either in 1979 or 1980, with the intention of extending the studies and measuring any changes which may have occurred.

Puffin Survey

The method of linear transects, used most conveniently for colonies on steep grassy slopes, could not easily be used on the flat terrain of this island. It was felt that the use of random quadrats might produce more accurate data since samples could then be taken from a wider range of habitats. By viewing the island from the top of the lighthouse tower one could plainly observe how the colony density depended on soil depth. Where this was deep, the vegetation grew tall and supported a high burrow concentration, whereas on the higher ground with shallow soil, the density was low.

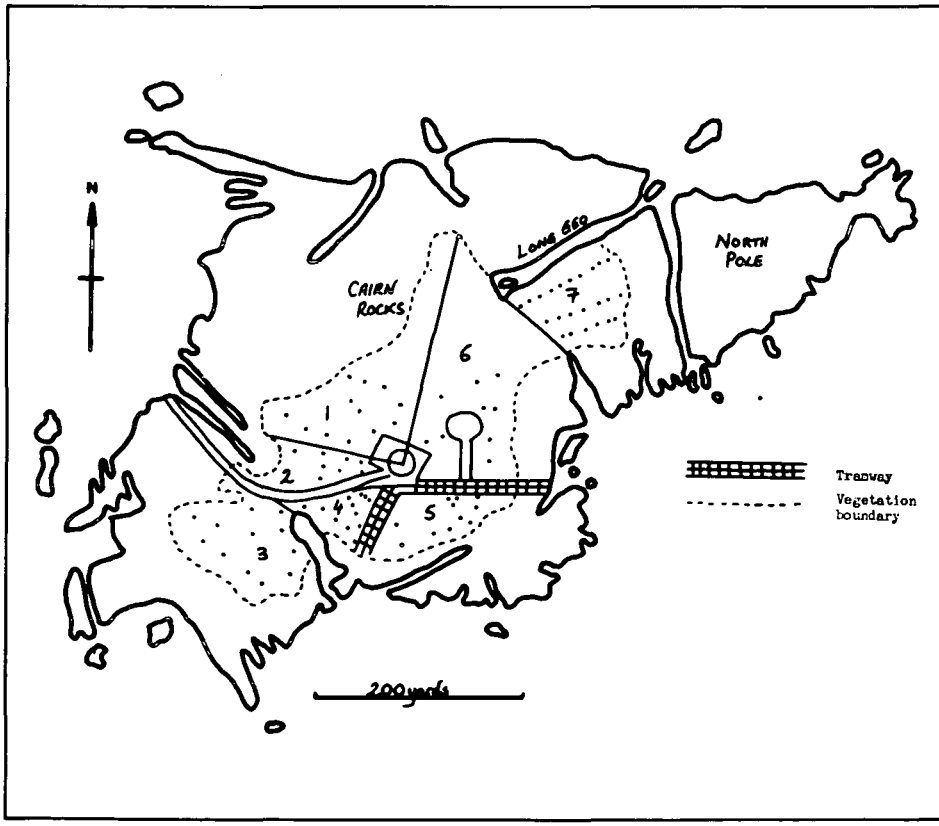

Figure 1 Map showing areas used for Puffin census, and approximate location of quadrats.

There was some overlap in certain parts of the island into the rock/soil boundary. This however was of small extent and was not considered in the results of the survey. It is nevertheless stressed that the numbers breeding in these areas would only serve to swell the final figure.

The island was divded into a total of 7 sections as shown in Figure 1. Attempts were made to choose these using natural features and cairns, but at the same time giving a homogeneous habitat character based essentially on the growth of mayweed. Quadrats were randomly sited by setting out on some given compass bearing for a distance, say 30 paces, changing direction and repeating. In sections 4 and 7 however the area was covered more systematically and it is felt that these figures might be biased towards the density away from the seaward edges. Each quadrat was 3 yards square and was marked out using four pegs and rope. It was then progressively searched to record burrows with adults or young as occupied, and obviously used burrows which were empty together with those which could not be bottomed as unoccupied. In deciding upon the number of burrows, care was taken to ensure that the entrances did not lead to the same nesting chambers. A total of 88 quadrats was taken and the approximate positions are shown on the map. Since each section was chosen so as to encompass one habitat, the final results were obtained by simply scaling up the numbers to correspond to the area of each. These data are summarised in Table 1.

TABLE 1: Summary of Puffin census

Section	Sample size	Area sq yds	Average occ/yd^2	Average unocc. /yd^2	Total burrows /yd^2	Total occ.	Total unocc.	Proportion occupied
1	13	10720	2.92	2.39	5.31	3477	2833	0.55
2	8	5150	0.88	5.75	6.62	500	3290	0.13
3	12	10450	1.92	6.25	8.17	2230	7250	0.23
4	12	3325	0.75	6.75	7.50	277	2490	0.10
5	11	7135	1.18	7.09	8.27	1476	5620	0.14
6	9	20070	1.11	5.22	6.33	2475	11650	0.17
7	23	9458	0.74	2.35	3.09	777	2470	0.24
Total	88	66308				11212	35603	

The overall result was a minimum breeding population of 11,200 pairs, taken from the number of occupied burrows only, to a maximum of 46,800 pairs taken from the total burrows used. During this period, young Puffins were fledging at a high rate, producing at the lighthouse for example several hundred per night. The evidence of the fledging was also noted by the change in the numbers of occupied burrows when checked during the first day, to the examinations made during the survey period. It is noted that this maximum figure compares with the visual estimate of 60,000 pairs made during a visit in 1967 (Stark 1967).

As a secondary measure an attempt was made to estimate the population size from a count of flying birds when they were at their maximum in the evening. In general, individuals tended to make almost circular tours of the island and the time for one

such circuit was measured. The number of birds flying past a given line in unit time was then crudely estimated and the product gave a total for the birds in the air of 10,000. There were of course birds at the extremities of the island which were flying around more local paths and one could easily add 50 per cent to this figure.

As a final comment on the habitat characteristics, it was most interesting to note how the burrow density increased at places near the sea where the soil was deeper and also that these areas had a lower percentage of occupancy. It was assumed that this was because they were the preferred sites and hence the more experienced, earlier breeders had taken them and their young had by then fledged. Sections 4 and 5 seemed to verify this idea although it should be noted that they were surveyed later in the week when fledging was well advanced.

A total of 2,299 adult and 1,712 pulli and fledged juvenile Puffins were ringed with about 500 of each age also colour-ringed. Table 2 gives an account of the daily variation, which in the case of the adults reflects the work effort, but the juveniles show the degree of fledging. They were mainly birds simply herded together at the lighthouse during the mornings after they had assembled during the night. Presumably it was the electric lights around the base of the tower which attracted them. Such behaviour is also observed on St. Kilda with the lighting round the army complex. It was assumed that the catchment area of the lighthouse was only of youngsters in the immediate vicinity since all 4 of the retrapped juveniles were ringed in burrows in section 1. As an attempt to get a further population size indicator, the retrap rate was examined assuming that the Lincoln Index could be applied. Although such assumptions were false the population predicted varied between 14,000 and 53,000 pairs. A total of four adults were retrapped from the work done during 1967 and 68. The latter, 1968 bird had been ringed as a pullus. Thus both adults and pulli show some signs of site fidelity.

TABLE 2: Daily record of Puffin ringing and retrap data

Date July	Adults ringed	Accumulated total	No. of retraps	Juv/pulli ringed	Accumulated total
17	52	52	0	128	128
18	78	130	0	220	348
19	286	416	0	388	736
20	197	613	1	159	895
21	290	903	4	167	1062
22	300	1203	4	369	1431
23	786	1989	9	197	1628
24	310	2299	22	84	1712

Other breeding species

The Kittiwake nests in all the main geos although the largest concentrations were on the south-east side. The number breeding was determined by walking the island's perimeter and counting the nests from each side of each geo. It was felt that our total of the order of 1,000 pairs was some 90 per cent accurate because of the ease of viewing the nesting sites. The young were well advanced, varying from well feathered to almost flying. Other breeding species were also counted during this exercise although their results did not carry the same degree of accuracy. In the case of the

Shag possibly 50 per cent of the young had left the nest sites and hence for comparison, the count on the westerly side was of nests only, whilst on the east both nests and immatures were counted. An interesting feature was the wide range in the stage of breeding of the Shag. This was from birds still sitting on eggs to immatures capable of flight and swimming.

The Eider breeding level was estimated at being 6 pairs according to the number of females with young. This compared with the lighthouse keepers' report of 11 nests found earlier in the season. Terns bred at two sites and our observations indicated only Arctic. However a partly decayed and dried carcass was found in the north colony which had the more orange bill with dark tip, characteristic of the Common. It is interesting to note the light-keepers' comment that the tern colonies move around the island and that this year's sites were not used last year. Although young Guillemots and Razorbills were visible near crevices in the rocks, it was quite impossible accurately to count them. An estimation was therefore made from the number of adults apparently tending young; no nests with eggs were found. It was considered that the birds remaining were the late breeders since none of the young had feather pins developing. To add to the uncertainty however, very few adults (about 10) were observed with young on the sea as we approached the islands. Three Black Guillemots were seen but breeding was not proved.

Two other species present in notable numbers were Storm and Leach's Petrels. The former species breeds generally over the island, especially on the higher ground near the lighthouse and at cairn rocks, as well as in the railway support masonry. The cairn rocks was in fact the area where ringing was done by Stark in 1967, but contrary to observations on that visit, the railway masonry harboured large numbers of nesting pairs. 596 Storm Petrels were ringed, and six were retrapped from the 1967-68 work. Attempts were made to prove the breeding of Leach's Petrel and although significant numbers were caught (28), no nests were found. The birds were however excited by the tape recorded lure and induced to call in flight. This response tended to be infrequent and often involved only one bird. One bird was trapped which showed signs of a brood patch.

There were two species of gull present, namely Herring and Great Black-backed. The latter species although at a reasonable level, was not observed to attack Puffins. In fact only two 'Puffin washing' sites were found and these only produced two relatively fresh carcasses. It is possible that predation is more in evidence earlier in the season. The Herring Gulls mainly harassed the Puffins in the evenings when the latter were bringing in fish. They quickly learned that easy pickings were available in the vicinity of the erected mist nets. It is possible that during wetter seasons the dried pools might retain sufficient water to be attractive to Common Gulls; no records exist to confirm this however.

Fulmars breed only on the North Pole where the rock surface is bare. They were in fact nesting on the flat of these rocks and hence found difficulty in taking to the wing. No nesting sites were found on ledges which were generally occupied by Kittiwakes. The only wader found to be breeding was the Oystercatcher and one pair was present with half grown young. Breeding passerines were represented by the Starling with up to 10 pairs and the Wheatear with at least one pair and of course the Rock Pipit with possibly 20 pairs.

A map (Figure 2) shows how the various species were distributed round the island, and their numbers are shown in Table 3.

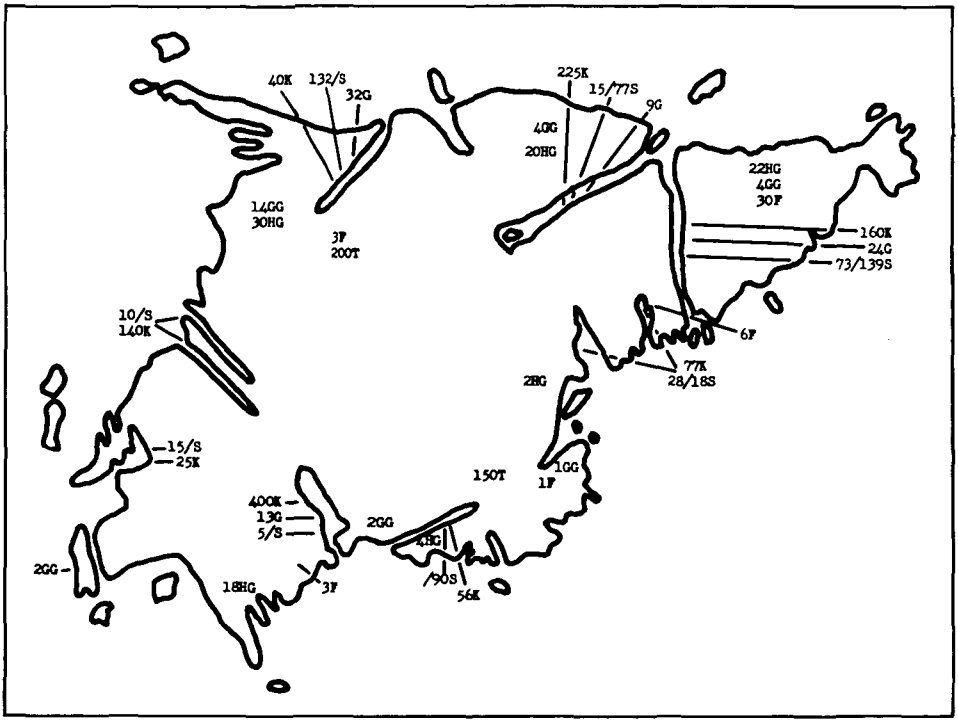

Figure 2 Map showing distribution of some breeding seabirds on Sule Skerry 1975. K = Kittiwake, HG = Herring Gull, GG = Great Black-backed Gull, T = Arctic Tern, G = Guillemot, S = Shag, F = Fulmar. Units of the counts as in Table 2.

TABLE 3: Breeding populations of some seabirds on Sule Skerry

Species	Pairs	Number on map indicates	Comments
Kittiwake	1163	pairs	nests easily counted
Herring Gull	48	individuals	young well grown and scattered
G.B B Gull	14	individuals	young well grown and scattered
Arctic Tern	175	individuals	birds in flight estimated
Guillemot	36	individuals	5 bridled adults
Shag	400+	nest/imm	only nests counted on the west
Fulmar	43	pairs	largest numbers on North Pole

Passage species

A daily record was kept of the non-breeding species which either visited or flew past the island. These are described below. Although Lesser Black-backed Gulls have been recorded as breeding, only one bird was seen and this did not stay. In addition to the breeding population of Great Black-backed Gulls a party of some 50 comprising adults and immatures, visited the island near long geo for a short period during rough seas. Sandwich Terns were observed in ones and twos on a number of occasions during the week. The breeding Oystercatcher pair was joined on two days by a party of two and then three visitors. Turnstone, Dunlin and Redshank were present in

varying numbers (0-10), throughout our stay and were spread around the island, Lapwing were observed on one day with 12 birds flying towards the mainland. Whimbrel and Curlew were seen and in the case of the latter, single birds were again noted as flying in the direction of the mainland. A Woodcock was flushed out of the mayweed near the lighthouse. Few Great Skuas were observed and one light phase Arctic was reported. Three Manx Shearwaters were recorded flying out at sea in a westerly direction, that is away from the possible colonies in the Orkneys. One breezy evening with occasional showers brought a Swift which attempted to roost at the tower, but was dead the next morning. A single House Martin passed over the island and a female Blackbird was observed.

Conclusion

The estimated numbers of breeding Puffins was 47,000 pairs. This would appear to be a full colony because of the absence of old burrows. Both Kittiwake and Shag appear to have swollen in numbers since the earlier visit and again the Kittiwake has probably reached its maximum level. Very few Guillemots and Razorbills were present but the evidence of the breeding level was inconclusive because of the lateness of the visit. This also applies to the Black Guillemot. Storm Petrels breed generally over the island but with the largest concentrations at the cairn rocks and railway masonry sites. Leach's Petrel was present during the period of the visit but no absolute proof of breeding was obtained. It is noted that Grey Seals breed on the island and young animals were seen on the north-west peninsula. It is intended to repeat the exercise during 1979/80.

Acknowledgements

The arrangements for the visit to Sule Skerry were made over a period of 18 months and the party members would like to thank the following bodies for giving financial assistance: Seabird Group, RSPB, BTO, Nature Conservancy Council and ITE. We would also like to record our appreciation to the following individuals for the advice and technical assistance: Mr D Lea, Dr M P Harris, Mr P Evans, Mr D Stark, Mr Henderson and Commander Emmerson of Scrabster, the Northern Lighthouse Board, the light keepers Mr D McLoud, Mr A Tate and Mr R Leask and finally the crew of the vessel Malden of Wick. The party members were: D Budworth, A C Blackburn, D Saw, P Childs, A Goodall, G Thomas and J Peck.

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Counting Tysties: Some Results from Orkney

A K D Ramsay

Since the publication of the results of "Operation Seafarer" in Cramp, Bourne and Saunders (1974) there has been considerable discussion about the results; their validity and interpretation. The accuracy of the counts of a number of species has been questioned and some of the problems associated with the counting of Tysties *Cepphus grylle* are investigated. All observations for the purposes of this paper have been made at a number of boulder colonies in Orkney.

Tysties generally nest under boulders in storm beaches or in cliffs, either in burrows at the top or in cracks on the cliff-face. Non-breeding and off-duty birds sit around the colony or on the sea, behaving in much the same way as other auks. It is the number of birds seen around the colony which appear to have been counted and the total number used as breeding pairs for "Operation Seafarer". This paper attempts to show how this could be a considerable over-estimation of the number of breeding pairs. Only 8343 "breeding pairs" were reported for "Seafarer". Thus, if the findings described below are valid throughout Britain, then the species is one of our rarest breeding seabirds. While arguments may be put forward supporting the "Seafarer" figures as an index, this paper will show how the results could include very large errors.

Diurnal attendance at colonies

The numbers of Tysties in attendance at the colony varies with the time of day (Slater and Slater 1972). Very few are seen at the colony in the afternoon. Slater and Slater noted that between 6 and 13 August at a colony with 13 nests on Fair Isle there was an average of only one bird present in the afternoons, while mid-morning counts produced an average of 6 birds.

Hourly counts were made at a section on Auskerry over a 24 hour period in mid-July 1974 and the results are plotted in Figure 1. Two peaks emerged approximately twelve hours apart. Counts made at sections of both Rusk Holm and Eynhallow agreed with the Auskerry counts. It was impossible to undertake counts every hour at these two sites, so five periods of counts were made around the same time as the maximum and minimum counts for Auskerry. While it is not beyond the bounds of possibility that there were drastic changes in the numbers present at times when counts were not made, the apparent similarity of the graphs suggests that there is some consistency in the results.

Dott (1974) found that numbers of Puffins *Fratercula arctica* in attendance at a colony on St Kilda in late July varied considerably. Similar counts made by the author on Fetlar in 1972 confirmed the pattern suggested by Dott. Puffins desert the land in mid-afternoon, reappearing later to reach a peak shortly before dusk. Greenwood (1964) and Dott have shown that attendance of Guillemots *Uria aalge* at colonies varies little during the day although Greenwood found that maximum counts occurred during brief periods in early morning and late evening approximately twelve hours apart. This is similar to the time of the peaks found for Tysties although the morning

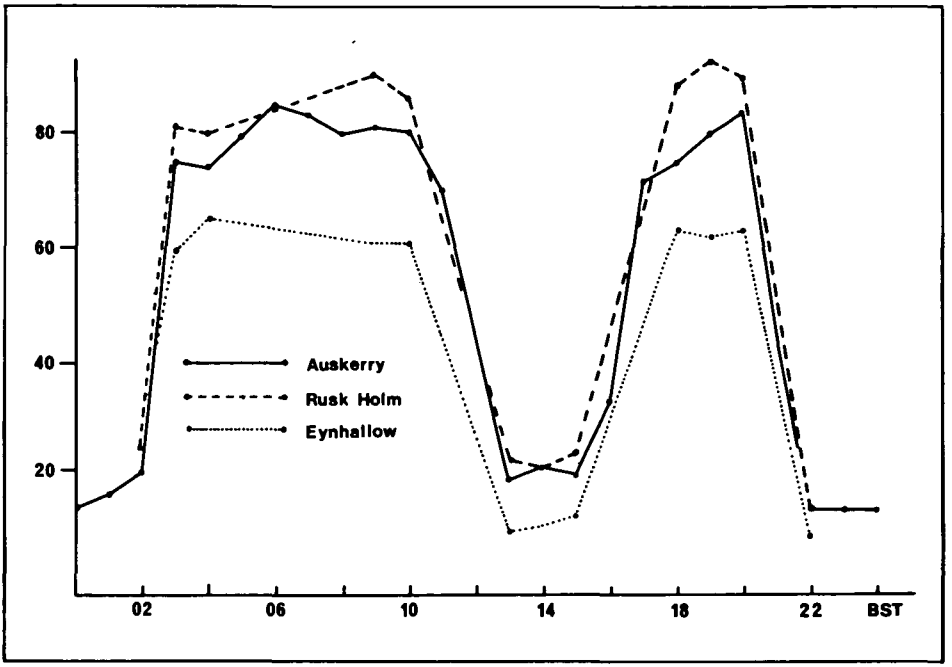

Figure 1 Counts of Tysties at 3 Orkney colonies over three separate 24 hr periods.

peak appears to be more extended in the latter species. It does appear that Puffins and Tysties have a much more striking diurnal pattern of attendance at colonies than Guillemots.

In conclusion it would appear that in a 24 hour spell there are two periods of time when there is a high peak and two when numbers are low. This obviously has considerable ramifications for counting Tysties.

Number of birds present in relation to number of nests in a colony

During 1974 and 1975 in mid-late July, counts of Tysties were made at sub-colonies on seven different islands in Orkney. Counts were also made of the number of nests. All birds sitting on the rocks or close inshore were counted. Thorough searches were made in the boulders for nests and from mid-July these were very evident (all the eggs had hatched) since there were considerable amounts of droppings. Failed nests and probable sites were included in the counts.

Table 1 shows the number of nests found at each colony, the number of birds counted and calculation of the number of adults per nest. The date and time of each count is also included. All counts were made at times when peaks were likely to be recorded so that comparison would be made between colonies. The number of adults per nest varied from 5.5 at one of the Faray Holm colonies to 6.7 at both Faray and Corn Holm. The majority fell between 5.7 to 6.1 adults per nest – remarkably close. It should be noted that a considerable number of single nests were found away from the colonies; there were usually 1 to 3 birds close to these. Non-breeders it is suggested tend to congregate at colonies rather than close to single nests.

TABLE 1: Number of adult Tysties per nest at a number of Orkney colonies

Colony	Date	Time	No. of birds	nests	Adults/ nest
Auskerry 1	21.7.74	1930	80	14	5.7
Auskerry 2	21.7.74	2000	23	4	5.8
Auskerry 3	22.7.74	1930	70	12	5.8
Auskerry total	20-22.7.74	various	266	69	3.9
Auskerry total	15-17.7.73	various	298	75	4.0
Faray Holm	26.7.74	1900	35	6	5.8
Faray Holm	26.7.74	2030	22	4	5.5
Faray	26.7.74	1000	34	6	5.7
Rusk Holm	27.7.74	0900	92	15	6.1
N. Westray	29.7.74	2000	37	6	6.2
Corn Holm	2.8.74	2000	40	6	6.7
Corn Holm	2.8.74	2030	20	3	6.7
Eynhallow 1	17.8.75	0400	29	5	5.8
Eynhallow 2	17.8.75	0400	18	3	6.0
Eynhallow 3	17.8.75	1100	61	10	6.1
TOTAL			639	109	5.9

Perhaps more significant are the figures shown in Table 2 where the total number of birds counted at several whole islands at both peak times and low times are related to the number of nests. At peak counts there was an average of 4.1 birds per nest (3.9-4.6) and at minimum an average of 1.2 birds per nest (1.1-1.2).

These figures are lower than those presented in Table 1 because the counts include both colonies and isolated nests.

TABLE 2: Number of nests and birds at a number of Orkney Islands

Colony	Year	No. of nests	Birds (peak)	Birds (min)	Birds/ nest
Eynhallow	1975	39	161		4.1
Eynhallow	1975	11		9	1.2
Auskerry	1973	75	298		4.0
Auskerry	1974	69	266		3.9
Auskerry	1974	20		18	1.1
Rusk Holm	1974	50	230		4.6
Rusk Holm	1974	22		19	1.2

Average at peak times = 4.14 birds/nest
Average at min. times = 1.15 birds/nest

Implications for Seafarer results

Many Tystie counts for "Operation Seafarer" in Orkney and elsewhere in the British Isles were made in late June to mid-July and it is likely that the numbers of adults present at colonies were much higher than the number of nests. "Operation Seafarer" counts of Tysties were largely of individuals but these were translated into breeding pairs giving a figure of 8,343. If the maximum average of six birds per nest

found by this study is applied to the "Seafarer" figures then there would only be about 1,400 nests in Britain. The true figure is likely to be somewhat higher than the 1,400 and lower than 8,343. The problem facing us is exactly how much less than 8,343 is the true figure. Table 3 shows the "Operation Seafarer" figures at six Orkney sites, subsequent peak counts and the differences between them. The table assumes that peak numbers occurred at all the colonies at mid-morning and again in the early evening.

TABLE 3: Seafarer and recent peak counts of Tysties in Orkney

Colony	1969 count	Date	Recent count[1]	Date	%change
Faray Holm	82	20.6.69	147	25-26.7.74	+79
Faray	14	20.6.69	35[2]	25.7.74	+150
Rusk Holm	8	22.6.69	230	26-27.7.74	+2775
Eynhallow	141	1969	163	17.7.75	+16
Corn Holm	45	8.6.69	75	2-3.8.74	+67
Auskerry	342	15.7.69	298	20-23.7.74	−13
TOTAL	632		948		+50

Notes. 1. counts made at peak times. 2. only north half of east side counted.

Much of the difference between the 1969 and 1973/74 counts is probably due to the different timing of the counts. It is unlikely that substantial changes in the population took place in the five years.

It is possible to reinterpret the "Seafarer" figures using the following assumptions:

1. That all counts were made at peak times.
2. That for isolated nests, two adults were counted per nest.
3. That four adults per nest were found in colonies.

On this basis, if all birds nested in colonies, there would have been about 2,000 pairs in Britain. It is likely that up to 20 per cent nested as isolated pairs (based on personal observations in Orkney) and if the above assumptions were true there would then have been about 2,500 pairs of Tysties in Britain in 1969. The true figure is probably higher than this since some counts would have been undertaken at times when minimum numbers of birds were present at the colonies. At colonies where counts were made at times of low adult attendance there would have been approximately one bird per nest. If the counting day is assumed to be about 9 hours long, then about one third of the time coincides with low adult attendance. This would result in around 4,000 breeding pairs of Tysties in Britain during the "Operation Seafarer" census. This figure could well be fairly close to the true one.

Discussion

Despite the suggestion that the counts of 8,343 pairs of Tysties in Britain and Ireland could be an underestimate (Cramp *et al*, 1974 p 181) the evidence presented here suggests that it could well be the opposite. It is one of our rarer and more sedentary seabirds and it is therefore likely to be one of the most affected by any major oil disaster in breeding or wintering areas. Both David Lea and Bobby Tulloch *(pers comm)* have come across large wintering flocks, on occasion over 1,000, in Orkney and Shetland. According to the "Seafarer" counts Orkney has 2,240 pairs (individuals?) or

about 26.9 per cent of Britain and Ireland's total. The North Isles combined have well over half our total breeding population. A major oil disaster in Scapa Flow, Orkney or one of the wintering regions in Shetland could well have disastrous effects on these breeding populations.

While this paper does not set out to provide all the answers on counting methods, it is felt that some tentative conclusions are possible. Given that counts are undertaken in July they should be done either in the morning or early evening. All birds sitting ashore and on the sea should be included. If the total count is divided by four this should give a close approximation to the number of nests – at least in colonies largely located in boulders where there are only a few isolated nests.

This paper has set out to throw some light on the problems of, and solutions to counting Tysties. More research is urgently required and hopefully some workers will now be stimulated to act. If anyone is interested in working on Tysties in any part of Britain, I would be grateful if they would get in touch with me at: Warden's House, Berstane Road, Kirkwall, Orkney.

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Scottish Shearwaters

R L Swann and A D K Ramsay

Welsh Manx Shearwater *Puffinus puffinus* colonies have for long been the subject of much study and documentation: Scottish colonies, however, have received scant attention. Since 1969 we have been visiting the Isle of Canna, Inverness-shire in order to conduct long term studies into seabird populations, breeding success and movements. We have also made several visits to the neighbouring island of Rum where P Wormell has done much work on shearwaters. This paper looks at some of the results of the shearwater work on Rum and Canna.

Colony size

The problems of counting Manx Shearwater colonies are numerous (Cramp *et al* 1974). The Canna shearwaters are mainly concentrated on steep slopes between 30 and 250 feet above sea level mostly below a raised basalt cliff on the south side of the island along the Tarbert Road (see Figure 1). Smaller numbers are found in similar situations at Bre Sgor, Compas Hill, Sanday and the Nunnery. In order to assess the breeding population counts of burrows with droppings at their entrances, indicating that shearwaters were prospecting them, were undertaken in April 1973 and 1974. In 1973 1,314 were counted and in 1974 1,600. Using observation burrows (15 in 1973 and 48 in 1974) it was discovered that 73 per cent were eventually used by

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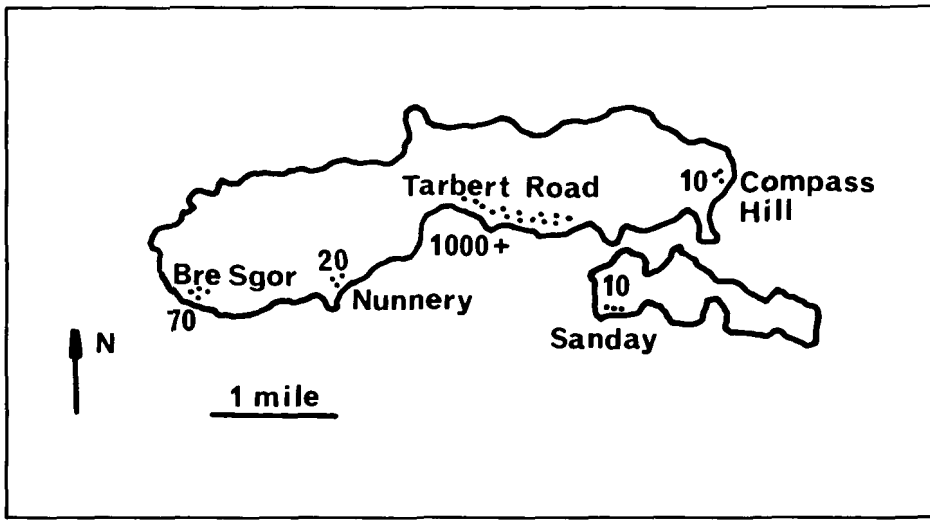

Figure 1 Map showing Manx Shearwater colonies on Canna. Numbers refer to the estimated number of occupied burrows at each site.

breeders in 1973 and 81 per cent in 1974. Using these figures a population of 950 breeding pairs is suggested for 1973 and in 1974 1,296 pairs. The 1973 figure is less reliable due to the low number of observation burrows used and their concentration in one particular part of the colony. The 1974 figure using more burrows spread more evenly throughout the colony should be more reliable. Other factors influencing the result would be the numbers nesting on the actual cliff and the numbers in multiple burrows. Both these are estimated to account for no more than a hundred pairs. We therefore estimate the Canna Manx Shearwater colony to be in the order of 1,000 to 1,500 pairs. A series of sample areas throughout the colony are now being counted to try and determine any long term changes in numbers.

Breeding Success

Using observation burrows we have figures for the period 1973-75 (see Table 1).

TABLE 1: Shearwater breeding success Canna 1973-75

	Per cent Eggs Hatched	n	Per cent Young Fledged	n
1973	84*	(23)	61	(18)
1974	68	(41)	84	(25)
1975	87*	(8)	86	(28)

Note: Per cent young fledged is from eggs hatched.
* Figures marked thus are possibly too high due to small sample sizes.

In 1973 the low percentage fledging was almost totally due to heavy rat predation in the core of the colony. In this area the total breeding success was only 12 per cent compared to 72 per cent in the rest of the colony. The rats appeared to attack after

the young were about a week old and had been deserted during the day by the adults. In April 1974 A F Leitch put a spoonful of Warfarin at the mouth of all burrows with rat droppings and this was followed up again in specific areas in April 1975. The 1975 breeding season showed no sign of rat predation so the threat appears to have been removed. This may only be temporary as the rat population on Canna is on the increase, apparently due to the mild winters.

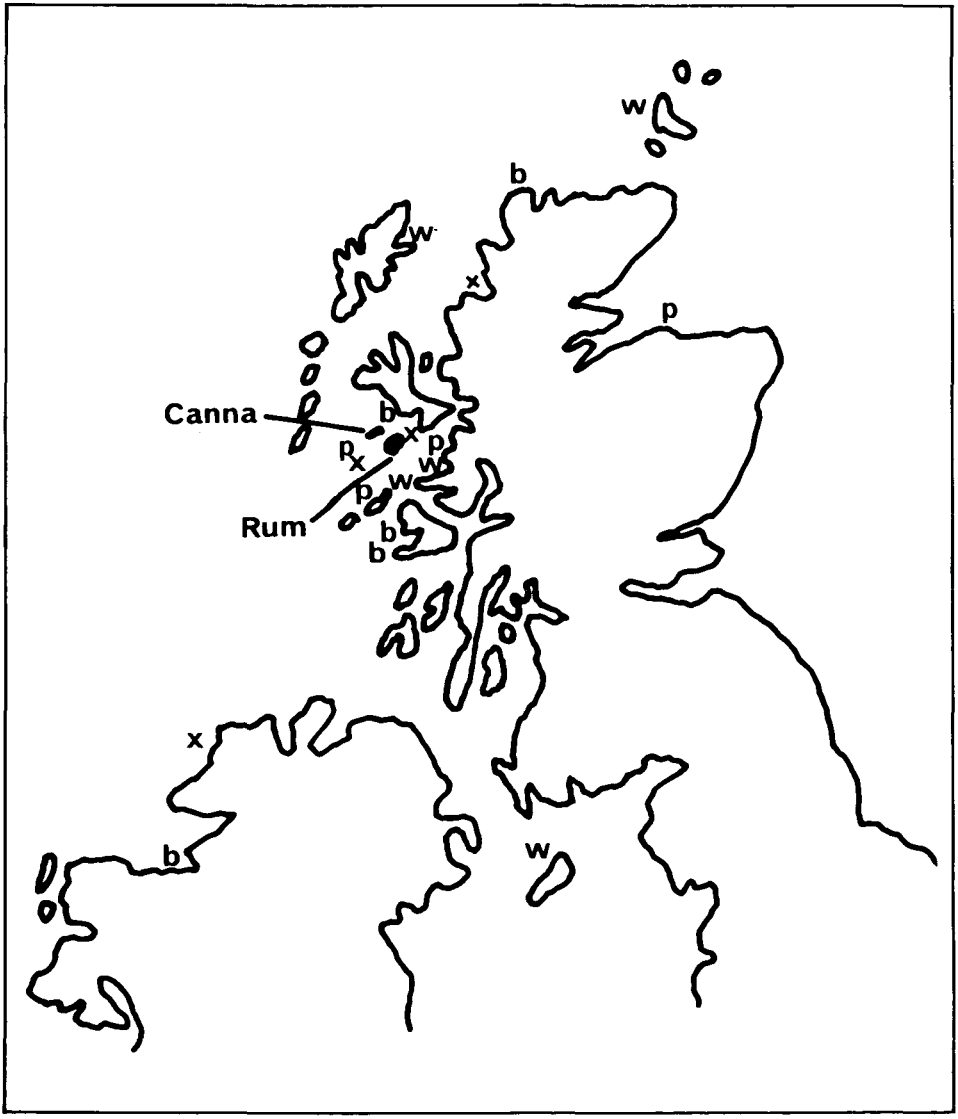

Figure 2 Shearwater recoveries in British waters from Canna and Rum.
p = pullus in year of ringing x = 1-3 year old
b = 3+ year-old in breeding season (May-Sep) w = 3+ year-old outside breeding season.

Movements

One of our early aims was to ring as many birds as possible in order to determine the summer feeding and wintering areas of Scottish Shearwaters. In this respect we were initially encouraged by free B T O rings. From 9,000 birds ringed on Canna and Rum there are 24 recoveries, those in British waters are shown in Figure 2. Within a month of leaving the colony there have been three recoveries of pulli within 60 km on the west coast of Scotland and one on the east coast. Both adults and immatures winter off the east coast of South America with 5 recoveries in Brazil (between 9°S and 27°S) and one in North Uruguay. The recovery of a second year bird in Texas (USA) in February may suggest a movement up to the East Atlantic seaboard of North America. Young birds return to Canna in their third year and the record of one in the Bay of Biscay in February (in its forth year) suggests a return via northern Spain rather than directly across the Atlantic. Summer recoveries are well scattered from Kirkwall to the Isle of Man and off the west coast of Northern Eire. This suggests feeding in inshore waters, mainly within 200 kms of the colony on young Herring (P Wormell *pers. comm.*). There has only been one definite interchange involving a Scottish Shearwater colony: a bird ringed on Copeland 22/7/72 and controlled on Canna 29/6 and 26/8/73. We have decided to ignore a 1973 control of a Skokholm Shearwater on Canna as the evidence suggests a possible misreading of the ring. Because of the low recovery rate much more ringing still needs to be done to give us more information on these movements.

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Growth in the Number of Nesting Colonies of Kittiwakes in Eastern Murmansk and Factors Determining this

L O Belopolski, L N Gorobets and N N Polonik

In the Soviet Union there are very large breeding colonies of seabirds, the largest being found on Novaya Zemlya. The Murmansk colonies are considerably smaller in size, but are of great interest because all the species of auks which breed there are peculiar to the boreal zone of the Atlantic Ocean. The Semiostrovya ("Seven Islands") region of eastern Murmansk is the only place where the birds nest in very large numbers, and here the "Seven Islands Reserve" at the present time a branch of the Kandalakshski State Reserve, was founded in 1938.

The results described in this paper were obtained on the largest island of the group — Kharlov Island. The island has towering, precipitous and often inaccessible granite cliffs. The seabird colonies occupy the clefts and fissures of the more broken northern shore. The sea comes right up to the cliffs, which are almost devoid of vegetation except for camomile and scurvey grass *Cochlearia* sp.

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The Kittiwake *Rissa tridactyla* is one representative of the breeding birds in these eastern Murmansk colonies. The following have devoted works to the study of various aspects of the biology of the Kittiwake: Modestov (1940), Uspenski (1941), Belopolski (1957, 1961), Coulson and White (1956, 1961).

On the Murmansk coast, Kittiwake colonies with the highest numbers of breeding birds are found on Rybachii Peninsula, on Kharlov Island and in Dvorovy Bay near Drozdovka Station (Saamski Region). Apart from this there are small colonies at a number of points on the western and eastern shores.

TABLE 1: Numbers of Kittiwakes on Kharlov Island

Year	No. of nests
1938	6169
1965	6068
1966	10382
1967	8414
1968	11965
1969	18402
1970	19006

According to census data for 1938 (Uspenski 1941) and the years 1965-1970 (archives of the Kandalakshski State Reserve) it can be seen (Table 1) that the number of Kittiwakes on the Kharlov Island increased by a factor of three from 1938 to 1970. Moreover, in recent years a number of new colonies have been formed, for example on Cape Ispaniya ("Cape Spain"), in the first and second Leontyerski clefts, and on other rocky sections where there were none in 1938. In some colonies which existed earlier, the number of nests of this species has increased more than three times. For example in the third cleft section of the Shirokii colony the number of breeding Kittiwakes increased from 32 nests in 1938 to 906 in 1970, ie more than 28 times.

Apart from those sections where numbers have increased in recent years a few colonies have in fact disappeared, as, for example, four colonies in Sirena Bay, or at least the number of nests has increased by less than three times. An analagous picture presented itself on the other islands.

Thus, for example, on the west side of Kuvshin Island there were 50-100 nests in 1938, but in 1970 only 42 were counted, of which 11 remained on the western cliffs, while a new colony of 31 nests had appeared on the eastern side. Finally new Kittiwake colonies have appeared on Veshnyak Island, where the number of nests reached 255 by 1970. The total increase on the Sevèn Islands was from 6,269 nests in 1938 to 18,699 nests in 1970, ie almost a threefold increase.

We shall attempt to discover the reason for this phenomenon. The numbers of any animal depends primarily on the annual population increase of the given species, its fecundity and the extent of juvenile and adult mortality. In favourable conditions the fecundity of a species may increase and if it exceeds the mortality then numbers will increase. In unfavourable conditions the opposite is true, a reduction of fecundity and increase in mortality occurs, and this leads either to stabilisation of the population or a reduction in numbers.

However in natural conditions, as is well known, fluctuations in population numbers depend on many other factors; the age at which sexual maturity is reached, hydrometeorological factors, the richness of the food base, the distribution of the given species. Other ecological conditions include the influence of Man which can be very important, and finally the inter-relations between different species in colonial breeders.

Let us trace the fluctuations of Kittiwake numbers at one or another island or colony. First and foremost we are interested in the decrease in the number of Kittiwake nests on separate sections of the breeding cliffs, sometimes involving the complete disappearance of the birds. There are two reasons to explain this. Firstly as a consequence of consistent poaching. This, for instance, is the reason for the complete destruction of nesting colonies on the rocky cliffs of Sirena Bay. This section, being rather remote was hardly protected at all and was thus subjected to regular nest-robbing. To some extent these are also the reasons to explain the small growth in Kittiwake colonies on other more accessible cliff sections where poaching was noted on more than one occasion.

Secondly, the reduction in the number of colonies may also be brought about by other natural factors, when the number of Kittiwakes nesting in auk colonies suffers a sharp decline because of a corresponding increase in the number of auks. In such cases there is a fight between Kittiwakes and auks over nesting sites, and this ends in victory for the auks, so the Kittiwake is squeezed out and its numbers fall in the given colony.

This inter-specific fight with the expulsion of the Kittiwake from the colonies has been well described by Belopolski (1956, 1957, 1961). Thus in 1947 after the establishment of the "Seven Islands Reserve", there was a Kittiwake colony on Kuvshin Island containing 150 nests. At this time the auk colony was in a state of depression. A completely different picture presented itself in 1950, when the number of auk colonies had increased markedly. In place of the former Kittiwake colony there were now only four nests and no young flew from these; the approach to the Kittiwake nests was made very difficult owing to the above average density of nests in the auk colony. Some sections formerly occupied by Kittiwakes were not suitable for auks and they did not settle there. A similar decline in the number of Kittiwakes in connection with the expansion of auk colonies has been noted at the main seabird colonies on Kharlov Island, where the numbers of Kittiwakes in 1951 had decreased almost two-fold in comparison with 1948.

An even more serious decline in Kittiwake numbers was noted in the colonies of Gribovaya and Bezymyannaya Bays in the Novozemelski branch of the "Seven Islands Reserve", where a count in 1950 showed that the number of nests had declined almost seven times, from 22,500 to 3,000, compared with the data obtained in 1947 (Belopolski 1957).

There is thus a decrease in the number of Kittiwakes in a colony where auk numbers show a marked increase, and this may sometimes lead to the complete disappearance of the Kittiwake colony.

An increase in the number of Kittiwakes may follow two paths. Firstly, when in existing colonies there is a decrease in auk numbers and nesting ledges are vacated. This takes place in colonies exploited by Man. Both in the organised exploitation of colonies and in poaching activities it is first and foremost the large, thick-shelled auk eggs that are collected, and these birds nest on the wider, more accessible ledges.

Kittiwake eggs are taken in smaller quantities, as the majority of nests are as a rule situated on precipitous, scarcely accessible cliffs, and the eggs themselves are small and extremely thin-shelled. Moreover the fecundity of the Kittiwake is almost twice that of the auks and Kittiwakes attain sexual maturity in their third year of life, whereas with the auks this happens only in the fourth or fifth year.

TABLE 2: Changes in numbers of Kittiwakes and auks at various Kharlov Island colonies

Year	Kittiwakes	Auks
1938	12338	7406
1964	?	1986
1965	12136	1674
1966	20642	2036
1967	22764	2972
1969	16836	3293
1970	36804	4148

From Table 2 we can see that the census in 1938 (Uspenski 1941) showed 7,406 auks, by 1965 the number of these birds had decreased to 1,674, ie almost five times. Beginning in 1966, with the improvement in the protection of seabird colonies, auk numbers gradually began to increase and by 1970 had reached 4,148; all the same this was still considerably lower than in 1938. With the Kittiwake the picture was the exact opposite and only in 1965 were the numbers somewhat lower than in 1938. Beginning in 1966 Kittiwake numbers began to increase markedly and by 1970 they were nearly three times the 1938 figure.

Thus the increase in Kittiwake numbers in the main mixed colonies for the most part went ahead with a corresponding decrease in the numbers of breeding auks, the Kittiwakes then taking over nesting ledges vacated by the auks.

A second way in which Kittiwake numbers increased was through the formation of new colonies, consisting almost entirely of Kittiwakes alone, either birds squeezed out of auk colonies, or such as found nesting places in the colony where they were reared. The formation of completely new colonies like this was first noted in the summer of 1941 near the Leontyevski colony on Kharlov Island (Belopolski 1957).

In 1966 11 new colonies were established; six on Kharlov Island, four on Veshnyak and one on Kuvshin Island. In 1967 two new colonies were formed on Kharlov Island. No new colonies were noted in 1968 and 1969, but in 1970 four colonies grew up on Kharlov and one on Veshnyak Island. Altogether 18 new colonies were formed on the islands during the period 1966-1970. The number of nests in these new Kittiwake colonies had reached 1,532 by 1970; 1,277 on Kharlov, 255 on Veshnyak and 231 on Kuvshin.

It is interesting to note that the formation of new colonies coincided with an increase in auk and Kittiwake numbers, in the first case in 1966, in the second in 1970 which constituted the beginning of a growth in numbers of auks and Kittiwakes, although the number of auks in 1970 did not reach that in 1938 whereas there were three times more Kittiwakes than in 1938.

Fluctuations in the numbers of Kittiwakes may thus serve as an indicator, pointing to a successful rise in the number of auks or to a depression in the population of this valuable species.

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(Russian titles are translated)
Belopolski, L O 1956. Times of egg laying in seabirds and factors determining these. *Zool. Journal*, 35, 10: 1522-1534.
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Seabirds Observed during a Boat Trip from Casablanca to London, August 1974

A de Jong

At the end of August 1974 I was lucky to find a cargo-ship (coaster) willing to take me back home from Casablanca, Morocco, after a stay in the "Maghreb". While I worked at night, I was able to spend most of the day on sea-watching. The observation-technique I used was probably the traditional one in these kind of situations: watching carefully in all directions ([1]) with the naked eye and using binoculars (15X70) when something is noticed and scanning the sea every once in a while. It goes without saying, that with this kind of observation many more birds pass unseen than while watching constantly with binoculars from the coast. My place of observation was always the bridge and at random on starboard or port (changing regularly). The height above sea-level was about 6 metres.

This paper contains: the periods of observation (Table 1), a map showing the route followed (Figure 1), the weather-conditions (Table 2) and a table of observations (Table 3), followed by a discussion for several species.
Needless to say, I owe many thanks to the ship's Captain and crew, who were kindly willing to take me with them.

([1]) My personal experience is, that one can cover 270°constantly and that the rest (90°) is covered about 50 per cent of the time.

Fluctuations in the numbers of Kittiwakes may thus serve as an indicator, pointing to a successful rise in the number of auks or to a depression in the population of this valuable species.

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TABLE 1: Hours of observation

Date	24-8	25-8	26-8	27-8	28-8
Periods of the day	19.30-21.00	8.30-12.00 12.30-13.30 16.00-18.00	10.30-12.00 12.30-15.00 16.30-21.00	16.00-17.30 18.00-20.00	12.30-14.30
Number of hours per day	1,5	6,5	8,5	3,5	2

TABLE 2: Weather-conditions during the days of observation

Date	24-8	25-8	26-8	27-8	28-8
Wind-velocity	3 à 4	3 à 4	2 à 3	2 à 3	2
Direction of wind	NW	NW	NNW	NNW	SE
Clouds	0-100% changing	20% on horizon	0-40%	40% changing	10% light
Sight-range limit	6 miles	>3 miles	4-6 miles	6 miles	6 miles
Remarks	cool	hazy	sea smooth	wave-height ±4 meter(b)	sea very smooth

Note: (a) when one could see the horizon clearly, I estimated 6 miles as the theoretical sight-range (for big conspicuous birds like adult Gannets).
(b) in the Bay of Biscay there had been a gale the previous day, so the waves were still rather high.

Discussion

Manx Shearwater *Puffinus puffinus*
Only 4 Manx Shearwaters were seen. Nothing can be said about the subspecies to which these birds belonged.

Great Shearwater *Puffinus gravis*
Great Shearwaters were only observed from just south of Cape Finisterre (Spain) till the northern part of the Bay of Biscay. In fact only two rafts were seen, of which the second was far the biggest. The birds of 26-8 showed no preferance for a special direction. The birds of 27-8 on the contrary showed a strong preferance for westerly directions (83 per cent flew SW-NW). These observations were made during the same period that hardly any Great Shearwater was seen in Great Britain *(Brit. Birds* 67: 490, 1974 and Voous, K H and J Wattel: *Ardea* 51: 143-157, 1963).

Sooty Shearwater *Puffinus griseus*
On 27-8 at 16.20 a shearwater was seen which was likely to be a Sooty Shearwater (mentioned in Table 3 as Shearwater sp).

Cory's Shearwater *Calonectris diomedea*
No conspicuous raft was seen. The Cory's Shearwaters observed showed no preference for any direction. The most northerly observation was close to Cape Finisterre (Spain), though 3 shearwaters observed at 17.00 on 27-8 (position: 46,7°N-6°W) were probably Cory's Shearwaters.

Storm Petrel *Hydrobates pelagicus*
Four Storm Petrels were observed (3 on 25-8 and 1 on 26-8) flying in northerly directions following and/or overtaking the ship.

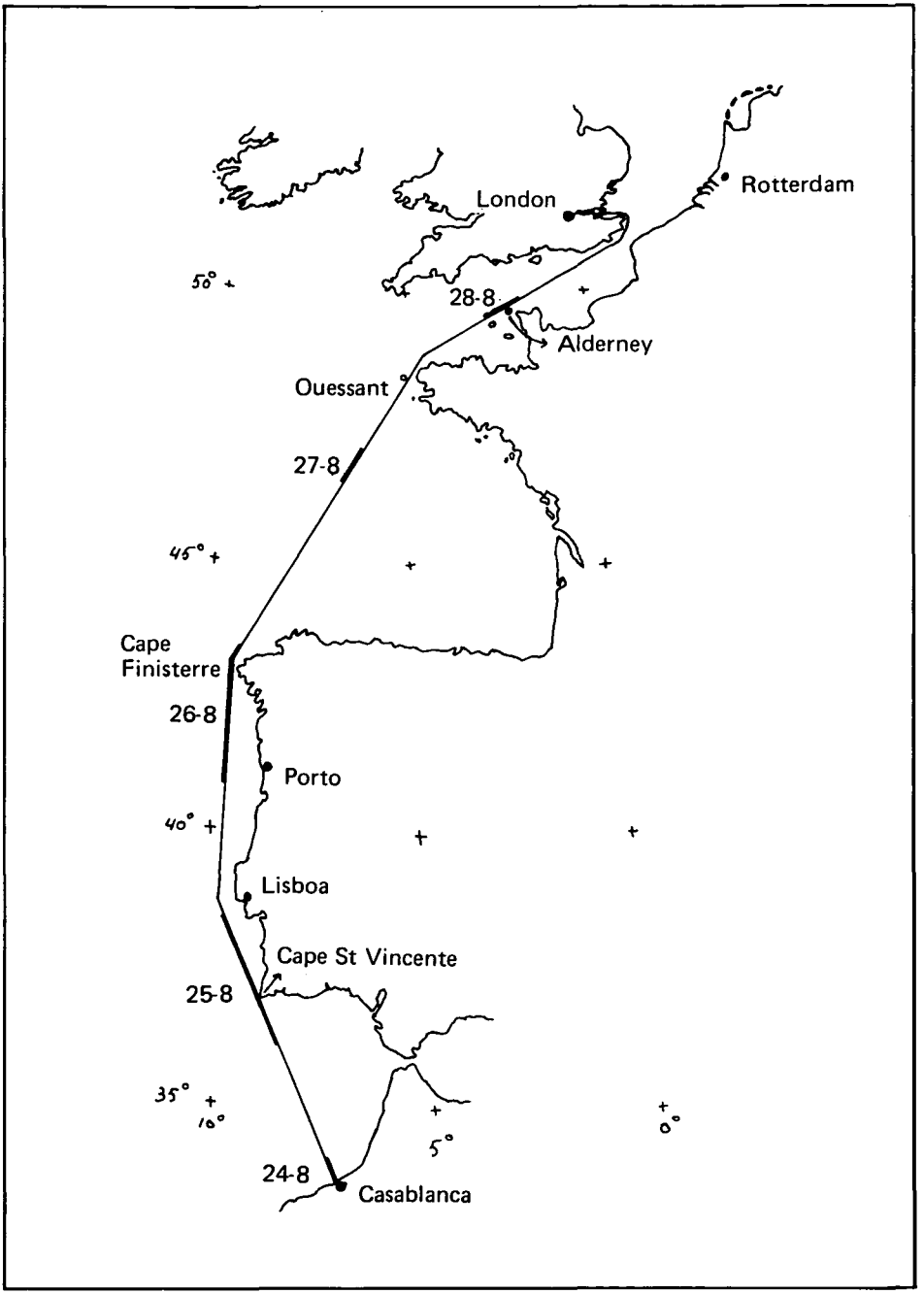

Figure 1. Map showing the route of the voyage. Solid lines indicate the periods of observation.

TABLE 3: Numbers, average numbers per hour and directions of flight

Species	Date					Total	Direction of flight								
	24-8	25-8	26-8	27-8	28-8		N	NE	E	SE	S	SW	W	NW	nd
Manx Shearwater	– –	1 0,15	2 0,23	1 0,28	– –	4	–	–	2	–	–	–	1	–	1
Great Shearwater	– –	– –	5 0,65	22 6,3	– –	27	3	–	1	–	–	7	12	1	3
Cory's Shearwater	2 1,35	4 0,62	7 0,91	– –	– –	13	2	1	4	–	5	–	1	–	–
Shearwater sp.	– –	– –	2 0,23	4 1,15	– –	6	1	1	–	1	–	3	–	–	–
Storm Petrel	– –	3 0,46	1 0,12	– –	– –	4	3	–	–	–	–	–	–	1	–
Gannet	– –	5 0,77	20 2,4	– –	57 28,5	82	2	–	–	2	12	8	–	–	58
Great Skua	– –	– –	1 0,12	– –	– –	1	–	–	–	–	–	1	–	–	–
Arctic Skua	– –	1 0,15	10 1,18	– –	1 0,5	12	2	3	–	1	3	–	–	1	2
Pomarine Skua	– –	3 0,46	2 0,23	– –	– –	5	–	–	–	–	3	–	–	1	1
Skua sp.	– –	– –	3 0,35	– –	1 0,5	4	–	–	–	–	–	–	–	–	4
Herring Gull	– –	52 8	1 0,12	1 0,28	– –	54	–	–	1	–	–	1	–	3	49
Lesser Black-backed Gull	1 0,66	– –	– –	– –	– –	1	–	–	–	–	1	–	–	–	–
Great Black-backed Gull	– –	1 0,15	– –	– –	– –	1	–	–	–	1	–	–	–	–	–
Common Gull	– –	– –	– –	– –	2 1	2	–	–	–	–	–	–	–	–	2
Sabine's Gull	– –	– –	217 25,6	– –	– –	217	4	20	2	–	–	–	–	3	188
Gull sp.	– –	– –	2 0,23	– –	– –	2	–	–	1	–	1	–	–	–	–
Sandwich Tern	10 6,6	5 0,77	2 0,23	8 2,3	2 1	27	–	–	3	–	11	9	–	2	2
Black Tern	– –	4 0,62	– –	– –	– –	4	–	–	–	–	–	–	–	4	–
Tern sp.	– –	5 0,77	3 0,35	– –	– –	8	2	–	–	–	3	–	3	–	–

nd = no directing: roosting, feeding, flying around etc.

Great Skua *Stercorarius skua*
Only one observation: 26-8 at 12.30 (position: 41,5°-10°W), flying south.

Arctic Skua *Stercorarius parasiticus*
Twelve Arctic Skuas were observed, of which 9 were off the Iberian coast on 26-8. No preference for any direction was noticed. All birds that could be aged (4) were adults. Nine out of 11 birds, of which the colour-phase could be determined, were of the dark phase. Compared with the data given by O Hilden (*Ann. Zool. Fennici* 8: 223-230, 1971) the low percentage of light-phased birds is remarkable.

Pomarine Skua *Stercorarius pomarinus*
Five Pomarine Skuas were observed of which 3 flew to the south. All were seen off the Iberian coast.

Sabine's Gull *Xema sabina*
I was lucky to see quite a few of these beautiful gulls. All of them were off the Iberian coast between Porto and Cape Finisterre. They were 10-20 miles offshore on the sea, where a lot of fishing takes place. Except for a few scattered ones, all birds were seen in flocks. They showed no preference for any direction; most of them were roosting and possibly feeding on the sea-surface. These observations correspond strikingly with those of W H Bierman (*Ardea* 54: 217, 1966) on 29 and 30-8-1965.

Sandwich Tern *Sterna sandvicensis*
During the whole trip 27 Sandwich Terns were seen. There was a rather strong preference for southerly directions.

Black Tern *Chlidonias niger*
Four Black Terns were seen flying NNW in a small flock on 25-8 (position: 38°N-9°W).

Observations from Cross-Channel Ferries

P J Oliver

Since 1962 the author has maintained detailed records of observations made from ferries between the English and French Channel ports of Dover, Folkestone, Boulogne and Calais. There is nothing very remarkable about these records but since, apart from inshore observations made from the various bird observatories, little or nothing appears to have been published on the birds of the Straits of Dover, it has been thought worthwhile to summarise and present the data.

Data are available for 29 transects and the number made in each month is shown in Table 1, which also summarises by month the number of each species recorded. It is not usually practicable to count the large numbers of gulls, many of which take up station behind the ferries as soon as they leave the harbour, but observations of all other species have been recorded, frequently with a note of the time and the approximate direction of flight. The data on time (effectively an indication of the distance from the coast that observations were made) are insufficient to warrant detailed discussion, but on almost every Autumn crossing a far larger number of birds

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TABLE 1: Number of transects made across Straits of Dover and number of birds seen in each month

Number of Transects	May 8	June 1	August 3	Sept. 6	Oct. 8	Nov. 3
Red-throated Diver						1
Diver sp.	1			2		2
Leach's Petrel						2
Storm Petrel						1
Petrel sp.						1
Fulmar	5					
Cory's Shearwater						1
Sooty Shearwater						1
Manx Shearwater						1
Gannet	15			40	133	92
Cormorant					1	
Heron				4		
Mallard					5	2
Teal					2	
Shoveler					1	
Velvet Scoter				33	22	
Common Scoter	9			836	137	15
Eider	15			7		1
Bar-tailed Godwit				1		
Arctic Skua					1	8
Pomarine Skua					3	
Bonxie	1			3	4	5
Little Gull	6					1
Kittiwake	14			1	170	606
Common/Arctic Tern	109			25		
Sandwich Tern	5			2		
Tern sp.	11					
Razorbill	4			1	32	3
Guillemot	3			3	4	2
Puffin					1	
Auk sp.	5			5	71	61
Collared Dove	1					
Feral Pigeon	38			1		
Swift	25					
Skylark					19	2
Swallow	35					
House Martin	8					
Hirundine sp.	15					
Starling					227	83
Chaffinch					12	

Note: Omits Great and Lesser Black-backed, Herring, Common and Black-headed Gulls, for which data are not available.

has been seen near the French coast than on the English side of the Channel. Counts were commenced as the ferries emerged from the outer breakwater of the harbours, thus excluding from the data terns and gulls that are often to be seen feeding in the harbours, and also (in Spring) the large flocks of Kittiwakes below the nesting colony at Dover. Each journey normally takes about 1½ hours, but sometimes recording has ceased during the course of the crossing if it has become clear that no birds are to be seen.

The small number of transects precludes any firm conclusions being drawn, but it seems that while the records indicate that migration is still under way in the Straits in May this has (as would be expected) ceased in June. More gulls are usually to be seen in August than in the Spring, and it is surprising that there have been no observations of other species in that month. It is clear from the Table that late Autumn is the time of greatest movement especially of Gannets, Kittiwakes and auks.

Comments on certain species follow. References to Cap Gris Nez are based on the Observatory Reports (1965 to 1969).

Divers. The few records suggest that these birds remain comparatively close inshore.

Petrels and shearwaters are usually scarce within sight of both coasts and the erratic records (all relating to birds flying down-Channel) call for no special comments. The records of Fulmars in May probably derive from birds nesting at Dover.

Gannet. This species can be seen from Cap Gris Nez in almost every month, but the Table reveals a marked increase in abundance in mid-Channel in October and November. On at least two occasions in late October this species has been seen across the whole width of the Channel and not, as is more usually the case, concentrated off the French coast.

Ducks. The transect records are consistent with available records from Cap Gris Nez. In all cases ducks have been seen only close to the French shore, generally flying south-west.

Skuas. The relatively large number of Bonxies compared with Arctic Skuas suggests that the former species prefers to keep well offshore, as Arctic Skuas are almost always much more frequently observed than Bonxies from both the English and French coasts. All the skuas were flying south-west down Channel.

Kittiwake. The transects reflect the seasonal pattern of occurrence off Cap Gris Nez. As with Gannets, numbers of this species have on at least two occasions been observed flying south-west across the whole width of the Channel, not being restricted to the French side. The records in May derive from the nesting colony at Dover but so far none has been seen feeding in the Straits.

Auks. These species are mostly seen on the water rather than apparently on migration. The seasonal distribution of records calls for no comment, but the high proportion of Razorbills amongst those specifically identified in October is of interest.

Passerines. Most species are seen flying across to England or south-west; it is not clear what may be the destination of the latter birds. On one occasion in May, a number of swallows alighted on the boat in mid-Channel in foggy conditions, apparently disoriented.

Seabird Movements off the Cherbourg Peninsula, April 1958

C J Henty

Introduction

The Cherbourg peninsula lies in the middle of the Channel coast of France and since it projects due north for at least 70 km beyond the general line of the coast should make an excellent observation point for detecting migration through the English Channel. Thus observations were carried out as follows. 1. at Cap de la Hague by D E D Campbell, C J Henty, E L Jones, G H Rees and E J Wiseman from April 12 to 18, and by Henty and Wiseman from then to April 22. 2. at Barfleur by Jones and Rees from April 19 to 22.

Methods

At Cap de la Hague sea watches were started soon after dawn and continued for several hours or longer if it seemed profitable. In addition we often made spot checks in the evening but never observed any notable movements. Observations at Barfleur were exploratory and the few hours of morning seawatching between April 20-22 were not very productive.

Weather

From April 11 to 14 the wind was continuously ENE or NE force 5-6, cloudy with sunny evenings and very cold. On the 15th the wind backed to NW/3 in the late morning and it became warmer for a short time. This continued on the 16th but the 17th was cloudy with drizzle and the wind W to SW/2. The 18th and 19th were sunny and warm with light W winds and from 20th to 22nd the weather continued warm and almost calm.

TABLE 1: Numbers of birds flying past Cap de la Hague. Bracketed numbers refer to SW direction, unbracketed to NE

APRIL 1958

Date	12	13	14	15	16	17	18	19	20	21
Wind	NE/6	ENE/6	NE/5-6	N/5	N/4-5	W/2	NW/2	SW/1	SSW/2-3	0
Observation: Continuous Sporadic (hrs)	2 2½	2 2½	3½ 2½	3½ 4	4½ 2½	4½ 3½	6	5½	5	5½
Diver sp.	3	(2)	8 (1)	23 (2)	44	91 (5)	68 (1)	45	18	18
Gannet	38 (6)	17 (1)	124 (11)	67 (9)	17 (4)	20 (14)	9 (18)	6 (10)	4 (7)	5 (18)
Scoter	6 (6)		20 (17)	3 (15)	99 (7)	4580 (10)	4350	13520	2850	143 (26)
Long-tailed Duck						11	2			
Fider								6	25	
Red-breasted Merganser	1		2		29	13	11	73	5	1
Brent						24	110	162	4	
Common Gull			4	7	8	58	6	9	5	28
Arctic Skua						1	1	6		
Sandwich Tern	74	45	362	373	252	16	30	160	138	194

Results

Details of the numbers of the common species are presented in Table 1. During the later part of the period with strong northeasterly winds there were persistent small movements of Gannets *Sula bassana* and larger passages of Sandwich Terns *Sterna sandvicensis* with both species moving mainly to the northeast, up channel. Out of 205 Gannets all were adult except for 5 2nd and 3rd year birds. During the passage into strong head winds the Sandwich Terns flew low over the waves, by contrast in a second phase of movement in calm or light tail winds many flew quite high up to about 60 metres. Divers *Gavia spp.* also passed during the last two days of northerly winds but their numbers increased with the switch to light westerly winds. Definite identifications comprised 35 Red-throated Divers *G. stellatus,* 19 Great Northern Divers *G. immer* and 15 Black-throated Divers *G. arctica.* Many of the last species were in full or partial breeding plumage. There were a number of grebes offshore — 3 Great Crested *Podiceps cristatus,* 5 Red-necked *P. grisegena,* 7 Slavonian *P. auritus* and 4 Black-necked Grebes *P. nigricollis.*

The passage of many species was almost confined to the period of light westerly winds (tail winds since nearly all birds passed to the north-east). These species included Long-tailed Duck *Clangula hyemalis,* Red-breasted Merganser *Mergus serrator,* Eider *Somateria mollissima,* Brent Goose *Branta bernicla,* Common Gull *Larus canus* and Arctic Skua *Stercorarius parasiticus.* However these species were almost swamped by a massive passage of Common Scoters *Melanitta nigra* starting on April 17 and 18 with over 4,000 on each day and culminating with 13,000 on the 19th. A total of over 25,000 Scoters passed to the north-east in the 4 days April 17-20 but we recorded only 1 Velvet Scoter *M. fusca.* Male Scoters outnumbered females about 3½: 1 (one count gave 103:28) whereas the ratio was about equal in Eider and drake Red-brested Mergansers were scarce.

At Cap de la Hague seawatches were made about a kilometre either side of the extreme northwest point. At the southern station (Goury) seabirds were distinctly closer to the shore and were usually first seen between the rocks known as L'Etat and Greniquet, ie coming up from the south, out of the Gulf of St. Malo. Just around the extreme point at the up-channel station seabirds were not only further out to sea but seemed to be moving NE out to sea rather than ESE along the local trend of the coast. Three flocks of Brent Geese totalling 261 birds were first seen far off to the south over Baie d'Ecalgrain then passed overhead at Goury and left the peninsula on a NE bearing. Several divers and Red-breasted Mergansers and flocks of Common, Black-headed and Lesser Black-backed Gulls *L. canus, L. ridibundus and L. fuscus* flew in exactly the same manner.

On April 15th simultaneous watches were made between 07.30 and 09.00 at Cap de la Hague and 12.5 km to the east at Pointe Jardeheu. At the Cap, 10 divers and 282 Sandwich Terns flew up channel whereas at Pointe Jardeheu no divers and only 27 terns were recorded. At Barfleur, 48 km east of Cap de la Hague, the admittedly less intensive seawatching failed to reveal any visible passage although 1,500 Scoter and other seafowl were present offshore.

The conclusion seems inescapable that in spring most seabirds leave Cap de la Hague NE out to sea toward the opposite (English) coast.

It is very clear from Table 1 that passage of sea duck is markedly inhibited by strong head winds and the data suggest that Scoter, Long-tailed Duck and Red-breasted Mergansers commence migration as soon as winds are moderate and/or in the same

direction as the migration. The major peak of Scoter on April 19 could be a delayed response of birds that had been in the Gulf of St. Malo but it is more likely to represent the continued migration of birds that had been flying for at least two days. Assuming that an individual Scoter flies each day for a time roughly equal to the duration of the population passage (c. 4hrs), a flight speed of 70 km per hr and a coasting movement, it can be calculated the origin of the Scoter passing Cap de la Hague on the peak day was at least as far south as the southern half of the Bay of Biscay. Conversely the earlier Scoter and Red-breasted Mergansers and all the Long-tailed Ducks would previously have been around the coast of Brittany.

Finally it is worth commenting on species that were scarce. We saw only a few auks that moved in both directions – Guillemot *Uria aalge,* Razorbill *Alca torda,* Puffin *Fratercula arctica* – and a single Little Auk *Plautus alle* offshore. No Manx Shearwaters *Puffinus puffinus* were noted and only 4 Fulmars *Fulmarus glacialis* and 4 immature Kittiwakes *Rissa tridactyla.*

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Summary
Seawatching at Cap de la Hague and Barfleur on the Cherbourg peninsula between April 12 and 22, 1958, showed that only Gannets and Sandwich Terns moved upchannel into strong NE headwinds. With light west winds there were many divers, Brent Geese, Red-breasted Mergansers, Eiders and Long-tailed Ducks and an avalanche of Common Scoters totalling 25,000 in four days. Most birds came from the south and then moved out to sea to the NE and hence did not coast due E along the north side of the peninsula.