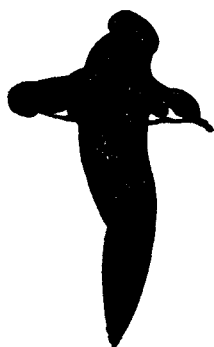


SEABIRD REPORT 1971



The Seabird Group

50p

THE SEABIRD GROUP, 1971-72.

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EDITORIAL

GULLS AND TERNS

Many seabirds are showing marked fluctuations in their numbers which may or may not be connected with human activity, as discussed in this editorial last year. In most cases if they are due to human activity the causes appear to be major developments in the way in which we obtain our food or dispose of wastes which only affect the birds remotely. **Observations of what is happening to birds may have a considerable impact on public opinion over such matters as pollution, but it is often hard to do much for the birds which have been affected directly, except perhaps on a purely local scale during oil pollution incidents, as discussed in one of the reviews at the end of this report.** However, in two closely-related groups which present very different problems, the gulls and terns, there is a much closer relation between the welfare of the birds and human activity as a result of its impact on their breeding-sites. In both cases recent developments give cause for alarm here.

Both gulls and terns appear to have evolved originally as feeders along the shore. The gulls take the larger and more sedentary animals occurring on the land, and the terns the smaller and more mobile ones in the water, though there is a good deal of overlap. Some members of both groups have taken to breeding inland, and others to feeding out at sea. They have both tended to be confronted with similar problems in finding somewhere safe to breed, away from terrestrial predators in one direction and unpredictable floods and tides in the other. These they have tended to solve in the same way by developing rather plastic preferences for similar nest-sites on off-shore islets and sandbanks, coastal sand-dunes and shingle-beds, and inland bogs and marshes. Here indeed they often breed amicably together, combining to repel predators, although individual large gulls in particular are liable to prey on other birds, and the skuas make a habit of it.

Presumably there must once have been an ample choice of not only feeding-places but also breeding-sites available for birds frequenting the shore, or they would not have evolved their present habits. However, while inter-tidal ecology still remains comparatively unchanged compared with that of the land, as a result of human activity the composition of the coastal bird community and the availability of nest-sites in particular has now been thrown severely out of balance. An increasing proportion of farmland has now been converted into the semblance of a mud-flat for much of the year by man, who has also taken to littering both land and sea with edible garbage, so that the gulls have tended to flourish, whereas the area of shallow water attractive to terns has been progressively reduced by reclamation. Reclamation has had a particularly severe impact on the supply of breeding-sites in coastal and inland marshes, while human recreational activities are also leading to increasing disturbance to other seabird nesting-sites on beaches and islands. In consequence we are confronted with the spectacle of an increasing number of aggressive, often predatory, gulls, competing for a diminishing supply of increasingly disturbed breeding-places with a declining number of inoffensive terns.

If we consider the gulls first, their enormous increase in recent years is rather obviously the result of a combination of an increase in the food-supply as a result of human activity, and a decrease in human predation. The great majority of these birds can be regarded as useful scavengers which remove offensive garbage which would otherwise attract less attractive animals. They

cause a certain amount of nuisance, but the worst accusations which were brought against them at the discussion we once organised on the subject (Ibis III: 445-448) were that they were liable to make a mess and a noise, occasionally steal agricultural produce or animal food, may get in the way of aircraft or carry disease, or disturb the local botany or other birds. These are all rather marginal offences, especially when one often has to search hard to find anyone who is complaining among the legions of people who like feeding them. They could all be dealt with by vigorous local action if people cared to take the trouble.

There are, however, certain drawbacks to "local action", especially when it is applied to the breeding stations. Most of our gulls used to nest far away, in inaccessible places around our outer coasts and in northern Europe. With the relaxation of persecution in recent years the birds have tended to try and breed closer to their winter food-supplies, which one suspects are the factors really controlling their numbers, first on local cliffs, islands and marshes, and then, as recently demonstrated by Stanley Cramp (Brit. Birds 64: 476-487) on rooftops. At first these birds are usually regarded as an attractive novelty, but on the roof or in a nature reserve they soon tend to be regarded as too much of a good thing, and there is then a demand for their "control" by such measures as the destruction of their nests and eggs, and if this does not work, their slaughter.

There are several points which can be made about this. In the first place, if people do not want gulls, by far the most effective defence is to prevent them settling in the first place, since like a lot of seabirds they seem slow to form new colonies but very tenacious once they are established. Secondly, if they do settle, it seems wise to consider very carefully whether they are really doing any harm. Many allegations are made about the damage gulls do at nature reserves, for example, but a good many other birds still flourish in spite of the presence of gulls at such places as the Isle of May, the Farnes and the Pembroke Islands, even according to P. G. H. Evans in the presence of 2,000 pairs of Greater Blackbacks on North Rona (Ibis 115: 476-478), while later in this report there is an account of a similar state of affairs on the rock Am Balg. Thirdly, if it is proposed to dislodge them once they have settled, it is wise to consider carefully where they may go if they are displaced, since they may go somewhere where they are even less welcome, in the same way that the Starlings evicted from Trafalgar Square settled on Buckingham Palace.

If gulls are now finding difficulty in locating anywhere to settle, especially when they wish to sit on eggs, the situation is even worse with the terns, which tend to come behind them in the queue. These were very seriously reduced on all our coasts in the last century, but as a result of the institution of active conservation measures substantial populations have been built up again in some areas. However, there are still many gaps in their distribution, for example the entire Severn estuary, while elsewhere the birds are again under increasing pressure. The Little Tern, which insists on nesting spread out on bathing beaches, was shown by Roger Norman and David Saunders to be seriously reduced in our first enquiry (Brit. Birds 62: 4-13). The other terns, which are readier to nest in groups in reserves, have usually done better, but even so in many areas they are also becoming increasingly troubled by visitors who with the best of intentions keep them off their eggs or otherwise disturb them even there (R. Chestney, Trans. Norfolk Norwich Nat. Soc. 21: 353-363). Sandwich Terns, which gather in particularly large colonies which they are particularly prone to desert if they are disturbed during the early stages of the breeding cycle, have been suffering particularly badly, for example along the east coast of Scotland (W. R. P. Bourne and A. J. M.

Smith, Biological Conservation in press). This is particularly serious because we now have half the north-west European population since the Dutch birds were poisoned by pesticide effluents discharged into the Rhine in the 1960s (R. Booth and D. A. Jonkers, TNO Nieuws 1972: 553-555).

Gulls are sometimes blamed for the decline of terns. Individual large gulls may certainly sometimes make a nuisance of themselves, or the smaller gulls displace the smaller terns by taking up all the space on small islands, though these are hardly their favourite nest-sites if anything else is available. However, in the first Seabird Report J. H. Taverner described how Sandwich Terns may deliberately settle in the centre of Black-headed Gull colonies for safety, while in the account of the birds of the north Kent estuaries reviewed in this report it is also remarked how Common Terns deliberately nest near the Black-headed Gulls, as they also do on the Wash. Mediterranean Gulls have similarly joined breeding Black-headed Gulls in Hampshire (J. H. Taverner, Brit. Birds 85; 185-186), and doubtless before long Little Gulls will be found nesting with them as well, as they do on the continent. Clearly any wise reserve warden will keep an eye on the number of gulls that start to descend on sites of special interest, but if excessive numbers start to arrive and displace other species surely often the conclusion to be drawn is that we have too few reserves, not too many gulls. It seems time conservationists left the destruction of noxious wildlife to pest control departments and devoted the energy saved to considering whether it is really justified, and how they can improve their care of what is left.

ESTIMATES OF THE NUMBER OF GANNETS BREEDING ON ST KILDA 1969-1973

T. J. Dixon

The last estimate of the number of Gannets breeding on St. Kilda was made in 1959 by Morton Boyd (J. Anim. Ecol. 30: 117-136, 1961). I made another of the number breeding ten years later by comparing aerial photographs of sample areas of the colony with his totals for the national census of breeding seabirds in 1969. Since then Mr. Tom Weir has shown me an additional photograph of Stac Lee taken in May, 1971, the month of Dr. Boyd's observations, and I have been able to take further photographs in the same month of 1973.

The same divisions and sections that Dr. Boyd used have been taken as standard for the purposes of this comparison but his demarcations were not made clear in his paper and so had to be estimated from his distribution maps.

Photographs in 1969

In July, August and September, 1969, extensive aerial photographic cover was obtained of the St. Kilda Gannetry on Boreray and adjacent stacks. A Royal Air Force "Shackleton" took a total of 55 photographs of the nesting sites of which 26 were used for counting. Of the 31 taken in July 13 were used, of the 20 in August only three, and ten from the 14 in September. It was hoped that given the necessary weather conditions full cover could be obtained and the resulting figures used for "Operation Seafarer" and to see if the colony had suffered any changes over the past ten years.

The colony was not totally covered as had been hoped, and the value of these photographs was severely limited by lack of definition, as well as the weather conditions and the difficulties of getting close enough in a large air-

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Figs. 1-3: Cover in the photographs used for counting.

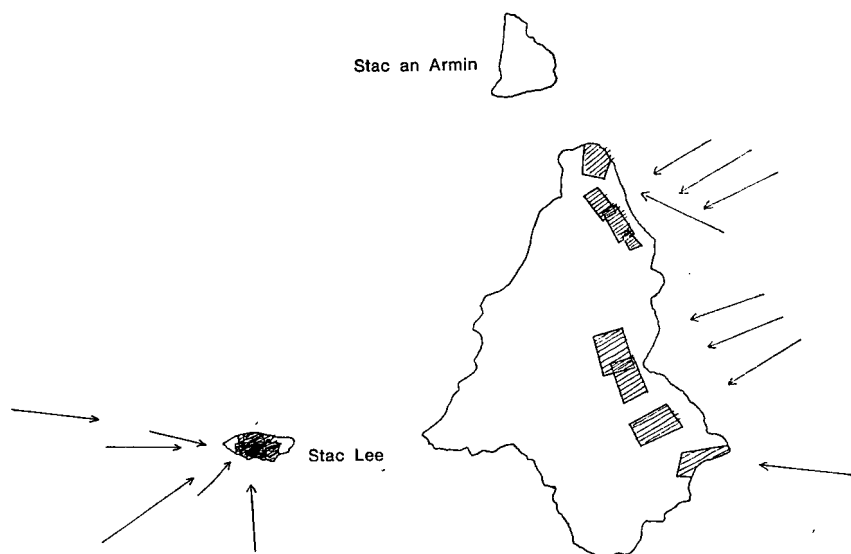


Fig. 1: July.

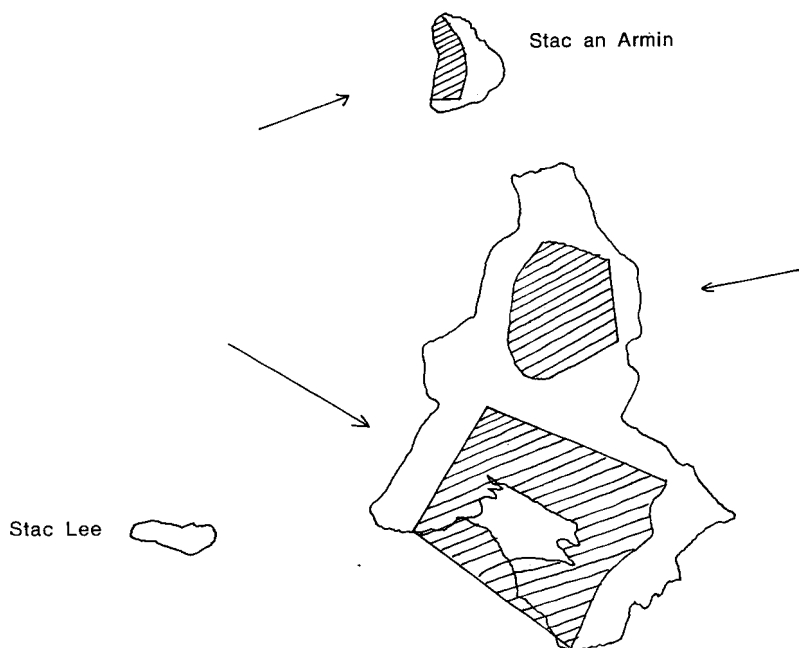


Fig. 2: August.

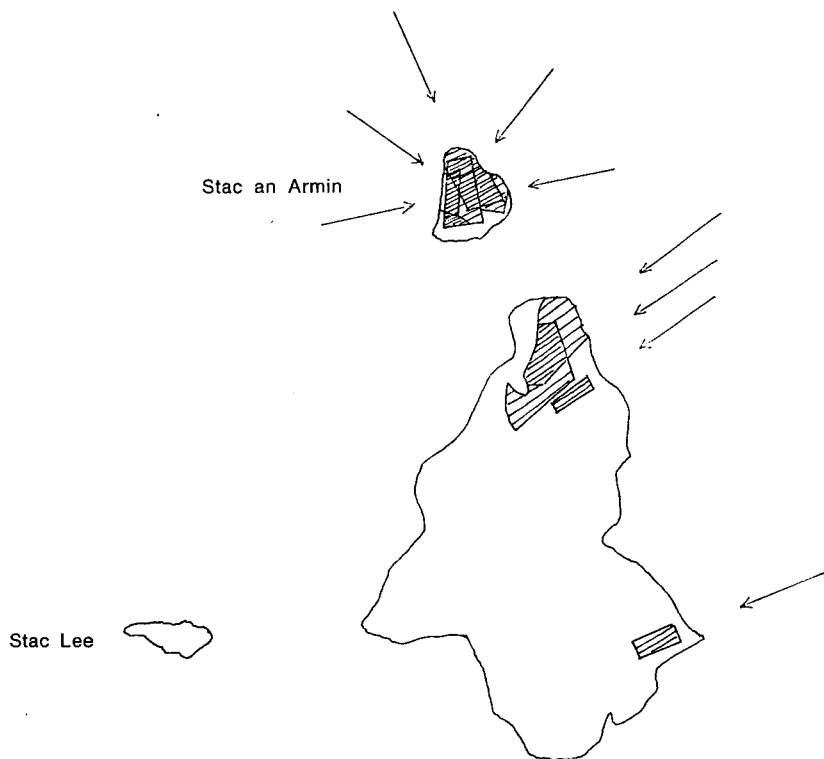


Fig. 3: September.

craft without danger to the crew. However, definition was the governing factor and since it was necessary to count with a low power microscope many of the photographs did not provide enough contrast and could not be used for counting. The cover obtained is shown in maps 1-3, one for each month.

Photographs were sorted as either countable or uncountable on the basis of definition under a low power microscope with a magnification high enough to permit differentiation between individual birds or pairs. A transparent grid of 144 squares was placed over each photograph and a copy made of the totals for each square. A single count was made for each square using a black felt-tipped pen to cancel each bird as it was counted, to avoid double counting. Estimations were made where the definition or the curvature of the face prevented direct counting. These were placed alongside the totals for each square and later allowed for in square totals. Several good pictures warranted no error margin but as a whole there was a margin of 5.2% in the combined totals. (Morton Boyd managed 3.6%). Little difference was found in the totals for May, 1959 and July, 1969. If further comparisons are made in later months it is apparent that there are large numbers of birds away from the colony, presumably feeding, in August and September (Table 1).

Table 1: Comparisons between birds present in 1959 and 1969.

Sub-section	Boyd: May, 1959	Seafarer: July, 1969
56 and 57	769	865
50 and 48	560	805
46	380	518
33 and 34	959	752
13, 14 and 15	1,009	1,284
8 to 12	1,052	1,298
1 and 2	45	165
99 and 100	6,297	5,404
102 to 105	1,241	1,357
106	151	129
Total	12,463	12,439 (Overall difference—24)
Sub-section	Boyd: May, 1959	Seafarer: August, 1969
83, 84, 85 and 87	2,048	1,697
42 and 43	716	404
51	297	74
45	557	354
48 and 50	560	229
49	508	278
107-110	1,718	1,433
Total	6,404	4,469 (Overall difference—1,935)
Sub-section	Boyd: May	Seafarer: September
53, 54 and 55	1,491	1,317
56	446	682
107	517	485
112 and 113	6,863	4,763
114	799	1,182
3, 4, 6, 7, 8, 9, 10	1,244	664
Total	11,360	9,033 (Overall difference—2,327)

Since the count of the whole population of the Gannetry could not be made from the photographs taken by the R.A.F., an estimate was made based again on the information in Dr. Boyd's paper of 1961. This was done by finding sub-sections throughout the colony which were comparable for both counts made, in 1959 and 1969. Dr. Boyd had already worked out the percentage for each sub-section of the whole colony and this figure was substituted with the total from the 1969 count. By multiplying up using the percentages given an estimate for the whole population was made in table 2. However the estimate is based on only 21 sub-sections out of 116 and must therefore be considered cautiously. If the areas where the colonies expansion occurred are not well represented then total numbers cannot be inferred.

Table 2: Estimation of the total population in 1969.

Sub-sections	Boyd total	% of each section	Section total	Seafarer total	Derived total	% of whole by sections
1, 2	45	100	45	165	165	0.1
8-12	1,052	56.9	1,849	1,298	2,281	3.9
13-15, 33, 34	1,968	32.6	6,042	2,036	6,245	12.7
46	380	18.8	2,016	518	2,755	4.3
48, 50	560	52.4	1,068	805	1,536	2.3
56, 57	769	28.8	2,667	865	3,003	5.7
99, 100, 102-106	7,695	85.8	8,967	6,880	8,018	19.0
				Derived total	27,008	48%
				Estimated population	56,267	100%

Photographs taken in May, 1971 and 1973

Mr. Weir's photograph of the south face of Stac Lee taken in May, 1971 compares almost exactly in date and aspect with the sub-sections for that face devised by Dr. Boyd, although in the former there are areas on the periphery, especially on the eastern edge, where the numbers counted are likely to be suspect due to the curvature of the face and the blurring in the photograph. Mr. Weir's photograph was a standard 35 mm. colour transparency which was counted by being projected on to a large sheet of white paper. The outline of the stack was filled in and all birds dotted, working from top to bottom, with a felt-tipped pen. It was then covered with a grid and lines drawn through each dot, linking up all dots in the same square to avoid double counting. All squares were then given a total. No error margin was allowed for on this count except for the areas where distortion or blurring occurred. These were checked again and the totals for the square revised. The totals counted for the whole of the south face of Stac Lee were 9,260 compared with Dr. Boyd's 8,967, an apparent increase of 293 individuals or about 3%. This would seem to be accurate although not reflecting an apparent overall increase in the colony of 17%. This may be due to the physical lack of space for extra nests and further strengthens the idea that the extra numbers in the colony will be mainly on the periphery.

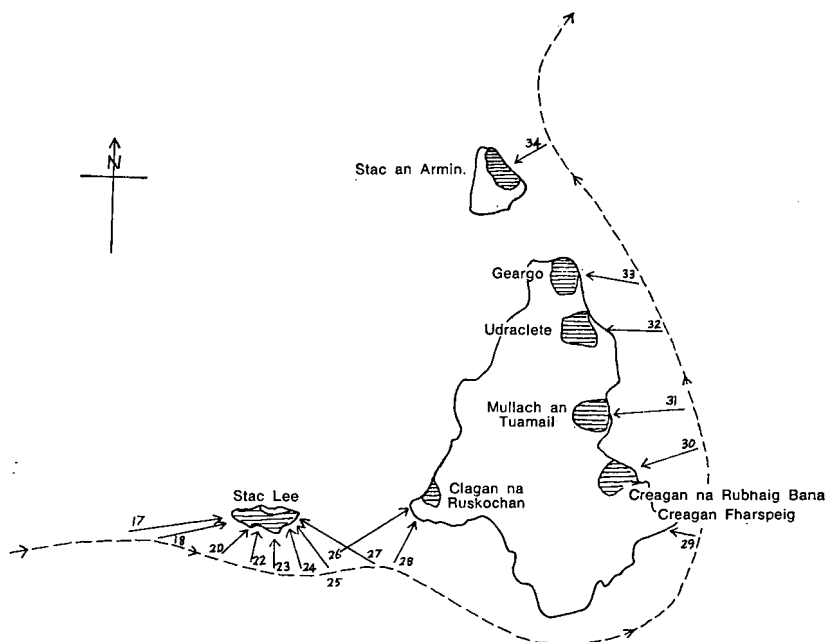


Figure 4: Route of fishery cruiser "Brenda" on 18 May, 1973. Arrows show angle, cover and film number.

Since the number of Gannets on St. Kilda was estimated for Operation 'Seafarer' I have also been able to visit the islands on one of the fishery cruisers and took colour photographs of the southern and eastern colonies as the ship sailed past (Fig. 4). I was fortunate in having good weather conditions and an adequate 200 mm. telephoto lens which has enabled me to count some of the colony again from the photographs obtained. The only

sections counted from these photographs were those on Boreray since my photographs of Stac Lee could not be compared directly with Dr. Boyd's coverage, again due to the lack of clear demarkation between the different sections and sub-sections on the southern face of the stack. However, the counts which have been undertaken appear to cover 35% of the total colony. I used the same technique as with Mr. Weir's photograph of May, 1971.

The use of colour transparencies may be preferable in good conditions with a steady hand and sunlight to highlight the birds against the usually grey background since this gives a better contrast for counting and a similar margin of counting error. In these photographs this margin was 5.3% against 5.2% for 'Seafarer' and 3.6% for Dr. Boyd.

These new photographs were taken in May this year and are directly comparable with the counts made by Dr. Boyd in May, 1959, unlike the 'Seafarer' series which were taken in July, August and September, which were subject to fluctuations in the numbers of birds present.

Table 3: Comparisons between birds present in 1969 and 1973.

Sub-section	Boyd: May, 1959		Mean	Dixon: May, 1973		Mean	% change
	Min.	Max.		Min.	Max.		
1 and 2	43	48	46	119	122	120	+ 215
3-4, 6-12	1,738	1,781	1,752	1,068	1,141	1,104	- 36
42 and 43	692	742	716	481	492	486	- 32
45	544	574	557	453	461	457	- 17
46	358	405	380	579	591	585	+ 54
48 and 50	1,025	1,117	1,068	1,108	1,155	1,131	+ 6
89	237	275	254	321	333	327	+ 22
114	770	828	799	1,232	1,337	1,289	+ 38
			Total 5,572			5,499 diff.	- 73

Table 3 indicates large fluctuations between the sub-sections for the two years with an increase of 215% in sections 1 and 2, and a 36% decrease in sections 3-4 and 6-12. Both these areas have numbers of 'club' birds which tend to gather near nesting ledges and cause counts to vary. These birds are highly restless and several of the 'Seafarer' photographs show them being 'put up' by the aircraft. No allowance has been made for these groups although they may greatly affect the totals for one or two ledges.

The same method has been used to give a figure for the total population although again this is based on calculating the increase from 19 out of 116 sub-sections and can therefore only be an estimate, subject to error, depending on where the increase in the colony has occurred.

Table 4: Estimation of the total population in 1973.

Sub-section	Boyd total	% of each sub-section	Dixon total	Derived section total	section as % of whole colony
1, 2	45	100	120	120	0.1
3-4, 6-12	1,752	94	1,104	1,174	3.9
42, 43	716	27.5	486	1,767	4.3
45	557	7.7	457	5,935	4.3
46	380	18.3	585	3,196	4.3
48, 50	1,025	100	1,131	1,131	2.3
89	254	100	327	327	0.5
114	799	10.4	1,289	12,354	16.2
	Total: 19 sub-sections			26,044	35.9%
	Derived population of the whole colony			72,295	100 %

Discussion

Since once Gannets have occupied a nest site at least one member of the pair normally guards it at all times, the number of birds present at a gannetry normally varies according to the proportion of sites attended by two birds and the number of birds which have not yet taken up sites (usually referred to as "club birds") which are present. J. B. Nelson (Ibis 108: 584-526, 1966) found that on the Bass Rock the proportion of occupied sites attended by two birds rose from about 18% in March and April to 24% in June and then declined steadily to under 10% in October, with considerable diurnal variation. The number of mobile club birds present is particularly hard to estimate, since while they often assemble in a distinct area outside the main colony they may also settle on unoccupied areas within it, and this may help explain many of the more marked variations in our sectional totals compared to previous ones. They and the females of pairs which have not yet started to lay are also particularly easily disturbed, so that for example whereas Dr. Boyd calculated that 21.9% of undisturbed nests examined from the land held pairs in May 1969, much the same proportion as was found by Dr. Nelson at the Bass Rock, he found that only 10.7% of nests held pairs in aerial photographs taken at much the same time, possibly as a result of disturbance by the aircraft. By applying appropriate correcting factors to different types of count he then estimated that the 47,189 birds counted in 1959 represented a total of 44,526 pairs occupying nests.

If we assume that when our photographs were taken near the middle of the day in reasonably good weather an average number of birds were present, it seems possible that the 1969 figures were comparatively low both because it was late in the season and because many birds were disturbed by the aircraft, whereas the May 1971 and 1973 counts may be comparatively high because this is the time of maximum attendance at the colony and in the latter case in particular because it was observable from the boat that the birds were little disturbed, while only the photographs giving a clear view of them were counted. If we in our turn apply similar correcting factors to our totals and assume that in accordance with Dr. Nelson's figures in the late summer of 1969 an average of about 16% of the nests would have been attended by two birds, of which about half the spare members of pairs were frightened away by the aircraft in the way reported by Dr. Boyd, the number of occupied sites would then be 52,099. Similarly, if we assume that in May 1973 about 22% of the nests were attended by two birds, of which none were frightened away by the boat, the total number of occupied nests would be 59,258.

Acknowledgements

The Ministry of Defence arranged for aerial photographs to be taken by the Royal Air Force in 1969 according to advice provided by Dr. J. Morton Boyd, and we are also indebted to him for subsequent comments on the results. Mr. Tom Weir supplied an aerial photograph taken in 1971, while the Department of Agriculture and Fisheries for Scotland arranged for me to accompany the Fishery Cruiser 'Brenda' in 1973 during the course of research financed by a grant by the Natural Environment Research Council to Professor G. M. Dunnet of Culterty Field Station, Aberdeen University. Drs. W. R. P. Bourne and J. B. Nelson assisted with the interpretation of the results.

Conclusions

1. The Gannet population of the St. Kilda group appears to have included about 52,099 pairs occupying nests in 1969 and 59,258 occupied nests in 1973, representing increases of 16% and 33% on the last estimate of 44,526 pairs in 1959. The 1969 counts may, however, be an underestimate because they are based on photographs taken late in the season.

2. The accuracy of these estimates may be seriously affected by the presence of non-breeding "club birds" in some parts of the colony, and because fluctuations in numbers around the periphery of the colony were missed owing to the incomplete cover.

3. For any further counts the cover must either be total or as close as possible to the areas covered in previous photographs, and at the same seasons.

4. The use of colour transparencies is probably easier and quicker for counting than black and white prints and will give a similar margin of error.

T. J. Dixon, The Seabird Group, Zoology Department, Aberdeen University.

THE ANNUAL SEABIRD SAMPLE CENSUS

C. J. Bibby

Operation Seafarer, the total census of British seabirds in 1969, was envisaged as a project not likely to be repeated frequently. Thus, to detect and assess the magnitude of changes it was apparent that a different and more sensitive system would also be required. This view was reinforced by the occurrence of a massive Guillemot mortality in the Irish Sea in autumn 1969 immediately after Seafarer.

In early 1971 plans took shape when the R.S.P.B. agreed to administer such a survey in conjunction with the Seabird Group. Originally the primary aim of the project was to collect information on fluctuations of breeding populations of auks, these being with the exception of some of the terns, especially the Little Tern, the only British seabirds to have shown signs of decline in recent years. The Fulmar and Kittiwake were then added as their population fluctuations might provide useful information on changes in the marine environment; they have been counted in the past, frequently occupy auk cliffs and are also relatively easy to count. All the terns have now been added as well, since some of their colonies are suffering increasingly from disturbance.

Unlike Seafarer, the emphasis of this survey is on accuracy rather than extensive coverage. The intention has been to choose small, easily-reached and clearly-viewed sample colonies with a high chance of being counted every year. The distribution of these shown in the figure reflects the distribution of ornithologists, with very thorough cover in the Irish Sea and less in Scotland by comparison with the distribution of cliff-nesting seabirds.

A substantial problem with many seabirds is knowing how to count them, as the value of such a survey relies entirely on the accuracy of its counts. O'Connor (1969) has discussed this problem in detail and most of his observations remain valid. Subsequent work on Guillemots has indicated the kind of variation of counts to be expected and it seems that a single head count taken in June in the middle of the day is likely to be within 10% of the "true" value. This means that if four such counts are made in each successive year one can confidently detect a 10% change in breeding population and with ten counts the figure can be reduced to 5%. If ten counts are to be made, this should ideally cover a period of several days, so it is immediately apparent that this is a time-consuming job. If a single count of this accuracy is made each year one can only be confident about detecting a 100% change!

Puffins are notorious for the variability of head counts from day to day, and even from hour to hour. It is quite possible to see a colony with no birds at

2. The accuracy of these estimates may be seriously affected by the presence of non-breeding "club birds" in some parts of the colony, and because fluctuations in numbers around the periphery of the colony were missed owing to the incomplete cover.

3. For any further counts the cover must either be total or as close as possible to the areas covered in previous photographs, and at the same seasons.

4. The use of colour transparencies is probably easier and quicker for counting than black and white prints and will give a similar margin of error.

T. J. Dixon, The Seabird Group, Zoology Department, Aberdeen University.

THE ANNUAL SEABIRD SAMPLE CENSUS

C. J. Bibby

Operation Seafarer, the total census of British seabirds in 1969, was envisaged as a project not likely to be repeated frequently. Thus, to detect and assess the magnitude of changes it was apparent that a different and more sensitive system would also be required. This view was reinforced by the occurrence of a massive Guillemot mortality in the Irish Sea in autumn 1969 immediately after Seafarer.

In early 1971 plans took shape when the R.S.P.B. agreed to administer such a survey in conjunction with the Seabird Group. Originally the primary aim of the project was to collect information on fluctuations of breeding populations of auks, these being with the exception of some of the terns, especially the Little Tern, the only British seabirds to have shown signs of decline in recent years. The Fulmar and Kittiwake were then added as their population fluctuations might provide useful information on changes in the marine environment; they have been counted in the past, frequently occupy auk cliffs and are also relatively easy to count. All the terns have now been added as well, since some of their colonies are suffering increasingly from disturbance.

Unlike Seafarer, the emphasis of this survey is on accuracy rather than extensive coverage. The intention has been to choose small, easily-reached and clearly-viewed sample colonies with a high chance of being counted every year. The distribution of these shown in the figure reflects the distribution of ornithologists, with very thorough cover in the Irish Sea and less in Scotland by comparison with the distribution of cliff-nesting seabirds.

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Puffins are notorious for the variability of head counts from day to day, and even from hour to hour. It is quite possible to see a colony with no birds at

mid-day and several hundred in the evening. Trying to make accurate assessments of population changes from such figures is wishful thinking. For present purposes counts of Puffins to be useful have to be made by census of occupied burrows late in the breeding season. This is done by sampling on fixed transects and/or quadrats. The main difficulty in such studies lies in telling an occupied burrow from one tenanted by non-breeding immature birds, or in some places perhaps rabbits or shearwaters.

Razorbills remain the hardest of the three auks to count and no reliable methods are known apart from nest counting which is rarely possible with the normal limits on time available as well as access to Razorbill colonies. The number of birds standing about varies impressively but it seems that these will have to be used. Lloyd (1973) gives a summary of factors influencing numbers of birds visible at a colony and their relationship to the breeding population. Clearly, further work is required along these lines.

With all these species, work in progress is enabling the results to be interpreted more reliably, but several areas require considerably more data. The validity of the census depends on a high degree of site fidelity on the part of adults and their offspring, otherwise a selected sample area may be in no way representative of the population as a whole. This matter is being investigated by seeing how population changes vary between nearby ledges and faces of a colony. Ringing might also make a contribution, if conducted carefully, but the risk of disturbance affecting the results must be considered.

In addition it must always be remembered that seabirds are long-lived, slow to reach maturity and have a large part of the population too young to breed. At the best, it is only possible to estimate each year that part of the total population which is breeding. The breeding success and survival of immature birds may be highly variable from one year to the next but these factors will not be reflected in the breeding population next year. On the other hand, it is possible that a variable part of the adult population may not breed each year and this could also produce spurious population fluctuations.

In the future, it may be possible to calculate population indices for each year. A preliminary examination of Guillemot counts in the Irish Sea is shown in the table.

Table: Population changes of Irish Sea Guillemot Colonies.

years	no. of colonies showing change			mean % change	95% confidence
	—	+	=		
69-70	25	6	1	— 15.8	— 69 + 58
70-71	4	9	1	+ 27.2	— 38 + 182
71-72	3	6	1	+ 8.3	— 49 + 136

Recorded changes are so variable from colony to colony that the confidence limits for changes from one year to the next are very wide.

Although there is a suggestion of decreases in 1970 following the 1969 disaster the following two years show changes in the opposite direction. It is possible that many colonies did not in fact suffer as badly in 1970 as was first thought, and some increases from 1970 to 1971 were very large (max + 94%). The cause of this is not known.

It is apparent that with seabird numbers there is a special danger in attaching too much significance to a single observation; widely different conditions seem to obtain at different colonies, from year to year and even from day to day. With a series of annual sample counts obtained by the most reliable means known we will have the best chance of correctly interpreting the significance of apparent population fluctuations.

**Sites for annual
seabird census**



In such a context it is undoubtedly unwise to labour the observations from any one colony or to jump to conclusions without widespread observation. It will take time to learn exactly what kinds of fluctuations are to be expected from year to year and in different parts of the country. The establishment of this pattern is the aim of the present survey.

References

- Lloyd, C. 1973. Attendance at auk colonies during the breeding season. Skokholm Bird Report in 1972.
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GREAT BLACK-BACKED GULLS AND OTHER BIRDS ON AM BALG, WEST SUTHERLAND

J. L. F. Parslow and W. R. P. Bourne

Introduction

The general increase in gulls throughout the temperate parts of the world in recent decades has included a spectacular multiplication of Great Black-backed Gulls off the north-west coast of Scotland. This has received most attention on the outermost island, North Rona, where the breeding population now numbers about 1,500 pairs (Evans, 1972). Sizeable breeding colonies also now exist on many islands along the coast of north-west Sutherland. In 1971 and 1972 J.L.F.P. found colonies of 90 pairs on Na Glas Leacan and over 100 pairs on An Garbh-eilean, both off the north coast of the Cape Wrath peninsula, while during a flight around the north of Scotland in a Royal Air Force Shackleton in April, 1971, W.R.P.B. noticed large colonies on Stac an Dunain immediately off the end of Cape Wrath, Am Balg seven miles south, and the islands immediately north of Kinlochbervie some six miles further on. Here David Saunders observed approximately 28 breeding pairs on Eilean a' Chonnaidh on 16 June, 1969, and J. N. Ford some 275 pairs on Eilean an Roin Beag and 430 pairs on Eilean an Roin Mor on 5-6 June, 1970 during the course of the Seabird Group's national census of breeding seabirds, 'Operation Seafarer'. Since there has been increasing discussion of the effect this increase may be having on other species, and the past history of the birds of Am Balg has been documented by Fisher and Piercy (1950), we decided to pay particular attention to the effect that the growing gull population there was having on the small but representative colony of other seabirds when completing 'Operation Seafarer' with visits to Am Balg in 1971 and 1972.

Am Balg, also known as Eilean Bulgach and locally as Bulgie Island, is a small, dome-shaped island of Lewisian gneiss surrounded by outlying rocks a little over a mile W.N.W. of the cliff-bound headland Rudh 'a'Bhuachaille on a deserted part of the west coast of Sutherland. It is about six acres in extent and measures about 230 yards across at its greatest width from north to south. The rocky north slope is bare and doubtless at times wave-washed. The west side has exposed cliff about 80-100 feet high, the east side more broken cliffs shielded by outlying rocks where it is possible to scramble ashore, while a series of faults running north-east to south-west across the southern promontory provide crevices and geos particularly favoured by sea-

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Table 1: Numbers of seabirds on Am Balg on four earlier visits.

Species	end June, 1882	19 June, 1914	7 July, 1927	6 July, 1948
Fulmar	none	a very few	breeding all along cliffs	80 nests
Cormorant	scarce	3 ads	none	50+ nests
Shag	common	<100 birds, incl. young	many	100+ nests
Herring Gull	colony over whole of grassy top of island		25-30 prs.	1 pair
Lesser Black-backed Gull	not mentioned		15-20 prs.	none
Great Black-backed Gull	2 pairs	a few	1 pair	c. 150 pairs
Kittiwake	many, (?) but not breeding	great nos.	abundant	c. 215 nests
Razorbill	plentiful	great nos.	abundant	2,000-3,000 present, incl. raft
Guillemot	plentiful	great nos. fewer than Razorbill	fair nos.	<200 seen on ledges
Black Guillemot	no mention	a few seen	no mention	one on sea
Puffin	very abundant, slopes, clifftops and face	grassy top covered with Puffins	top and boulders full of Puffins	600-1,000 birds, incl. raft

Note: Apart from the above, the only recorded ornithological visit was on 12 May, 1904, when observations were confined to Shags (30+ nests present) (Fisher & Piercy 1950, from which all pre-1971 data above are taken).

birds. The rounded summit rises to a small cairn on top of a rock outcrop in the west at an altitude reported in successive maps as 146 and 153 feet. The island is said to have supported sheep in the last century and to have been grass-grown when inspected from the sea in 1914. In 1948 it was reported to have been covered in Scotch Lovage *Ligusticum scoticum*, though a photograph in Fisher and Piercy (1950) shows a Fulmar incubating among Scentless Mayweed *Matricaria matricarioides*. We found that a considerable amount of peat still remains on the marginal slopes but that the top of the island occupied by gulls is now either bare or covered with a low but dense growth of Mayweed and the Orache *Atriplex hastata*.

The previous ornithological information is summarised by Fisher and Piercy (1950) and in table 1. J. A. Harvie-Brown landed towards the end of June, 1882, and his photographer again on 12 May, 1904, though the only notes recorded by the latter refer to Shags (Harvie-Brown 1885, Harvie-Brown and Buckley 1887, Harvie-Brown and Macpherson 1904). The Duchess of Bedford (1914, 1938) next sailed round the island on 19 June 1914, but was unable to land and her notes have to be interpreted in the light of others. W. and A. B. Duncan landed to ring some birds on 7 July, 1927, though apart from a note on the breeding of Fulmars in the next Report on Scottish Ornithology (Baxter and Rintoul 1928) their observations were only recorded long afterwards by Fisher and Piercy (1950) in their report on their visit on 6 July, 1948.

In 1971, J.L.F.P. and A. A. Bell sailed round the island examining the cliffs and spent a little over an hour ashore on 4 July, while four days later W.R.P.B. landed from the Fishery Cruiser 'Brenda' and spent two hours mainly scrambling around the peripheral slopes. J.L.F.P., accompanied by Graham Bundy, Dr. M. P. Harris and John Morgan, returned on 14 July, 1972 and made three circuits of the island by boat: because of a heavy swell at the top of a spring tide only one of the party, M.P.H., could be landed and he spent about 30 minutes ashore concentrating mainly on counting the Fulmar population. On none of these visits was the time really sufficient for a formal count of all the breeding birds, while it was rather late in the season for most of them. All the observations may not therefore be easily comparable. Nevertheless they provide an interesting indication of the changes in the numbers of birds reported at a small seabird colony over the course of time and the differences which may occur in estimates over even a short period.

Species Observed

The seals and birds observed are best discussed individually. The different estimates of numbers of birds recorded on the three visits in 1971 and 1972 are given in table 2. The source of the earlier observations (see also table 1) is indicated by the date.

Grey Seal. About 100 Grey Seals were recorded in July, 1948, about 30 on 4 July, 1971, and a similar number four days later. A few were seen around the island on 14 July, 1972. There appears to be nowhere where Grey Seals could haul out sufficiently to breed.

Fulmar. This species has increased steadily since it was first thought to be breeding in 1914. There are now numerous pairs distributed mainly over the rocky slopes and the outcrops on the summit margins, with most on the east side. The two estimates in early July, 1971 (200 and 400 nests) differed markedly; the true number probably lies somewhere between the two, since in 1972 M.P.H. counted 233 nests and, allowing for others possibly overlooked, put the maximum population at 300 breeding pairs. On 8 July, 1971 two nests in embrasures each contained two eggs under circumstances where eggs could hardly have rolled into them. As indicated by the following records, the

Table 2: Estimates by different observers of seabird numbers on Am Balg in 1971 and 1972.

Species	4 July, 1971	8 July, 1971	14 July, 1972
Fulmar	200 nests	400 nests	233-300 nests
Cormorant	14 nests	15 nests	10-15 nests
Shag	50 nests	100+ pairs	(25-30 nests)
Herring Gull	60 pairs	60 pairs	30-50 pairs
Lesser Black-backed Gull	2 "pairs"	0	0
Great Black-backed Gull	250-300 pairs 500 ads in air	400 pairs 1,000 ads in air	250-300 ads in air
Kittiwake	355 a.o.n.	275 a.o.n.	300-310 a.o.n.
Razorbill	211 adults	250 adults	240 adults
Guillemot	324 adults	250 adults	350-360 adults
Black Guillemot	1 on sea	0	0
Puffin	40 adults 150 occupied burrows	250 adults 250-1,000 burrows	3 adults (?100 burrows)

Note: "a.o.n." refers to apparently occupied nests. Counts of Razorbills and Guillemots refer to birds on ledges, and of adult Puffins to birds seen on (most) or around the island.

breeding season of this species was closely synchronised in at least 1927 and 1971, and appears to have been reasonably constant from year to year, but perhaps slightly late in 1948:

- 7 July, 1927: Of 12 nests, 10 had eggs chipping, two had small young
- 6 July, 1948: Of 27 nests, all had eggs, one chipping
- 4 July, 1971: Of about 20 nests examined all had eggs, at least one hatching
- 8 July, 1971: At least half the nests examined had small young
- 14 July, 1972: A few nests had eggs, but most contained small young.

Cormorant. A colony of 14-15 nests (with young at all stages) in early July, 1971 and 10-15 nests on 14 July, 1972 was situated above the south-western cliffs, an area they are always reported to have occupied except in 1927 when it was said to have been tenanted by Shags. Fish remains found beside the nests in 1971 included those of small trout of about 250 g.

Shag. Many young had clearly fledged before the three visits in 1971 and 1972, so it was impossible to make accurate counts of breeding pairs, especially as some nests had disintegrated. About 30 nests were located on all three visits, but in 1971 we differed considerably in our estimations of the total breeding populations these represented (Table 2). A limited number of young were being taken by gulls in 1971 (see below).

Oystercatcher. Probably two pairs, and a clutch found, in 1927, two pairs in 1948, but not seen in 1971 and 1972.

Herring Gull. About 60 pairs in 1971 and 30-50 pairs in 1972, some with large young, occupied a rocky area on the northern side of the island along the periphery of the Great Black-back colony on the summit. Despite the marked increase of the latter, the numbers of Herring Gulls have made a remarkable recovery from the single pair reported in 1948, though their numbers appear to be much reduced from those in 1882 and 1914. Large numbers still nest elsewhere on this coast, especially on islands off Kinlochbervie.

Lesser Black-backed Gull. Four adults, apparently two pairs, were seen on 4 July, 1971, but it was uncertain if they were nesting. They were previously reported to form a large minority among about 50 pairs of gulls nesting in 1927, but they are now scarce along the whole coast north of the Summer Isles (Ross-shire), where there are at least two colonies.

Great Black-backed Gull. In 1971, a huge colony occupied the top of the island, where the scene was dominated by the mass of adults wheeling and calling overhead, and the terrain was clearly greatly affected by the birds' nest-making activities and deposition of guano. Most of the chicks were nearly fully feathered (about five weeks old) and scattered readily. Nest sites had mostly been trampled and were often obscured, so that estimates of the size of the colony had largely to be made from actual and photographic counts of flying birds. Both indicated a maximum of 500 flying adults on the afternoon of 4 July, when a rapid count without any extensive search of the vegetation revealed 165 gull chicks (including many obvious broods of two) in the centre and east of the island, and two or even three times as many could have been present. This was thought compatible with a breeding population of 250-300 pairs, about twice that in 1948. However, in the morning four days later it was considered that twice as many flying birds and rather more nests might have been present. No attempt was made to estimate the breeding population in 1972 but there were only 250-300 adults in the air over the colony, and clearly fewer than in the previous year. Fish bones littered the ground in many

places, with piles by some nests. A representative collection picked up in 1971 has been identified by A. C. Wheeler of the British Museum (Natural History) as gadoid, probably *Polachius* sp. The fish taken were probably about 9-10 inches (230-250 mm.) long. Searches were also made for evidence that the gulls were preying on other birds, but only one pile of about six dead small young Shags and two long-dead Puffins, which latter might have been killed by something else, were found on the island.

Kittiwake. Counts of apparently occupied nests totalled 355 and 275 on the two visits in early July, 1971 and 300 and 310 on separate circumnavigations of the island on 14 July, 1972. These figures suggest a moderate increase since 1948.

Razorbill. Most breeding birds had probably already left the cliffs by the time of the visits in 1971 and 1972 when counts of between 211 and 250 adults, mainly on the broken southern and eastern cliffs, were made. It is difficult to estimate the total number now present, but it seems unlikely to equal the 'great numbers' of the past, or even the 2-3,000 seen in the area in 1948, a frankly surprising total for such a small island, if indeed they were all breeding there.

Guillemot. Counts of adults present on the cliffs varied between 250 and 360 on the three visits in 1971 and 1972. One chick, accompanied by two old birds, was present on the sea a short way off the island on 4 July, 1971, and one chick was still present on a ledge four days later. As with the Razorbill, the total number now present is hard to estimate, but it seems likely to be less than on the earliest visits to the island though more than in 1948.

Black Guillemot. One was seen off the island on 4 July, 1971. On the same day the species was found to be not uncommon along the coast of the adjacent mainland, 55 being counted on the sea along three miles of coast south from Rubha nan Cul Gheodhachan; but on 14 July, 1972 only six were seen on this stretch of coast.

Puffin. Until 1927 this species is reported to have been very numerous and breeding all over the top of the island. It is not clear how many burrows were still present in 1948, though it was estimated that 600-1,000 Puffins were still present in the area. About 100 could be seen from the opposite mainland standing about the warren area on the south-east side of the island on an afternoon in late June, 1971, but only about 40 adults were present when the island was visited on 4 July. Counts of burrows that day, many amongst *Matricaria*, indicated a total of about 200, of which about half were thought to be occupied. Together with small numbers found nesting in crevices, mainly on the southern cliffs, the total population was estimated to be 150 pairs, with a maximum of 200. However, at least 250 Puffins were present on the ground and sea four days later, when the area of the warren was thought to be about 120 x 25 yards along the eastern slopes and about 25 x 10 yards along the southern ones, and it was estimated that anything from 250 to 1,000 burrows might be present. On 14 July, 1972 only three adult Puffins were seen and the number of burrows very roughly estimated by M.P.H. as 100. Two Puffin corpses were found on 8 July, 1971.

Rock Pipit. One in 1927, three pairs in 1948, and seen in three places in 1971 and one in 1972.

Discussion

The seabirds of Am Balg are of interest because the island forms a small, discrete colony of a variety of species, which together with about 30-40 pairs each of Guillemots, Kittiwakes and Fulmars on the seaward side of the stack Bhuchaille, and small numbers of Fulmars and Shags on the mainland coast

to the south, are widely separated from other colonies in the area such as the huge ones on the cliffs beyond Cape Wrath, seven miles to the north, and Handa, eleven miles to the south. Since the other colonies are hard to count, and Am Balg is little disturbed by man, it might be hoped that it would provide a more useful site for sample breeding counts, or alternatively, if it had proved that gulls were causing serious disturbance to the other birds, for an assessment of the effect of their activities.

However, a number of difficulties affecting counts of breeding birds on the one hand, and the assessment of the results on the other, emerge from investigations at even such a comparatively simple site as Am Balg. In the first place, fairly experienced observers visiting the site only four days apart in July, 1971 tended to produce some rather disconcerting differences in their estimations of population size. While they agree within a pair in their estimate of the number of Cormorants and there was no vast discrepancy in the estimates for the Herring Gull, Kittiwake and two larger auks, W.R.P.B. produced considerably higher estimates for the Fulmar, Puffin, Great Black-backed Gull and Shag. This may very well have been an individual idiosyncrasy resulting from a more lavish allowance for nests that had disintegrated after the birds had left them or the number of nests represented by visiting birds some of which may have come from elsewhere. While the visit on 14 July, 1972 did not completely resolve the discrepancies, it did suggest that the estimates by W.R.P.B. the previous year for the first three of these species were probably too high and that by A.A.B. and J.L.F.P. for the Fulmar too low (cf. Table 2). We have previously noted similar discrepancies in our separate estimates of gull populations on a joint visit to another breeding station, where J.L.F.P. again recorded smaller numbers than W.R.P.B. Whatever the case, the difference of around 100% in the estimates for several species on the two 1971 visits to Am Balg indicates the amount of scepticism that needs to be exercised in assessing the results of seabird counts, especially at the end of the season when the young are large and nests starting to disintegrate.

Secondly, comparisons with previous observations indicate the importance of the earliness or lateness of the season in that year in influencing the results of censuses of especially those species with short breeding cycles on land. On 7 July, 1927 W. and A. B. Duncan (in Fisher and Piercy, 1950) specifically recorded that only three out of about twelve Guillemot eggs on one ledge had hatched. On 8 July, 1971 only one chick could be found on Am Balg, while on 14 July, 1972 there were few if any still present. At a study colony of about 170 pairs on the Clo Mor to the east of Cape Wrath, J.L.F.P. observed that about 95% of chicks had fledged by 7 July in 1971 and a similar proportion by 15 July, 1972; those chicks that remained (four on each of these days) were the result of relayings. If the 1927 observation was representative for the whole of Am Balg in that year, and not the result of relaying on a ledge which had been swept by the sea or robbed, it suggests that most Guillemots must have bred at least three weeks earlier in both 1971 and 1972, which seem both to have been early years elsewhere as well, than in 1927. In any event it is evident that we missed the main breeding population on our recent visits, and almost certainly saw many fewer birds of both this species and Razorbill than actually bred.

Nevertheless, if we preserve a properly sceptical attitude towards the population estimates and allow for 1971 and 1972 being early seasons for some species, it is possible to make a rough assessment of the present situation and trend of events affecting the seabirds of Am Balg. By far the most conspicuous phenomenon in recent years is the increase in Great Black-backed Gulls which had evidently begun sometime before Fisher's and Piercy's visit.

in 1948. It would appear to be based upon a food supply of fish, of a type and size which it is somewhat doubtful if the gulls could regularly catch for themselves. The larger gadoids include the Pollock *Pollachius pollachius* and Coalfish *P. virens*, both of which are very common in the deeper waters off the Scottish coast, and their younger stages might conceivably be accessible to gulls in inshore waters. Such fish would, however, be most easily available to gulls among the waste fish escaping from the nets or discarded as being below commercial size by trawlers working in the vicinity. While trawlers are commonly followed by Herring Gulls when cleaning fish as they approach port, these gulls are normally replaced by the two Black-backs when trawling at sea. The large increase in the Great Black-back population on islands near Kinlochbervie is said to have occurred since the now thriving fishing station was established there in 1947 (A. Munro, personal communication). The food supply provided by the trawling industry is doubtless an adequate explanation for the great increase of this gull in the area in recent years.

The increase of Great Black-backs has had one obvious consequence on Am Balg—the replacement of the grass sward capable of supporting sheep in the last century by a mixture of bare rock, eroding peat and coarse herbage, a process which had clearly begun by 1948. The Puffins are still burrowing in what suitable deep soil remains, but there is little of it. The alteration in the terrain could provide an adequate explanation for Puffins leaving the island without necessarily invoking other causes and there is still of course adequate accommodation for them elsewhere in the area, notably on the Clo Mor. It also seems possible, however, that at such sites Greater Black-backs may also have a direct effect on Puffins and other seabirds by taking them as prey. The dried remains of two adult Puffins were found on 8 July, 1971, but it was uncertain whether or not these birds had been killed by gulls. However, if the gulls were really preying to an important extent on Puffins it seems doubtful whether the latter would still survive on Am Balg at all. This is not to say that at some stage in the past predation on Puffins by Great Black-backs may not have been an important factor in reducing their numbers, but merely that with the present low population of the former and an abundant alternative food supply, it would probably not be economical for an individual gull on Am Balg to specialise on Puffins as a food source. A parallel situation exists on Annet, Isles of Scilly (and doubtless elsewhere), where following an enormous earlier decrease the Puffin breeding population has become stabilised at a low level of 50-100 pairs during the last two decades despite a fourfold increase to over 400 pairs in the Great Black-back breeding population on the island.

If we examine the status of the other breeding seabirds of Am Balg with particular attention to the possible effects of the increase in Great Black-backs, it appears that Fulmars have also increased markedly, and the numbers of Cormorant, Shag, Herring Gull and Kittiwake, while they have fluctuated according to the various past estimates, do not seem to have suffered severely, at least since 1948. A colony of Lesser Black-backed Gulls said to have been present before the Great Black-backs started to increase in 1927 has now departed, possibly as a result of competition for food or nest sites with the larger species. Such competition might also help to explain the substantial decrease of Lesser Black-backs in other parts of western and northern Scotland also being colonised by Great Black-backs, for example Orkney and Shetland (cf. Parslow 1967). In addition to the Puffin, the other two pelagic auks may also have declined—the Guillemot probably before 1948 though apparently not since, and the Razorbill possibly to some extent before 1948 and quite markedly since. During this latter period the Great Black-back numbers have roughly doubled and it might be argued that their activities may have been

responsible for at least the Razorbill decrease. There was however no visible evidence of damage from the gulls in 1971, and had it been significant one might have expected to find, even late in the breeding season, such evidence in the form of castings of chicks and eggshells or caches of predated eggs.

Though the evidence is far from conclusive, it seems possible that the decline of the auks on Am Balg is part of a general national trend. While the Great Black-backed Gulls have altered the terrain to the detriment of the Puffins, and may at some stage in the past have preyed on significant numbers of auks or their eggs and young, there is little evidence that they are causing much direct damage today. Indeed, unless the present auk populations are being sustained by immigration, their decline in the presence of so many gulls on Am Balg appears to be no worse than elsewhere, and it seems possible that the gulls can be acquitted of the blame for it.

Acknowledgements

We are grateful to David Saunders for drawing attention to the need for a survey of the island and information on results in the area for the Seabird Group's national survey of breeding birds, 'Operation Seafarer'.

J.L.F.P. thanks those observers named in the text who accompanied him to the island, while W.R.P.B. thanks Captain Henderson and the crew of the Department of Agriculture and Fisheries for Scotland's cruiser 'Brenda' for landing him on the island, and those concerned for the opportunity to survey the island from the air while accompanying a training flight in a Shackleton of 204 Squadron arranged by the R.A.F. Ornithological Society.

Summary

The isolated seabird station of Am Balg (west Sutherland) was examined for the first time in over 20 years twice in early July, 1971 and again on 14 July, 1972. All three visits were too late in the season for wholly satisfactory counts to be made of Shags, Guillemots and Razorbills. In 1971 different observers produced estimates of the numbers of breeding birds present which differed for some species by 100% or more. Some of these discrepancies were unresolved by the 1972 visit, but the more serious of them appear to have been due to over-generous estimates by one of the observers in the previous year possibly associated with influxes of non-breeding birds. Despite the counting difficulties encountered, the main conclusions on the status of the breeding birds are clear. There have been large increases in the numbers of Fulmars and Great Black-backed Gulls, but despite the increase in the latter the numbers of Cormorants, Herring Gulls, Kittiwakes and possibly Shags have not decreased conspicuously. Lesser Black-backed Gulls and Guillemots appear to have decreased in the past, the Razorbill more recently, and there has been a marked decrease of the Puffin. The reduction of the latter may be explained in part by the destruction of its nesting habitat by the gulls. It seems doubtful that there is much predation of auks by the Great Black-backs (the great majority of which clearly subsist on gadoid fish obtained around trawlers) or that if there was that the auks would survive on the island at all; the decline of the latter therefore seems more likely to be part of a general national trend. The Lesser Black-backed Gull decrease may be a result of increased competition from Great Black-backs for nest sites and/or food.

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THE MOVEMENTS OF TERNS AROUND EAST ANGLIA IN SUMMER

R. G. Pettitt

In 1948 David Butt and I began a series of dawn to dusk watches at Lowestoft in Suffolk, in the course of which we became interested in the diurnal movements of Common Terns. I continued these watches during the next three summers and again aided by P. Moss, P. Lever, H. Jenner and J. C. Eaton at this and other sites in 1960.

In the earlier years the terns from the large north Norfolk colonies fed locally or in the Wash. The coastline where the observations were carried out was exploited by birds from the smaller and ill-fated colony on Scroby Sands off Great Yarmouth (Fig. 1). The history of this colony is reported by Robin Harrison in 'Wild Bird Protection in Norfolk' for 1947, and the subsequent Norfolk Bird and Mammal Reports. Breeding was first reported when the bank became fully stabilised in 1947, and continued until 1964. In 1966 the bank became submerged, but it has since reappeared, and breeding occurred again in 1971. During most of the early years, including all those when watching was carried out, the eggs or young were destroyed by high tides. The extent of breeding recorded and date of destruction is set out in table 1.

Table 1: Common Terns nesting on Scroby Sands.

Year	Number of nests	Date of destruction
1948	368 +	5 July
1949	(not known)	Between 5-26 June
1950	170 +	3 July
1951	360	24/25 June
1960	270	1 July

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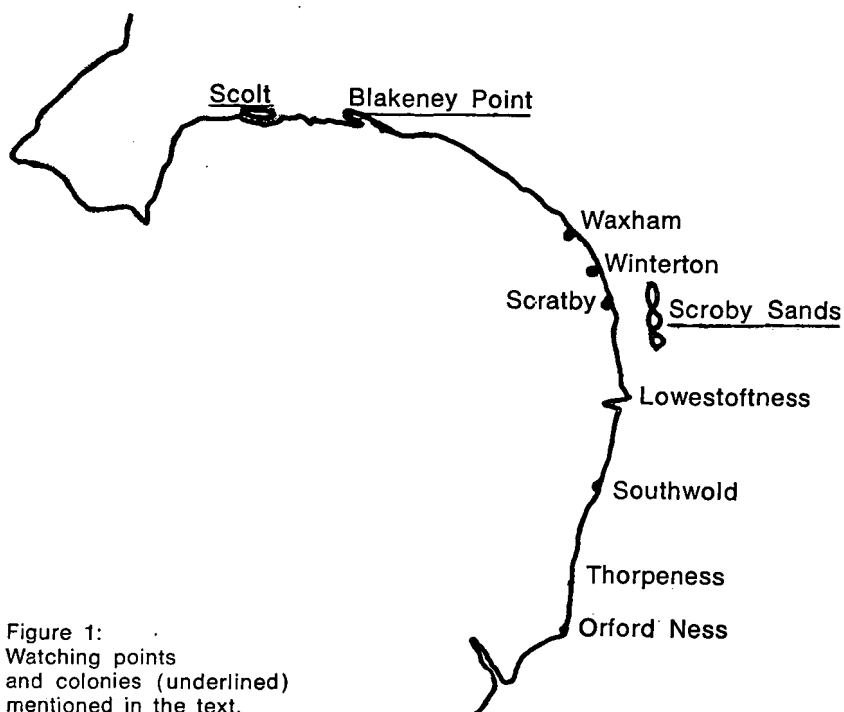
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Observations to the South

Most watching took place at Lowestoftness. In the three earlier years of the study movement either predominated to the south, or occurred as a rhythmic flow in both directions, first south, then north. It appeared that the birds were either spreading out to feed from Scroby Sands, or dispersing south. A total of thirteen whole-day watches and a smaller number of part-day ones were carried out in the first three years, and three more whole-day watches in 1960, when, as explained later, conditions were different. The total number of birds seen during watches from Lowestoftness is shown in table 2.

Table 2: Common Terns moving south during full day watches at Lowestoftness.

Date	Total number moving south	Nett southward movement
7 September, 1948	1,093	907
3 August, 1950	424	136
29 August, 1950	385	304
4 September, 1950	165	70
6 September, 1950	545	530
8 September, 1950	235	225
13 September, 1950	88	79
15 July, 1951	52	0
2 August, 1951	852	820
8 August, 1951	206	167
11 August, 1951	230	230
16 July, 1960	102	23
30 July, 1960	256	166
6 August, 1960	71	(172 north)

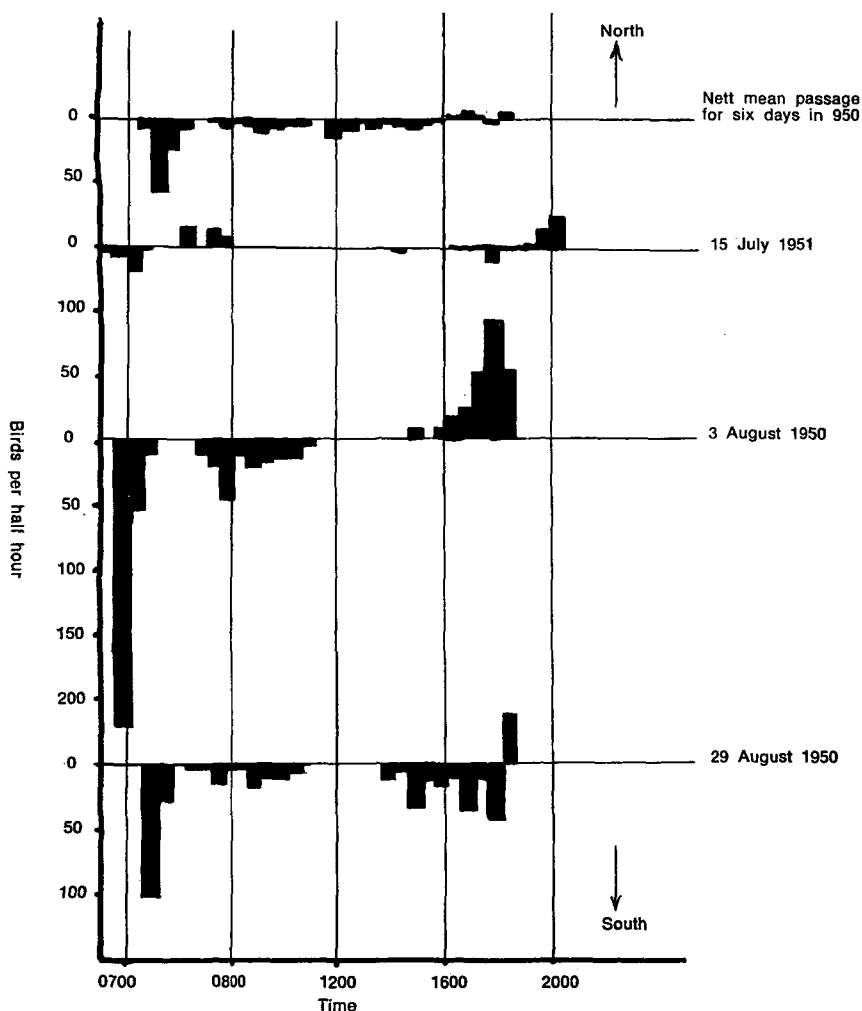


Figure 2: Tern Passage at Lowestoft.

The major activity occurred in the first hour or so after dawn, following a period when no birds were seen. Other periods of activity occurred in the mid-morning and mid-afternoon, with a strong revival in the evening. An impression of the general pattern is given first in figure 2, which shows the mean nett movement per half hour in the six full day watches of 1950. The rhythm, however, showed a distinct change during the summer months in this and the following year. The only observations for May (13 May, 1951) and June (30 June, 1951) revealed no movement past the Ness. In July there was little nett southerly movement, but a small number of terns passed south, and an equal number later returned north. The second part of figure 2 shows

the movement during 15 July, 1951. Fifty birds passed in the hour after dawn. Then there was a lull, after which the same number returned north. From mid-morning till the late afternoon no movement was seen, but in the late afternoon a similar movement occurred, the birds first passing south and then returning north. It appeared as though a double feeding-movement was taking place from Scroby Sands.

In August the total number of birds passing the Ness increased to between two and nine hundred per day, but the nett southerly movement varied considerably more. Two basic patterns occurred. The first seen on 3 August, 1950, and shown in the third part of figure 2, involved a quick movement in the first hours after dawn, a lull, when any birds seen were usually feeding, a smaller southerly movement during the morning which tailed off during the afternoon, and then a substantial number of birds hurrying north in the late evening. If these were the same birds that passed south during the morning, the greater number would eventually have returned.

A second pattern is shown by the movements seen on 29 August, 1950, illustrated in the fourth part of figure 2. A similar series of southward movements during the morning were followed by further southerly movement in the afternoon and a very small northward movement at the end of the day. It was not possible to tell until the end of the day whether a major nett overall southward movement was occurring or not. In any case, the terns were now clearly settling out on longer southward movements from which they did not return in the middle of the day. On some nights they failed to return at all, possibly beginning the first stage of their post-breeding dispersal.

It is tempting to think that on the nights when the terns did not return they reached the feeding area of the next colony or roost, perhaps at Benacre (which then had a Little Tern colony which was also used as a roost by Common Terns) or Orfordness. The birds which passed Lowestoftness in the early morning rush must have come from Scroby that morning unless they slept on the sea or flew by night, but they must also have included birds which had not bred or been reared there; for example, on 29 August, 1950 juveniles passed in the morning rush although none had been reared at Scroby Sands that year.

The date of the last northward return was not often ascertained, but clearly varied from year to year. There was still a good return movement at the end of the day in early September, 1948. There was a large return movement on 3 August, 1949, and again on the same date in 1950, when the return north remained noticeable until early September. In 1951 the return north was already small on 2 August; it may be significant that the destructive tides obliterated the Scroby Sands colony unusually early, on 24 and 25 June, in this year, instead of in early July. In 1949 high tides also occurred early, but the birds continued to attempt to breed throughout the season that year.

In the only year during which observations were continued during September, 1950, the nett movement was south then, with the pattern of movement established in August persisting until 15 September. During one later watch, on 19 September, the small number of birds passing continued fairly evenly distributed throughout the day. No doubt they came from distant colonies, and did not use Scroby Sands as a staging-post. In any case at this time of year the movement was doubtless mainly migration and much may have occurred unseen.

Observations to the North

To the north of Scroby Sands the movement was mainly southerly, though on some days there was no nett movement. The nett southerly passages on

the four full day watches in the first years of the study, and the nett northerly movement in the three days in 1960, are set out in table 3. A northward movement in the morning, with a return in the later morning or the same evening, was discernible, but it never reached significant proportions. In 1951 it totalled 60 birds on 8 July, 20 on 22 July and 60 on 6 August. There was thus no indication of an extension and increase of the movement away from the colony during the season in this direction as there was in the case of the southerly movement.

Table 3: Common Tern movement at points north of Scroby Sands.

Date	Place	Maximum number north	Nett passage & direction
11 September, 1950	Scratby	negligible	—
8 July, 1951	Winterton	60	22 south
22 July, 1951	Winterton	20	224 south
6 August, 1951	Winterton	60	1,030 south
16 July, 1960	Winterton	£80	50 north
30 July, 1960	Winterton	212	27 north
6 August, 1960	Waxham	102	74 north

Discussion

Where the daily routine to the north or south of the colony departed from the pattern described this was usually due to a single movement of birds on a day of greater than usual activity, commonly a movement in the middle of the morning on a day with east winds. This suggests the arrival either of birds of continental origin, or from further north along the British coast, which might otherwise have passed by further out to sea. Little Gulls sometimes also occurred with these movements, which particularly suggests an eastern origin for them. On days with a heavy movement it often continued over the period when activity was usually suspended, especially during the middle of the day. It was however interesting to observe that when conditions were adverse the progress made was better when the birds were normally passing south than when they were not doing so. On two September watches it was noted that they continued to fly into a fresh head-wind until 13.30 hrs., but then allowed themselves to be blown back until 14.30 hrs., when the passage was resumed.

The persistence of pauses in activity during certain periods of the day whether there was a nett southerly movement (i.e. presumed migration) or the birds were only feeding is interesting. Besides the watches at Lowestoft, the one full day watch carried out at Thorpeness, twenty miles further south, revealed a pause in activity at the same times, between 05.00-06.00 hrs., in the mid-morning, and the early afternoon. The watches at Winterton showed similar lulls during the very different movements observed there. If, as seems the case, these lulls are general, an explanation is probably to be found in the feeding-habits of terns. Either the lulls are periods of feeding, or periods of inactivity after feeding. No opportunity was found to test whether this connection existed during the period of this study.

The watches during the period 1948-50 were carried out at one site at a time which made it difficult to establish with clarity the apparent development of the southward feeding movements and their conversation into migration or dispersal. I was unable to carry out any observations in the following decade and it was not until 1960 that an attempt could be made with the help of other observers to mount simultaneous watches north and south of the colony. Observations were then carried out at Lowestoft and Winterton or Waxham on 16 and 30 July and 6 August; on the last date a watch was also carried out at Chapel Point in Lincolnshire by Roger Norman.

Conditions unfortunately proved quite different from those in the earlier years. The birds on Scroby Sands lost their nests on 1 July, and on 16 July there was no movement of any significance at Lowestoft, while at Winterton there was an extensive northward movement in the early and again in the late morning, each followed by a nearly equal movement south in the mid-morning and afternoon. On 30 July a small movement of the conventional sort occurred at Lowestoft, with a nett southerly component, while a small northward movement in the morning was followed by a return in the evening at Winterton. On 6 August, however, there was a nett northward movement at all three observation points, immature birds being conspicuously numerous. It seems possible that as suggested in the Norfolk Bird Report the birds from the Scroby Sands left early, moving on to the north Norfolk colonies, where a big westward movement was seen at Cley on 15 July and many birds accumulated further west at Scolt three days later, and that these birds were followed by others of conventional origin including many young birds. As a result of the loss of the breeding population the Scroby Sands featured neither as an important source of feeding birds nor as a roost for migrants at this time.

Whatever the explanation for the pattern found then, the watches in 1960 threw no light on the pattern found in earlier years. Whether the tendency of adult birds or failed breeders to go south rather than north as the season of migration approaches, and to go further afield as the season advances, was merely a chance feature of the earlier years of the study or is a general phenomenon remains obscure.

The regular movements appeared to be confined to Common Terns and closely allied species not distinguished from them. Sandwich Terns, which also attempted to breed on Scroby Sands, did not participate. Few were seen moving in August. Larger southward movements occurred in September, without much variation during the day except that the largest number were seen during the first hour of the day, when the passage started about half an hour after that of the Common Terns.

Summary

In the early 1950s it was found that Common Terns based on the Scroby Sands off east Norfolk tended to feed to the south. During the summer their daily movements extended further south and they ceased to return north in the middle of the day. After early August an increasing proportion ceased to return at all, and this happened unusually early in a year when the nests were flooded out early in the season. Whether the movements involved feeding birds or passing migrants their timing was similar, and at times they included immature birds which could not have been reared locally. In 1960 the pattern was found to have changed; the birds were going north to feed, and when the colony was flooded out they appear to have moved on in that direction to the colonies in north Norfolk, followed by young birds which probably came from the continent. It is suggested that the initial dispersal of Common Terns consists of flights between roosts or colonies which are made primarily as feeding movements. The fact that these took place in the direction in which the birds eventually appear to have departed both in the years in which they left to the south and one in which they may have left to the north may be significant. Sandwich Terns failed to show such well-defined movements.

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SEABIRD ACTIVITY IN THE STRAIT OF GIBRALTAR: A PROGRESS REPORT

E. F. J. Garcia

Introduction

This report is primarily concerned with the status of seabirds in the Strait of Gibraltar, as revealed by intermittent observations over the period 1969-1973 especially. The survey is continuing and a more detailed report will be published on its completion, probably in 1976. In view of this, I would like to request any ornithologists who may have unpublished records for the study area to make these known to me since this will enable as full a picture as possible to be constructed of what is known of seabird activity in the Strait. The final report will discuss, among other topics, the effects of wind, weather and other factors on seabird numbers present in the Strait, the scale of the various migratory movements and the food-availability in the Strait, as this affects seabird distribution within the study area especially.

The observations used in the survey so far were principally obtained both from sea-watches at Gibraltar itself and from a series of crossings of the strait. Most of these crossings were roughly diagonal, between Gibraltar and Tangier, and were made on board the ferry M.V. Mons Calpe. In addition, a few crossings were made between Gibraltar and Ceuta. Coverage has been

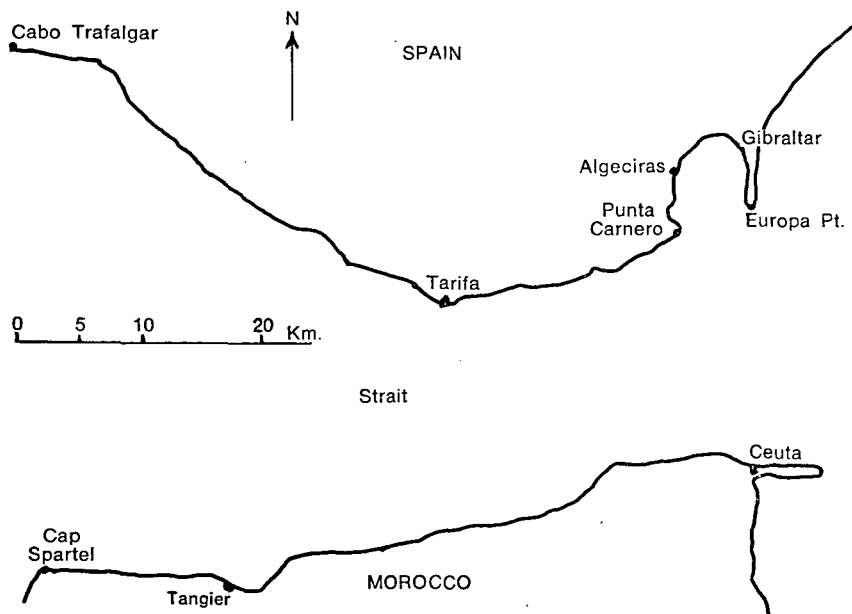


Figure 1: Strait of Gibraltar.

well-distributed throughout most of the year but the months of February, March and October have until recently been underwatched. The effect of this has been chiefly that the 'spring' migrations, of gulls and terns especially, have so far been less fully documented than the 'autumn' movements. This is expected to be remedied in future seasons. The Spanish coast in the west part of the Strait could not be visited but Mr. F. G. H. Allen kindly provided much useful

information on seabirds frequenting the shore between Punta Carnero and Tarifa. The localities mentioned are shown in Figure 1 which indicates the approximate study area. It is emphasised that cover of this area has been uneven but that it is likely to be improved during the second phase of the survey.

STATUS OF SEABIRD SPECIES

a) Shearwaters and Petrels

Cory's Shearwater is present in the Strait in the summer months together with the Manx Shearwater, which greatly outnumbers it at this time. Several hundred of the former regularly feed in the Gibraltar area between June and August. It then noticeably decreases during September and until the period of the autumn departure of the species from the Mediterranean.

Very few Cory's Shearwaters winter in the Strait, or indeed in the Mediterranean, the winter quarters of the subspecies involved, *P.d.diomedea*, lying in the Southern hemisphere, notably off South Africa (Bourne, 1955). Its movements into and out of the Mediterranean have recently been detected at Gibraltar. A large exodus from the Mediterranean was observed during a crossing of the Strait on 1 November, 1972. Over 1,200 birds were counted in two hours as the ship traversed a passage front which was concentrated near the southern coast of the Strait and it is very likely that the total numbers involved were much larger. The birds were too far offshore to have been noted at Gibraltar but a small passage to the west was seen from the Rock for several days subsequently. The return passage from the Atlantic was well documented in the spring of 1973 when a huge northerly movement was seen off the Moroccan Atlantic coast on 10 March (W. R. P. Bourne; *in litt.*). The birds were turning east into the Strait round Cap Spartel where sample counts suggested an approximate passage rate of 3,000 birds per hour. The movement was also visible at Europa Point, Gibraltar where the passage rate increased from 450 birds per hour in the morning to about 3,600 birds per hour by the evening. The passage continued on a greatly-reduced scale during the remainder of the month and throughout April, and was virtually over by early May.

The Manx Shearwater is generally numerous only between late May and September. A marked coasting movement is noted moving east to west past Gibraltar in June, sometimes earlier. This early passage attains a peak in late June when up to 1,000 birds may pass in sight of the Rock per hour. In 1972 Balearic Shearwaters *P.p.mauretanicus* comprised a large proportion of this movement. East to west movements continue through July into August but the birds are then chiefly of the Levantine race *P.p.yelkouan*. The impression given is that the movements of the latter race near Gibraltar are local and that the several thousand Levantine shearwaters which frequent the study area in August and early September do not travel much further west than the Strait and instead remain to feed and moult in those waters. From September onwards the numbers of Levantine Shearwaters in the Strait decrease rapidly. The birds presumably return east although they have not yet been noted doing so in numbers. There is evidence that the Balearic Shearwaters begin to return from the Atlantic in December and the movement is probably protracted. Like the Cory's Shearwater, the Manx is normally noted only in small numbers in the winter months but there have been exceptions to this rule. The nominate race of the Manx Shearwater has seldom been satisfactorily identified in the Strait.

The Sooty Shearwater occurs occasionally in the Strait in September and October and the Great Shearwater has also been recorded, in October and November. In both cases the numbers involved have been small. Likewise Wilson's Storm-petrel is an occasional visitor in late summer and autumn but

there are few records although this species can be numerous off Cape St. Vincent in the same period (Bourne, 1965). The British Storm-petrel is seen mainly in late spring and summer and may breed on nearby shores. The numbers are usually small but I have seen gatherings of up to 50 birds over areas of turbulence. Leach's Storm-petrel is cited by Irby as having figured in 'wrecks' near Tangier. There do not appear to have been any recent recurrences of this species in the study area.

b) Gannet

The Gannet is present all the year round, although only a few non-breeders are seen in summer. It is most numerous during passage periods but many are present in winter.

The passage into the Mediterranean of juvenile birds precedes that of the adults and occurs principally in September. Most of the adults arrive in the latter half of October, passage continuing through November. Passage out of the Mediterranean occurs principally between mid-March and late April. Counts of the passages have been discontinuous but they do strongly suggest that the numbers of Gannets which winter in the Mediterranean are of the order of hundreds rather than of thousands.

The wintering Gannet numbers fluctuate widely. There are always some present in the Strait but occasionally gatherings of over 100 form, apparently over fish-shoals. One such gathering, off Tangier on 27 December, 1972, comprised 70% adult birds and it must be emphasised that both in winter and on passage there is no observable numerical dominance of juveniles, as has been stated by Bernis (1966) and others.

c) Cormorants

The Cormorant is seen in ones and twos during some winters. Those seen closely have all shown the characteristics of *P.c.sinensis*. About 20 pairs of Shags breed on Gibraltar but do not wander far from the rock. The species has only once been seen in the Strait proper during the current survey.

d) Sea Duck

Common Scoters occur on passage and in winter but very few seem to enter the Mediterranean although many pass down the Moroccan Atlantic coast. The largest flock seen in the study area lately was of about 60 birds. Red-breasted Mergansers are occasionally seen in flocks of up to 30 birds in the winter months only. Other sea-duck are rare and there have been no records since those listed by Lathbury (1970), except for six probable Goosanders, on 12 December, 1971.

e) Skuas

The Great Skua is by far the most numerous of the skuas occurring in the study area. It can be seen in any month but the largest numbers occur in winter and, to a lesser extent, during the passage periods. Inward migration of this species occurs from August, the birds returning in March and April. It seems probable on present evidence that the numbers wintering in the Mediterranean seldom exceed a few hundred birds at most. The numbers present in the Strait in winter fluctuate widely but two or three are usually to be seen on any crossing. Occasional influxes from the west occur in winter and at this time up to 40 Great Skuas have been counted during a single diagonal crossing. These influxes are soon followed by a return movement to the Atlantic. They appear to be associated with the passage of cold fronts, usually from the west, and also involve other wintering seabirds, notably Gannets and Kittiwakes. The investigation of the relationship of the movements to weather conditions forms an important aspect of the continuing work.

The Long-tailed Skua occurs only rarely in the Strait, in autumn. The Pomarine Skua occurs on passage, in May, September and October but is scarce and not more than two have yet been noted together. Again this is a species which is much more numerous further west (Bourne and Norris, 1965). The Arctic Skua occurs commonly but in small numbers during passage periods. It is perhaps more numerous in autumn (August-October) than in spring (March-April). Probably most of these passage skuas entering the Strait from the west leave again westwards fairly soon. A few Arctic Skuas remain each winter and occasional birds summer.

f) Gulls

The Herring Gull *L.a.michahellis* is the only breeding gull in the study area. Several hundred pairs nest on the Rock itself and are sedentary. A minority of birds of the nominate race occurs in winter.

The most numerous of the larger gulls is the Lesser Black-backed Gull. This performs an inward (i.e. west to east) migration in late August and September, with a return passage in March and April. However, several hundreds are present in the study area throughout the winter months and large movements can also occur at this time, especially in early January when several thousands have been counted passing over the Rock in some years, as in 1969. Most are of the subspecies *L.f.graellsii* but the nominate race is also common.

The Black-headed Gull is the most numerous of the smaller gulls. Over 1,000 may be present at Gibraltar alone in December and January and large numbers frequent Algeciras, Tangier and other ports in the study area. It is particularly attracted to sewage outlets, such as that at Europa Point. First arrivals are noted in August when passage at Gibraltar is from east to west, unlike that of the Lesser Black-backed Gull. Numbers continue to build up from then until December. Birds begin to leave the study area in February and by early May only a few immature birds remain and these may summer locally.

Little Gulls occur chiefly in winter when gatherings of over 200 birds have been counted off Gibraltar, some 70% immature. In addition, a passage to the west has been noted in August and September, the birds returning in March and April, but the numbers involved appear to be small.

Mediterranean Gulls are present in the study area between October and April, in groups that seldom exceed ten birds. Immature birds slightly outnumber adults. In July and early August, 1972 a total of 50 adult Mediterranean Gulls was counted flying west past the Rock. Similar observations in 1973 suggest that this early movement is regular. Both this species and the Little Gull are far more marine than the Black-headed Gull and feed well offshore instead of along the coasts and in the harbours.

Movements of Audouin's Gull towards the west are seen at Gibraltar throughout July, August and early September. Over 120 birds passed the Rock in this period in 1972. About 40% of these were juveniles. This species remains in the study area throughout September and early October, Punta Canero being a favoured locality where gatherings of up to 60 birds occur annually at this time. From October onwards it moves further west and very few remain in the winter months. The return passage from the Atlantic occurs in April.

The Kittiwake is present in the Strait between late November and March. Numbers are greatest following winds from the west but lately have not exceeded a total of a few dozen birds. The species does enter the Mediterranean at such times but the birds probably soon return west. However, sizeable 'wrecks' of Kittiwakes have occurred in the Mediterranean in the past (Bernis, 1967).

The only other regularly-occurring gulls are the Great Black-backed Gull and the Common Gull. The former is represented by a few individuals in winter. The latter is usually scarce but "influxes" of small groups have occurred in some winters. There is no notable passage of either species at Gibraltar.

g) Terns.

Terns of several species occur in the Strait as migrants but only the Sandwich Tern winters in the area. In autumn 1972 and winter 1972/73 two or three Caspian Terns were present in Tangier harbour and this may be a regular wintering locality of this species which has otherwise seldom been noted in the study area lately.

Tern passage is most evident in autumn at which time the direction of passage of all species is east to south-west, with the partial exception of the Sandwich Tern. The passage begins in late July when the first Black Terns appear. This species is easily the most numerous of the terns at Gibraltar and passes in thousands throughout August. Passage diminishes in September and only a few stragglers remain by late October. The Whiskered Tern is occasionally seen among the Black Terns in autumn but this species appears to migrate south further east and the largest group noted recently comprised only 12 birds.

A small passage of "Comic" and Little Terns also begins in late July. "Comic" Terns pass west throughout August, September and early October. Although most are too distant to be definitely identified as Common Terns it seems certain that not more than a tiny minority are Arctic Terns. The few Arctic Terns which have been identified have occurred singly in April, August and September and are most likely to have wandered into the Strait from the west. The flow of "Comic" Terns past Gibraltar seems spasmodic but many birds pass too far offshore to be seen from the Rock. On present evidence, the passage seems to be of the order of a few thousand birds. The passage of Little Terns is small and occurs between late July and October. Sightings of two or three birds are the rule. A sparse, steady passage of Sandwich Terns moves west through the Strait during August-October. A smaller passage moves eastwards in the same period.

The Lesser Crested Tern has occurred several times in autumn, usually singly, and there are also records for this species in April and May but its movements are very incompletely understood.

The Black Tern returns principally in late April and May. The return movement is not concentrated along the Moroccan Atlantic coast and occurs rapidly on a broad front instead (Bird, 1937) and consequently the passage at Gibraltar is a shadow of the autumn movements although several large flocks have been recorded there and elsewhere in the south of Spain (Mountfort & Ferguson-Lees 1961). Eastward passage of Sandwich and Common Terns is noted mainly in April. Little Terns arrive later, in May.

h) Auks

Auks are present in the Strait chiefly when on passage into and out of the Mediterranean, but small, variable numbers may linger in the study area. These latter birds are mainly Razorbills of which small groups may take shelter in Gibraltar Bay during stormy weather in winter.

Most of the auks seen from Gibraltar itself have occurred during the westward migration. This is noted chiefly between March and May with a peak between mid-March and mid-April, at which time between 30 and 250 auks may pass in sight of Gibraltar per hour. The rate of this passage is greater further out in the Strait and shore-based watchers can only record a small fraction of the total movement. Those birds which are seen from shore are

generally too far away for specific identification but observations at sea indicate a large predominance of Puffins, the remainder being Razorbills. These observations correspond well with those of Pettitt (1970) at Cabo Finisterre in early April. The inward passage of auks does not appear to occur before October at the earliest and continues through December into January, at least in some years.

I have not observed any auk species other than Puffin and Razorbill in the Strait but P. J. Oliver saw 7 Guillemots on westward passage through the study area on 17 April, 1967 and this confirms the suspected occurrence of this species, in small numbers, in the Western Mediterranean.

Acknowledgements

Full acknowledgement of all who have contributed to the study so far must be left until its completion, for reasons of space alone. I am most grateful to Dr. W. R. P. Bourne who very kindly provided observations and references and made many helpful criticisms of the manuscript. Clive Finlayson and Mario Mosquera were chiefly responsible for the shore-based observations and the study could not have been attempted without their assistance. They also made many useful contributions to the discussions underlying this report. Charles Perez, John Cortes and William Buckley also contributed many important records. Finally, the kindness and co-operation of Captain Delf and the officers of the "Mons Calpe" is gratefully acknowledged.

Summary

Recent observations in the Strait of Gibraltar have enabled a clarification of the status of many seabird species in that area. Large migrations of Cory's Shearwaters, with a peak rate of over 3,000 birds per hour, are reported for the first time. The Manx Shearwaters frequenting the Strait in summer have been found to be mainly Levantine Shearwaters *P.p.yelkouan* and not Balearic Shearwaters *P.p.mauretanicus* as sometimes suggested. Counts of Gannets entering the Mediterranean have shown that the numbers wintering there are probably of the order of hundreds rather than of thousands. The Great Skua is often very common in winter and the other skuas occur on passage. Kittiwakes, Little Gulls and Mediterranean Gulls have been found to be much commoner in winter than previously supposed whilst the last mentioned species performs a small westerly movement in July and August. Audouin's Gull has similarly been found to perform a regular migration out of the Mediterranean. Common, Sandwich and Black Terns are numerous as migrants through the area, the last species in particular passing west in thousands in autumn. Auk passage has been detected on a large scale for the first time and consists mainly of Puffins. These are most evident when leaving the Mediterranean in spring in a protracted movement involving thousands of birds.

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E. F. J. Garcia, 50 Governor's Street, Gibraltar.

ROYAL AND LESSER CRESTED TERNS IN CADIZ PROVINCE, SPAIN

F. G. H. Allen

Since there are comparatively few reports of the southern "*Thalasseus*" crested terns in Europe, it may be useful to place on record some additional notes of the occurrence of the Royal and Lesser Crested Terns in the south of Spain supplementing those already reported in *Ardeola* 15: 144, 16: 262.

Although a Royal Tern in winter plumage in the L. H. Irby collection at the Royal Scottish Museum was killed before 1867 in the Straits of Gibraltar, and another in similar plumage in the Dalgleish collection there appears to be one of two collected near Tangier in 1882, Dr. F. Bernis informs me that he knows of no Spanish record before 25 April, 1970. On that date I accompanied a group of Dutch ornithologists to the salinas near Sanlúcar de Barrameda, Cadiz province and saw two large terns, subsequently identified with the help of colour photographs as Royal Terns in full adult summer plumage, as already reported. On 27 April, 1971 we again visited this area and were amazed to find two Royal Terns within a hundred yards of where they were seen before, together with two, and possibly three, pairs of Caspian Terns, which were again photographed in flight. I have consulted Dr. P. A. Buckley who has been making a special study of Royal Terns in North America about their identity and the possibility that they might be breeding, and he accepts the identification of the transoceanicity sent to him. He comments that the birds normally nest colonially or with other "*Thalasseus*" terns, so that if they were breeding locally (which is pure surmise on my part) in the absence of more closely-related species it is "a statistical certainty" that they would nest alongside the Caspian Terns. I do not think that these have been found nesting in Spain yet although for some years they have been suspected of doing so on the beaches of the Coto de Doñana only about $3\frac{1}{2}$ miles in a direct line from where we saw them.

On 15 May, 1968 Col. H. Morrey Salmon also saw a tern on the beach just north of Tarifa which he believed to be the Lesser Crested Tern. I know the bird well from long residence in the Far East, and his photograph leaves no doubt in my mind that he is correct, as also already reported. On 20 October, 1972 I saw two more in the Bay of Algeciras while in company with E. G. Turbott. The diagnostic yellow bill was unmistakable as they flew by 70 yards away beneath us as we looked over the cliffs.

F. G. H. Allen, Finca la Rana, Los Barrios, Prov. Cadiz, Spain.

(Although the Royal Tern was only known to nest along the Atlantic and Pacific coasts of America until quite recently, large colonies of this species and many other seabirds have recently been found in west Africa (R. de Naurois, *Mem. Mus. Nat. Hist. Nat. Paris Series A Zoologie*, 56: 1-312, 1969), so that it is to be expected to stray north towards the approaches to Gibraltar. The main distribution of the Lesser Crested Tern lies in the Indian Ocean, and

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the precise status of the birds reported from time to time along the southern shores of the Mediterranean is still unclear, though they have been found breeding and often have young birds with them. It would be particularly interesting to know where they go in winter, and ringing might rapidly produce interesting results here. Ed.)

THE SHEARWATERS OF DIOMEDES

Isabel Winthrop

Six years ago I spent a week at the beginning of June on San Domino, the largest in a group of small islands called the Tremiti, in the Adriatic twelve miles off the Gargano Peninsula. Although it has a hotel, the little island was peaceful and unspoiled, the villagers depending on fishing rather than tourism. The word "diomedee" kept cropping up. There was a café of that name and talk of elusive seabirds called diomedee that flew in from the sea after dark. At the end of my stay, some of the young trainee staff of the hotel offered to take us to witness their return at about 11 p.m. before the moon rose.

They led us along a track to the rising ground at the southwest end of the island where the cliffs are highest and a lighthouse stands at one point. The going was rough through a pine wood with prickly undergrowth, but the trees thinned out on the cliff-top overlooking a bay in the area of the Grotta del Bue Marino (Cave of the Sea Ox). We sat down and birds started to fly in to the cliff face, unseen by us, but making two kinds of sounds—a deep, rather pompous CAW—CA-AW, which the Italians explained was the male bird, and an apparent reply like a baby's wail, which they said was the female. We listened for about twenty minutes, some of the birds flying very near us, and when I looked up I saw against the sky-glow the silhouettes of large birds gliding on powerful-looking wings. I associated the experience with a vaguely-remembered radio programme about shearwaters by Ludwig Koch, but my Italian was too limited to enquire much about them at the time.

I had also discovered that the Homeric Hero, Diomedes, was connected in some way with this part of Italy (Apulian towns, like Brindisi, claimed to have been founded by him) which made me wonder if there was a link between him and the diomedee. Eventually, a letter to the Natural History Museum put me in touch with Dr. W. R. P. Bourne and with his help I started on a trail of identification more absorbing than a detective story.

In the entanglement of names and confusion of identities that have be-devilled shearwaters, a connection between Diomedes and the birds that breed on the Tremiti Islands has persisted from about the Late Bronze Age to the present day. According to Homer, at the *Siege of Troy* "Diomedes of the loud war cry" was both wise in council and brave in battle. Athene had him in her care. In the *Odyssey* he reached home safely, for Homer says "... the company of Diomedes the tamer of horses brought their fine craft to anchor in Argos." But in later accounts this was not the end of his story.

He had wounded Aphrodite in battle and she ensured that disasters followed him. One version says that he was driven by a storm on to the coast of Lycia where he just escaped being sacrificed to Ares. When he reached Argos he found his wife living with another man so set off on his travels again. Another legend says he was driven out of Argos to experience more dangers at sea, with his men crying for an end to their wanderings. One of them, Acmon, shouted defiance at Aphrodite, provoking her into transform-

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ing him and some of the other men into birds. Ovid (43BC-18AD) says they flew into the air and hovered round the rowers, looking "nearly, though not quite, like snowy swans."

Virgil (70BC-19AD) gives a similar version where Diomedes, now driven on the shores of Daunia (modern Apulia) is asked to help Latinus fight against Aeneas. The Hero pleads that he cannot help for, "Transformed to birds, my comrades wing the skies—Ah! cruel punishment for friends so true—Or skim the streams; from all the shores arise Their piteous shrieks, the cliffs re-echo with their cries."

Timaeus, a Sicilian historian who lived sometime between 350BC and 250BC, wrote a history of Italy that included the arrival there of Diomedes. Only fragments of his work survive, but the poet Lycophron, who lived about the same time, is said to have used material from him in a complicated poem called **Alexandra** about the prophecies of Cassandra. "Another [Diomedes] shall found Argrippa, a Daunian estate . . . seeing the bitter fate of his comrades turned to winged birds . . . like in form to bright-eyed swans. Seizing in their bills the spawn of fishes they shall dwell in an island which bears their leader's name, building their close-set nests with firm bits of wood . . . And together they shall betake themselves to the chase and by night to rest in the dell . . ."

Although Aristotle (384BC-322BC) does not mention the Birds of Diomedes in his **Historia Animalium**, there is a note in the 4th century **De Mirabilibus Auscultationibus** (1909) attributed to him, but thought by some more likely to have been written by members of his school of Peripatetic Philosophers: "In the island of Diomedea, which lies in the Adriatic, they say there is a temple of Diomedes, wonderful and holy, and round the temple there sit in a circle birds of a large size, having great hard beaks. These birds . . . if Greeks land at the place keep quiet; but if any of the barbarians who live around them approach, they fly up . . . swoop down upon their heads, and wounding them with their beaks, kill them. The story goes that the companions of Diomedes were metamorphosed into these, when they were shipwrecked off the island and Diomedes was treacherously slain by Aeneas, who was then king of these regions."

Most accounts agree that Diomedes had a successful career in Daunia married to Euippe, daughter of King Daunus. Particulars of his death vary. Some say the king became jealous of Diomedes, had him murdered and buried on one of the islands called after him the Diomedans (now the Tremiti). Another account, quoted by Robert Graves in **Greek Myths**, says he "suddenly disappeared by an act of divine magic, and his companions turned into gentle and virtuous birds, which still nest on the islands." This seems to be the version of Strabo (64BC-24AD) who also mentions the "signs of the dominion of Diomedes in these regions," called Apulia by Strabo's time.

The persistent allusions to Diomedes in Apulia and southern Italy are examined by Giulio Giannelli in **Culti e Miti della Magna Graecia** (1924). He discusses the Greek peoples who probably colonised the area, in the restless period following the Trojan War, and who might have introduced the cult of a deified Diomedes. He cites traditions of temples dedicated to the Hero, alone or with Athene.

Most of the later descriptions of the Birds of Diomedes are derived from Pliny (23AD-79AD) who writes in his **Natural History** Book X (1940): "Nor will I pass by the birds of Diomede. Juba [50BC-24AD] calls them Plungers Birds, also reporting that they have teeth and that their eyes are of a fiery red colour, but the rest of them bright white. He states that they always have two leaders, one of them leads the column and the other brings up the rear; that they hollow out trenches with their beaks and then roof them over with lattice and cover this with the earth that they have previously dug from the trenches,

and in these they hatch their eggs; that the trenches of all of them have two doors, that by which they go out to forage facing east and that by which they return west; and when about to relieve themselves they always fly upwards and against the wind. These birds are commonly seen in only one place in the whole world, in the island we spoke of as famous for the tomb and shrine of Diomedes, off the coast of Apulia, and they resemble coots. Barbarian visitors they beset with loud screaming, and they pay deference only to Greeks, a remarkable distinction, as if paying this tribute to the race of Diomedes; and every day they wash and purify the temple mentioned by filling their throats and wetting their wings, which is the source of the legend that the comrades of Diomedes were transformed into the likeness of birds." Saint Augustine (354AD-430AD) in **The City of God**, Book XVIII, refers to the deification of Diomedes and the changing of his companions into birds in the island of Diomedea.

After a lapse of centuries, the Renaissance stimulated the study of natural history and the Birds of Diomedes reappear, sometimes illustrated, in the books that began to be published then. Taking their cue from Pliny the writers accept the Tremiti Islands as the breeding ground of these birds, but speculate about their species, and what known birds they correspond to.

Pierre Belon (1517-1564) in his **Histoire des Oyseaux** (1555) suggests they might be pelecans or onocrotali. Conrad Gesner's (1516-1565) description of Aves Diomedae in **Hist. Anim.** Book III (1617) is that of shearwaters. He too repeats the legends from the Roman writers and adds a tale about a Duke of Urbino who visited the monastery on one of the islands. He was shocked to hear the sound of crying infants and severely rebuked the friars for their immorality before they could explain that he was hearing birds. A friar sent a "case" or specimen of the bird to Ulisse Aldrovandi (1522-1605) who names the species **Procellaria Diomedea** and describes the shearwater and its habits in **Ornithologiae**, Book 6 (1647). He also refers to the name *Antenna*. J. Jonston (1603-1675) repeats the same speculations about the bird's identity and illustrates it in **Hist. Nat. de Avibus** (1657). He says it is about the size of a fat hen and has the voice of an infant.

In **De Ave Diomedea Dissertatio** (Amstelodami 1674) D. Friderici Lachmund tries to clear up the admitted confusion: "Of this there are many ancient legends and much error, some saying it is similar to the fulicae, others to the cygnus, to ardeae, to ciconiae. Even the name is not agreed upon among authors . . ." After detailing the comparisons and suggestions of the other writers he ends: "Thus I say of this fabulous bird that it is not onocrotalus, nor fulica, nor ciconia nor cygnus . . . but a bird in its own genera."

Sir Thomas Browne (1605-1682) in his **Natural History of Norfolk** (pub. 1902) seems to be the first to use the name shearwater. "A sea-fowl called a shearwater, somewhat billed like a cormorant but much lesser a strong and fierce fowle hovering about ships when they cleanse their fish." He tells how he kept a couple for six weeks cramming them with fish. John Ray (1629-1705) in Book III of the **Ornithology of Francis Willughby** (1678) refers to this and says of the bird that it "doth as it were, radere aquam, shear the water, from whence perhaps it had its name." Ray also writes about Ave Diomedea quoting Aldrovandi and calling the bird antenna, "This bird Aldrovandus sets forth for the Diomedea Avis, induced thereto by this argument chiefly, because the present inhabitants of the Diomedean Islands, called now Tremiti, do affirm thereof what Pliny of old concerning the Diomedean Birds, viz. that they were found in no other place but in those Islands." He describes the bird according to Aldrovandi and Gesner and advises: "Those who happen to travel to the Islands called Tremiti, would do well to enquire diligently concerning these birds, or rather themselves procure and exactly describe them, that so we may not be any longer without a true and perfect picture of them."

It would have been an extraordinarily enthusiastic ornithologist who tried to travel there before the days of steamers—even today it is an awkward journey from one of the less accessible areas of Italy. However G. A. Scopoli (1723-1788) had a bird sent to him and placed it in "Ordo. III anseres," designating it **Procellaria diomedea**, with an adequate type description for scientific purposes of the larger shearwater of the Mediterranean (**Annus I Hist. Nat.** 1769). For this reason the B.O.U. List Committee decided in 1946 that Scopoli's name and description should be accepted for the species, having priority of date over **Procellaria kuhlil** Boie, and that the "type locality of **Procellaria diomedea** Scopoli should be the Tremiti Islands in the Adriatic . . ." (**Ibis** 88: 533).

D'Arcy Wentworth Thompson gathers together classical legends and other speculations about the birds of the Tremiti Islands in a paper titled **The Birds of Diomed** in **The Classical Review** (Vol. XXXII, 1918), and in his **Glossary of Greek Birds** (1936) he gives eleven names of birds, mentioned by Greek writers, which he suggests may refer to shearwaters.

Coming to recent years, Dr. Edgardo Moltoni of the Natural History Museum of Milan made an "ornithological excursion" to the Tremiti Islands in 1956. In this report (**Rev. ital. orn.** 27: 81) he begins by saying that the islands' birds do not appear to have been studied and that he could only find a short article by Ceconi (1906), who had given the classical versions of the Diomedes' legends. Confusion had arisen about which of the two shearwaters (in Italian, Berta maggiore and Berta minore) was actually the diomedee. Moltoni found some evidence for the presence of Berta minore (**Puffinus puffinus yelkouan**) but observed the return of Berta maggiore (**Puffinus kuhli kuhli** (Boie) = **Calonectris diomedea** (Scopoli)), in the area of cliffs and rocks around the Grotta del Bue Marino which I visited ten years later. By the light of their torches he and his party killed three birds, retrieving the bodies next morning and confirming they were Berta maggiore. He had seen one of the smaller birds by torchlight and heard their cries among the sounds of Berta maggiore.

When the dead birds were shown to local people, they insisted these were not diomedee but arderie. They were aware of two species and assured Moltoni that the diomedee were the smaller. So it appears some confusion may never be cleared up: the Aves Diomedee described by Gesner, Aldrovandi, Jonston, and Scopoli in the type description of **Procellaria diomedea** correspond to the Berta maggiore, while to the islanders the smaller shearwaters are the diomedee. Still, it seems certain that shearwaters of some kind have bred on the islands since prehistoric times and their continued existence is living archaeological evidence of the traditional influence of a Homeric Hero in the colonies of Magna Graecia. The generic name **Diomedea** was eventually applied by Linnaeus to the greatest of all seabirds, the Albatrosses, who have carried it round the world.

I have a postscript to the shearwater story. A friend was recently cruising in the Bosphorus and asked the guide about flocks of seabirds flying low over the water. He said they were known as halcyons and were supposed to be the spirits of men drowned in the Bosphorus. In **Folklore of Birds** (1959) E. A. Armstrong mentions a similar belief, saying that the Greater and Manx Shearwaters "skimming along the coasts in the eastern Mediterranean . . . are believed by Moslems to be tenanted by the souls of the condemned." Is it possible that rafts of shearwaters were the "nests" the fabulous halcyons which could never be found breeding around the Bosphorus were supposed to make on the sea?

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DIURNAL ACTIVITY RHYTHMS OF THE KITTIWAKE IN THE ARCTIC SUMMER

M. de L. Brooke

Introduction

From 2000 hrs. B.S.T. on 30 July until 2000 hrs. on 20 August, 1968 the Ornithological Group of the British Exploring Society Expedition maintained a 24-hour a day sea-watch on the west coast of Spitsbergen in conditions of continuous daylight. Records were kept of the movement of all seabirds except the Fulmar along Forlandsundet, a 13 km. wide channel between the peninsula of Broggerhalvoya and the island Prins Karls Forland, from a site 10 m. above and 50 m. from the sea (see Fig. 1). The initial results of this work have been reported by Jonas (1969). This note presents further analysis of data on the Kittiwake with respect to systematic variation in the amount of movement during the course of the day.

Previous authors have commented on diurnal activity rhythms in Arctic seabirds in the continuous daylight of summer. In Spitsbergen, Feilden (1895) noticed a lowering of activity around midnight but Fisher & Hartley (1936) could not confirm any decline in activity at midnight at a feeding zone in front of the Nordenskiöld glacier. Likewise, at the same site Marshall (1938) recorded little fluctuation in a constant stream of Kittiwakes flying along the coast and over the tundra. At the lower latitude of Jan Mayen (c. 71°N), Cullen found that in late July Fulmars had a "rest-period" around midnight when the number of birds flying along the shore at a point far from any colony dropped very low. Kittiwakes at a breeding colony also tended to be less active around midnight; for example, a greater proportion of adults were then asleep. For both species these effects were more marked in late August, by which time there was a two hour period of darkness. Also on Jan Mayen, Moss (1965) studied a Fulmar colony from 12 August to 18 September, a period spanning the transition from a night consisting of a short period of poor light to one of about 12 hours of darkness and twilight, and found that most birds left the cliffs at night and returned in the morning. At Kapp Linne in Spitsbergen Fulmars tended to fly past south in the morning and then north in the evening, while the rate at which Arctic Terns visited a colony with food which was lowered for about four hours either side of midnight (Burton, Blurton-Jones & Pennycuik, 1960).

During the present period of observation, Kittiwakes were feeding well-grown young, and the first juvenile was seen on the wing on 10 August.

Observations

The mean number of Kittiwakes flying both north and south past the observatory in any one hour during twenty-one complete days of observation is plotted in Figure 2. A consistent trend is seen with Kittiwake movement apparently at a maximum around midnight, declining during the morning to a minimum around mid-day and then rising once again during the afternoon and evening. A similar U-shape is seen if median, and upper and lower quartiles are plotted.

In view of the wide scatter of observations at any one hour, it is possible that this result derives from some chance factor; for example, from a heavy passage of Kittiwakes around midnight on one or two days only. This possibility was examined by treating the total number of Kittiwakes flying past the observatory on each hour of every day to an analysis of variance (see Table 1), and found not to be the case. The highly significant variation between days

was to a large extent due to variations in wind strength; the stronger the wind, the greater the Kittiwake activity. There was no significant correlation between time of day and wind strength, and so the highly significant variation in Kittiwake passage with time of day can be said to be due to some variation in the birds' behaviour.

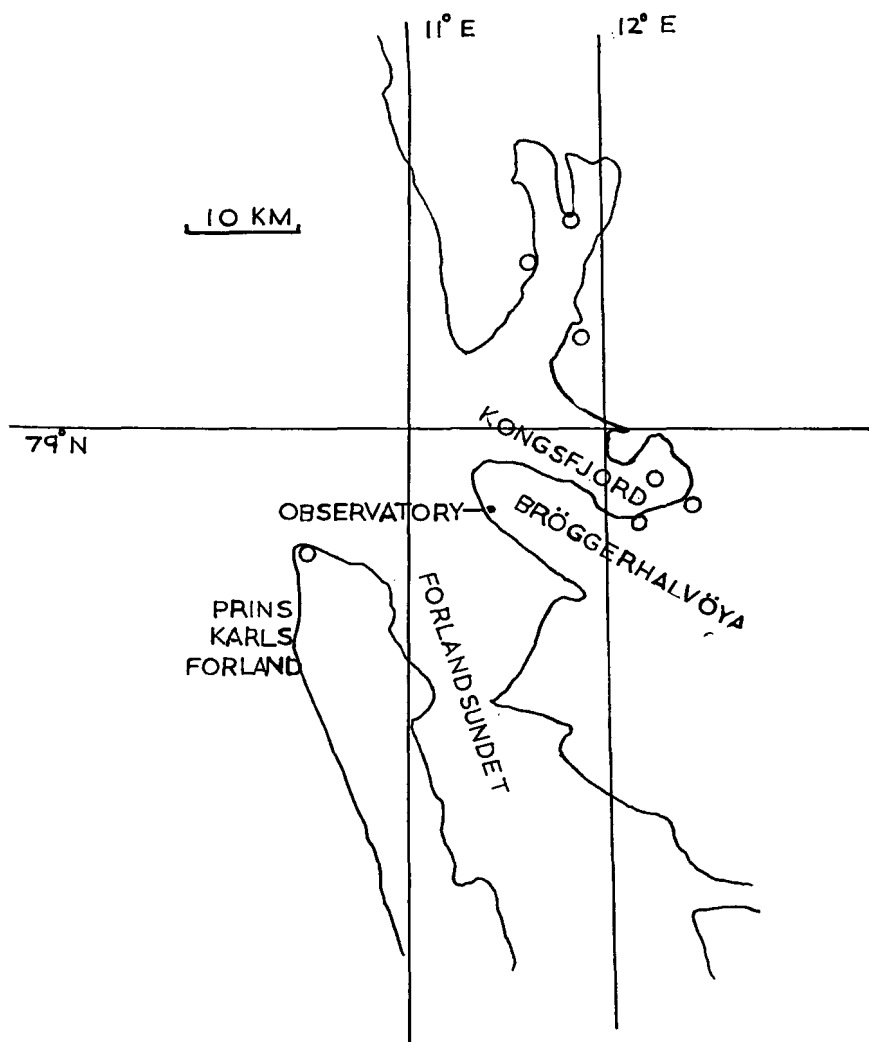


Fig. 1: The central part of the west coast of Spitsbergen. The circles indicate the approximate position of all known Kittiwake colonies within 50km. of the observatory (after Lovenskiöld, 1964).

Table 1: A Table of Analysis of Variance. See text for further details.

Source	Sum of squares	Degrees of freedom	Variance estimate
Days	315956	20	15798
Hours	160471	23	6977
Residual	786780	460	1710
Total	1263207	503	

F — ratio for hours=9.326, on 20 and 460 degrees of freedom, $p < 0.001$.

F — ratio for hours=4.079, on 23 and 460 degrees of freedom, $p < 0.001$.

If Q is the total number of Kittiwakes passing the observatory between 2100 hrs. and 0300 hrs. divided by the total number passing between 0900 hrs. and 1500 hrs. over the following noon period, then the value of Q is greater than 1 on 18 out of 21 days (X^2 , using Yates' correction=9.33, $p < 0.01$). The mean value of Q is 3.11 (S.D. ± 2.44 : range 0.54–9.01).

Likewise if q is the total number passing between 2100 hrs. and 0300 hrs. divided by the total number passing between 0900 hrs. and 1500 hrs. over the preceding noon period, then the value of q is greater than 1 on 18 out of 20 days ($X^2=11.25$, $p < 0.001$). The mean value of q is 3.04 (S.D. ± 2.56 : range 0.39–12.08). Kittiwake passage at the site of the observatory is therefore generally greater around midnight than around mid-day by a factor of about three.

This result is unlikely to be due to any observer bias since our group was divided into two three-man parties, each of which maintained watch for about three days at a time. When his party was on duty, every member of the group took two four hour watches per day, both at the same clockface time. Thus it arose that on about four-fifths of the days the same two people covered the 2100-0300 period as covered the 0900-1500 period on either the following or preceding day.

Discussion

In April and May, 1960, Myres (1963) observed with radar an orientated northward departure of responses in the evenings from the vicinity of a large colony of seabirds in the Shetland Isles. In the mornings a southward movement was observed which appeared to be their return (c.f. Moss' observations on Fulmars quoted on p. 1). Various lines of evidence strongly suggested that Kittiwakes were involved and Myres speculated that this oceanic species flew north to feed along the edge of the Continental Shelf to the north of the Shetlands and, additionally, to take advantage of the long twilight at high latitudes in summer, thereby increasing its daily feeding time. If this were so, there might be an area where Kittiwakes were present in greater numbers around midnight and the possibility that the Spitsbergen results are also interpretable in terms of feeding activity is considered below. It should be remembered, however, that the Shetland and Spitsbergen data refer to the beginning and end of the breeding season respectively.

As has been mentioned Fulmar movement was not recorded since preliminary observations showed that Fulmars flew a few hundred yards into wind before turning and flying for a similar distance downwind and so only made nett progress in one direction slowly. It would thus have been impossible to make useful observations on them without reducing the value of the data on other species. The data on the Little Auk were unsuitable for analysis, since the bulk of movement, which took place far out to sea, could only be seen using a telescope. All observers preferred using binoculars which were more efficient for recording the movement of all other species closer inshore. Of the other four species seen in numbers adequate for analysis, namely Black

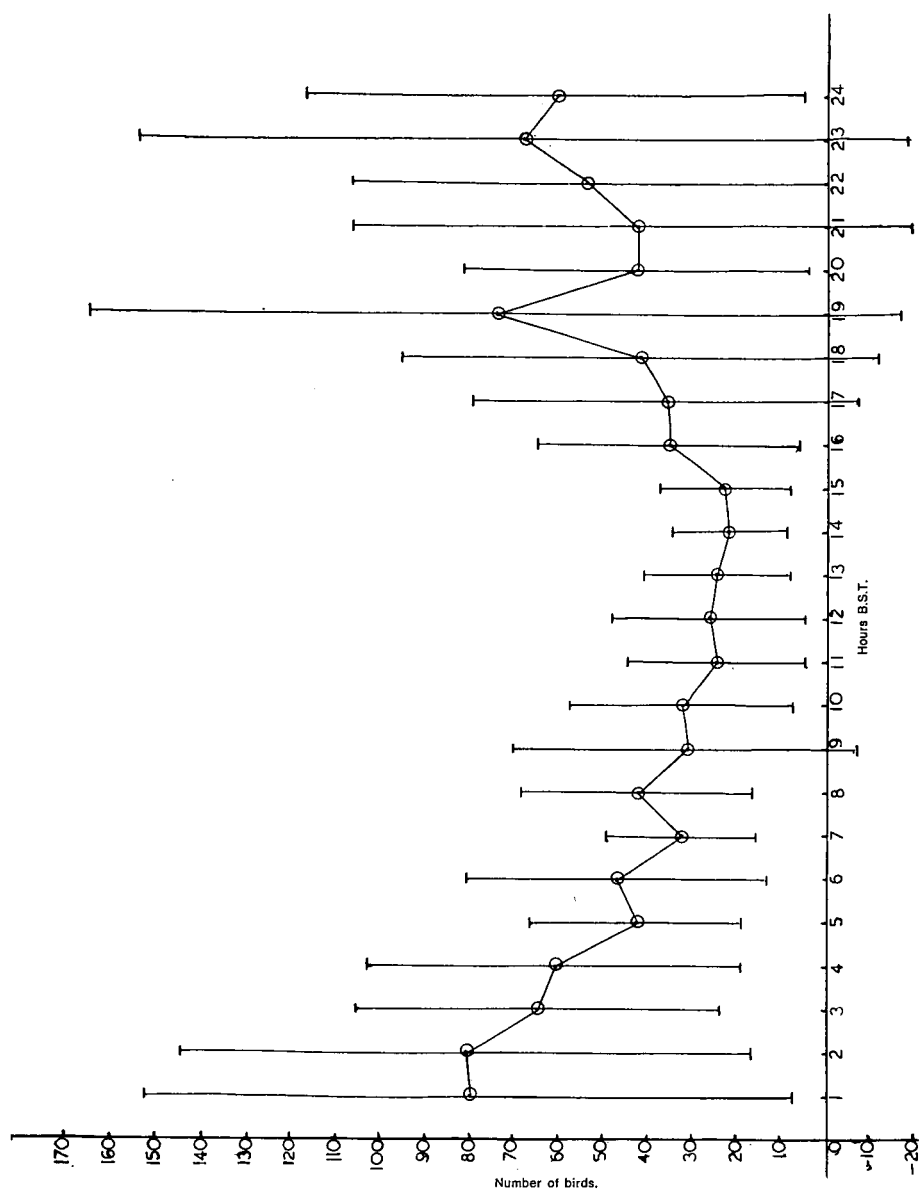


Fig. 2: Mean and standard deviation for the number of Kittiwakes flying past the observation point in successive hours B.S.T.

Guillemot, Brünnich's Guillemot, Puffin, and Glaucous Gull, none showed a significant diurnal rhythm of movement at the place of observation, though the latter three species, in contrast to the Kittiwake, showed a tendency towards increased activity in the middle of the "day" and reduced activity during the "night".

The auks feed by diving and the Glaucous Gull is a scavenger and predator, while the Kittiwake is primarily a surface feeder. It is possible that the Kittiwake's apparently distinct activity rhythm might be related to its different feeding habits. In Spitsbergen the Kittiwake feeds mostly on surface macroplankton (Lovenskiold, 1964). The detailed study of Fisher & Hartley at a glacier-snout feeding zone revealed that the euphausiid *Thysanoessa inermis* was the most important food item. *Thysanoessa* spp. are vertical migrants in temperate waters, the population being, on average, nearer the surface by night than by day (Hickling, 1925 and Gardiner, 1934). However, Bogorov (1946) and Digby (1961) noted little vertical migration in a wide variety of planktonic forms (*Thysanoessa* is not mentioned) in polar seas in summer, but Bogorov did find that some species, non-migrants in summer, begin a migration in autumn. Towards the end of the present period of observation the sun nearly reached the horizon at midnight and the amount of light entering the sea would be a small proportion of that entering at mid-day, as would be the case in autumn. The proportion would have been higher three weeks earlier at the beginning of the observation period. As light is one important factor controlling the migration of plankton (Bainbridge, 1961), it might be expected that if the greater Kittiwake passage around midnight was related to increased availability of food the observed activity rhythm would become more marked during the observation period. This was tested by comparing by analysis of variance the first eleven with the last ten days of observation and found not to be the case. Nevertheless the possibility of a relationship between the present observations and feeding behaviour cannot be excluded.

Alternatively it is possible that the observed rhythm of Kittiwake activity is due to the particular siting of the observatory. Thus the observed rhythm may not in fact reflect the activity cycle of individual birds. One among several explanations of a site-effect is that Kittiwakes have an activity rhythm which is roughly, but similarly, synchronised with the sun and travel from breeding colony to feeding ground along one route, returning along another. If this were so, a correlation between the proportion of birds flying in one direction and the number passing the observatory would be expected. If the mean number passing in a particular hour (see Fig. 2) is correlated with the number flying north in that hour (over the entire 21 days) divided by the number flying south, then $r = -0.41$ ($p > 0.05$). This figure may be influenced by many factors, including the presence of non-breeding birds in the area and the tendency of Kittiwakes to fly into wind regardless of direction. Winds were dominantly southerly for the first week of observation and the majority of birds flew south. Thereafter the situation was reversed. Nevertheless the weak correlation established above might suggest that the number of birds seen is greatest when the proportion flying south is greatest, and the possibility of a loon movement between colony and feeding ground remains open. Dr. J. C. Coulson (in litt.) has noticed at an English Kittiwake colony that the departing birds fly directly out to sea whilst many of the returning birds hit the coastline above or below the colony and follow it to the nesting point. Similarly Dr. W. R. P. Bourne (in litt.) comments that it seems to be birds returning to the Kerry seabird colonies that are seen at Cape Clear in summer.

No complete explanation of the Spitsbergen situation is possible without further knowledge of the colonies of origin of the birds seen, the location of

major feeding sites in the region, the proportion of non-breeders and some ability to separate migratory and local feeding movements.

Summary

After 21 days of continuous sea-watching at a site on the west coast of Spitsbergen in the summer of 1968 it was found that Kittiwake passage at the observation point was generally greater around midnight than around mid-day by a factor of about three. No similar effect was found in any of the other species investigated. Two explanations of this diurnal activity rhythm in the Kittiwake are discussed; that it is due to increased availability of food around midnight and that there is a loop movement between breeding colony and feeding ground. No certain conclusion can be reached in spite of some evidence in favour of both possibilities

Acknowledgements

The efficient organisation of the British Schools Exploring Society and especially Lt.-Cdr. R. I. Sinclair made this expedition while the cheerful perseverance of D. Jonas, C. Morton, J. Stowers, S. Sweet and P. Wright saw to the success of the fieldwork. I have profited from discussion with C. J. Bibby and M. Norderhaug, and Dr. J. C. Coulson and D. Jonas helpfully criticised an earlier draft of this paper. The staff of I.C.I. (Buxton Lime Group) generously made available office and computer facilities.

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(In early July, 1972 it was noticeable that there was a very marked increase in the feeding activity of Kittiwakes and to a lesser extent Arctic Terns at sea

off Bear Island around midnight, though there was little reduction in the amount of daylight there then. The birds appeared to be catching something resembling a worm, possibly a pelagic polychaete, which they were never seen to do at other times. Indeed, they spent much of the rest of their time resting in large flocks ashore. Ed.)

BIRDS AND SALMON NETS

David Melville

Brief details of a kill of Guillemots in salmon nets off Portrush, Co. Antrim, were given in the *Ulster University Bird Club Report for 1971*. Since then two other reports of auks being drowned in nets have appeared (Bibby 1972, Tull et al. 1972). Further work was carried out at Portrush during part of the 1972 salmon season and this note summarises some of the information obtained—details of taxonomic and chemical investigations are still awaited—and gives some general information from several areas in Ireland and Scotland.

Ireland

At Portrush salmon are caught using both fixed and drift nets. Fixed net fishing began in early May but it was not until the third week of June that drift netting started. No fishing is allowed on Saturday or Sunday but if it is rough it may not be possible to lift fixed nets. Generally fixed nets are left in the water from Monday to Friday, while drift nets are only set at night. In calm weather drift nets are seldom set as the salmon catch is small. I was present in Portrush until 17 July except for the period 21-28 June. During the study period there were three boats using drift nets and three fixed nets around Portrush.

Table 1 shows the number of birds recovered from nets during the study period. During the period 21-28 June a maximum of ten Guillemots was caught and what was probably a non-breeding diver. Between 17 July and the end of the drifting season in early August very few birds were caught and due to the calm weather the salmon catch was small. It can be seen that the majority of birds are caught in drift nets, a similar situation probably existing around

Table 1: Numbers of birds recovered from salmon nets at Portrush.

Species	Drift net	Fixed net
Guillemot	64	1
Razorbill	5	1
Shag	—	2
Eider	—	1
Black Guillemot	—	1
Kittiwake	—	1

Greenland (Tull et al. 1972). As the majority of birds are caught in drift nets they must be caught at night, while birds caught in fixed nets may be caught at any time. Bibby (1972) reports one case where Guillemots had been caught during daylight and I have seen Guillemots in fixed nets at Troup Head, Banffshire which must have been caught during daylight. A fisherman at Portbradden, Co. Antrim, found that slightly more birds were caught during daylight than at night in his fixed nets. Although O'Connor (1967) suggests that there is usually full attendance of Guillemots on colony ledges during the night, Greenwood (1964) found that birds from Handa, Sutherland spent the night at sea in early July. Tull et al. (1972) suggest that auks are feeding when caught in drift nets off Greenland, but have no evidence to support this view (Tull pers comm.).

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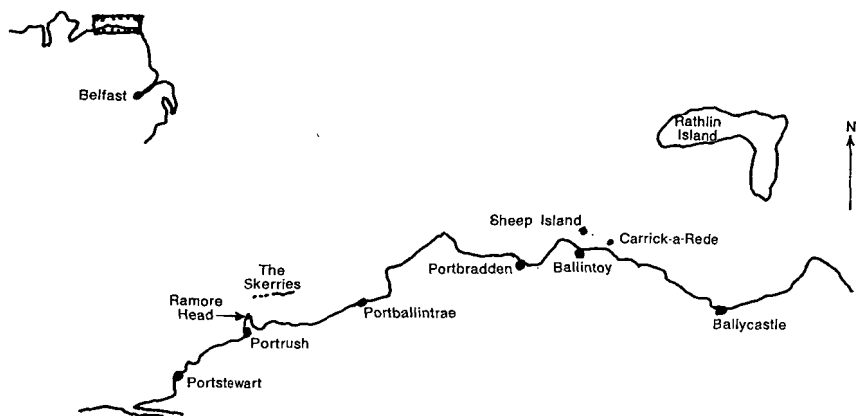


Fig. 1: Area of observation in Northern Ireland.

A total of 60 Guillemots was examined (29 males, 31 females) and of these only nine had obvious signs of food in the crop (five males, four females), while one female Razorbill had food out of one male and two females examined. Tuck (1960) found that Guillemots digest food very rapidly and that "Rarely can undigested fishes be found in their stomachs." Thus posthumous digestion may account for the very low number of birds with food, although on several occasions posthumous digestion did not appear to have occurred. It is also possible that the birds may regurgitate while drowning.

Unfortunately it was not possible to determine at what time of night the birds had been caught and thus it is still not clear how they were caught. Were they resting on the surface and dived when they encountered the net? Were they caught near dawn when they might have just begun feeding? The majority of birds caught in fixed nets must be caught while feeding—Holger-son (1961) reports birds caught in nets at a depth of 70 fathoms and Tuck and Squires (1955) report Brünnich's Guillemots caught in longline trawls at 40 fathoms, and it is difficult to imagine what these birds were doing if not feeding.

The number of birds caught in nets varied almost as much as the salmon catch—the maximum auk catch was 35 in one night, but averaged five, while the salmon catch varied between 130 and one per boat per night. Due to the variability of both catches and the short period during which the study was conducted it is not possible to formulate a valid relationship between numbers of salmon caught and numbers of auks caught. There was no correlation between sea conditions, wind speed or direction and auk mortality.

The variation in catch size is also great between different drift netting sites along the coast. At Portballintrae no birds had been caught up to 7 July and the maximum catch of salmon had been 73 in one night, while at Balintoy no birds and only one salmon had been caught after two weeks fishing. Few birds were caught around Ballycastle (P. Watson pers comm.) and one fisher-son considered that the numbers of birds caught had declined considerably in recent years.

At Portbradden it was estimated that 20-30 birds (Shag/Cormorant, Eider, Razorbill, Guillemot) are caught each year in fixed nets. At Carrick-a-Rede very few birds are caught since the fixed net is on the opposite side of the

small island to the seabird colonies; during the 1972 season only two birds were caught, one of which was released alive. Usually young birds are caught which are trapped in the "bag," having apparently followed the "leader" along. Both Greenwood (1964) and Pennycuik (1956) report cases of adult Guillemots apparently deserting their young and it seems likely that it is these waifs which are caught at Carrick-a-Rede. Birds were also found in the "bag" of the Portbradden net but some were caught in the "leader" where it passed over a sandy area. These birds may have been caught while feeding on sand-eels (*Ammodytes* spp) which tend to remain above the light coloured sand rather than the dark kelp (*Laminaria*) beds.

The "Blackfowl" have been used by fishermen along the North Coast as a sign of salmon for generations and many say that no birds are caught unless there are small fish fry about, thus suggesting that they are caught while feeding. The large kill off Portrush in 1971 occurred in a very small area just to the southeast of the Skerries and although this area was fished subsequently there were few birds caught. Tull (pers comm.) has found a similar tendency for Guillemots to congregate in small areas off Greenland. This could indicate that the birds were following fish shoals.

It is interesting that the majority of birds caught are Guillemots (all of the 72 examined in 1971 were Guillemots), because although more Guillemots than Razorbills are seen during seawatches, the ratio is much nearer 50:50 than in the catch figures. During the day mixed groups of auks can often be seen moving along the coast. On 28 June, 1971 when a vast auk movement was observed Razorbills were seen feeding in the tide race off Ramore Head, Portrush, while Guillemots flew past without putting down. On 13 July, 1972 a large shoal of Mackerel (*Scomber scombrus*) was feeding on small fry or sand-eels to the north of the Skerries, and although there were probably thirty Guillemots feeding as well as various gulls, Razorbills were seen to fly straight past. Fisher and Lockley (1954) and Harris (1970) found that the two species may feed on the same prey species but different size categories, and this might account for the catch differences—assuming that the birds were caught while feeding.

Tull (pers comm.) suggests that the birds might be decoyed to the floats of a net and says that they are easily lured to hunting decoys in Newfoundland. There are a great variety of floats used, the shape, size and material varying, and it seems strange that if birds were lured that only Guillemots were attracted. This is supported by several fishermen who said that they had never seen any signs of auks being attracted to nets.

Scotland

Drift netting is prohibited in Scotland and thus the total annual mortality is probably quite small. Apart from large stake net complexes along the Solway there appeared to be little salmon fishing along the west coast with only a few bag nets in sheltered sea lochs. Near Montrose, Angus, each stake net was reported to catch four or five birds per annum (mainly Cormorants). Around Troup Head on the Banff-Aberdeen border, bag nets are placed directly below the seabird colonies, and a high mortality results throughout the whole breeding season, mainly Guillemots. Due to their estuarine location stake nets are unlikely to catch many auks but might cause a considerable mortality of Shags, Cormorants and Eiders. Bag nets are used in the more rocky areas which are more suited to auk feeding and thus might cause a high mortality. However, due to the exposed nature of much of the coast it is not usually feasible to fish except in the more sheltered areas which are less likely to be frequented by auks.

Obviously the results in this brief study are of very limited value and it will be necessary to make a much wider study of auk catches before it will be possible to determine how the birds are caught, and then possibly how the kill could be reduced. In any case the corpses themselves are of considerable value in various studies (taxonomic, pollution, feeding, parasites, etc.).

Acknowledgements

I would like to thank all of the fishermen who so patiently put up with my enquiries and provided bodies from the nets: the members of the Ulster University Bird Club who helped in collecting some of the data: and H. M. Coastguard, Ballycastle for providing meteorological data.

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(We have also received a report from A. C. Macleod on the birds caught in salmon nets around the approaches to Loch Broom, Wester Ross. During the season extending from 30 May to 26 August, 1972 they had three conventional bag-nets and one of green monofilament nylon set in the channel between the Summer Isles and Achiltibuie on the mainland, three of them at Dorney Sound, and one at Achuart Point. Four Shags and a Black Guillemot were caught in the three bag-nets, and seven Shags in the nylon net. Two of the Shags and the Black Guillemot were still alive, caught by the wings in the bag-nets, and were liberated with the loss of some primaries. At a neighbouring station close to a breeding colony 50-70 Shags were caught in six bag and four nylon nets, and also a tern, the first ever recorded. Elsewhere an adult Gannet and a Red-throated Diver were caught in nylon nets, and a Fulmar by the leg in a bag net, and subsequently rehabilitated in captivity. The number of birds caught is clearly much influenced by both where the net is set, and the material of which it is made, nylon nets catching many more birds. Ed.).

FULMAR WITH A SMALL BILL AND ASPERGILLOSIS IN FIFE

W. R. P. Bourne

Wynne-Edwards (1956) has pointed out that an "off-light" female Fulmar collected by W. A. Payn at Blakeney, Norfolk on 29 September, 1928 and now in the British Museum (Natural History) has a bill-length of only 33.5 mm. and seems likely to belong to the small sized high-Arctic population successively named *Fulmarus glacialis minor* and *F.g.glacialis* by Salomonsen (1950, 1965). Although this race failed to secure admission to the latest checklist of British birds prepared by the British Ornithologists' Union (1971), there seems little doubt that it does occur at intervals in Britain since Pashby and Cudworth (1969) have reported the occurrence of a wreck of thousands of birds all round the North Sea early in 1962, hundreds of which reached Britain, where a number were collected. In view of this when E. F. B. Spragge sent in a Fulmar with a bill of only 32 mm. found during a Royal Society for the Protection of Birds/Seabird Group beached bird survey in Fife on 28 November, 1971, the immediate assumption was that it must be another of these Arctic birds, and it was preserved as a specimen.

However, whereas the overwhelming majority of small Arctic fulmars occur in the dark phase, this bird had a white head and neck of the type typical in the British population. It only weighed 450 g., compared to a range of 570-1,000 g. in 24 other Fulmars weighed in British waters, and 565-740 g. reported for the small Arctic population (Watson, 1957). On dissection it was found to be very wasted with nodular lesions of the lungs and minute gonads, possibly male. The trunk was referred to the Ministry of Agriculture, Fisheries and Food Veterinary Laboratory at Lasswade for investigation, and Miss D. Brown reported the presence of typical lesions of aspergillosis of the lungs, bronchi and air-sacs from which the mould *Aspergillus* was isolated.

This bird presents an interesting problem because if its extremely small measurements in table 1 are accepted at their face value, it would appear to be another British example of the small Arctic population. However, in view of the fact that it is in the pale phase whereas Arctic birds are normally dark, and has fresh plumage but in the dried skin a somewhat shrivelled bill and legs of the sort usually found with immature petrels, and had extremely small gonads, it seems perhaps more likely that it is a young bird of the large southern race now christened *F.g.auduboni* by Salomonsen (1965) breeding in Britain, which contracted aspergillosis as a chick with consequent stunting of its growth and possibly delay in fledging, which succeeded in leaving the nest, but died soon afterwards. In which case it presents an object lesson in the need for caution in the interpretation of the small specimens of petrels and other seabirds which are encountered in museum collections from time to time. The measurements of two dark Fulmars collected west of Shetland and at Bear Island also included in the table may also be of interest in indicating that colour is not an entirely reliable criterion for the identification of these birds, either.

Table 1: Measurements of Fulmars in mm.

Origin	Date	Colour	Sex	Weight	Wing	Tail	Cul- men	Tar- sus	Toe
Fife	28 Nov. 1971	Pale (male?)		450g.	315	112	32	51	57
60°22'N. 4°31'W.	16 May 1971	Dark	?	710g.	325	117	40	50	70
Bear Island	3 July 1972	Dark	male	1200g.	340	127	40	55	75

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GREY SEALS AND SEABIRDS

D. R. Grant and W. R. P. Bourne

During the course of a cruise up the west coast of Scotland in the Fishery Cruiser Brenda in January, 1972 W.R.P.B. noticed that a flock of gulls feeding busily over a fish shoal in the Inner Sound all immediately departed when a Grey Sea *Halichoerus grypus* surfaced amongst them. On arrival in Stornoway it was also noticed that the disreputable Grey Seals which frequent the harbour to feed on fish-offal would commonly come up under gulls sitting on the water, which gave them a very wide berth, and it was reported locally that the seals would catch the gulls whenever they could. It may be useful to place on record some instances when seals have actually been found attacking seabirds, in one case with an unfortunate outcome for the seal.

On 25 August, 1958 vast shoals of Mackerel *Scomber scombrus* in Village Bay, St. Kilda, attracted large numbers of Gannets and Grey Seals to feed on them, and the air was filled with milling birds and the water with threshing seals and fish. D.R.G. noted that Gannets diving for fish were frequently chased by seals as they surfaced. On one occasion a seal was seen actually to seize a Gannet while it was on the water which had the greatest difficulty in escaping, though finally it did, and struggled away along the surface, eventually becoming airborne. It may or may not have been the same bird as a Gannet washed up freshly dead with a serious wound underneath near the legs the next day. It may be remarked that while the seals were prepared to molest the Gannets, a very large male Killer Whale *Orcinus orca* which briefly entered the bay also caused a mild degree of consternation among the seals.

Two definite instances in which young seals appear actually to have eaten birds have been reported to us by Mr. S. D. E. Devlin of the Department of Agriculture and Fisheries for Scotland Marine Laboratory, Aberdeen. A well-grown young male Grey Seal weighing 49 lbs. shot on the shore at St. Cyrus, Angus, on 6 January, 1971 was found to be in good condition with remains of fish, cephalopods, crustacea, numerous parasitic worms and bird feathers in its stomach. The feathers came from the mantle of a gull, and the species was not identifiable with complete confidence, but seemed most likely to be a Kittiwake.

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Another young Grey Seal which followed a man along the shore until it was shot at Findhorn, Morayshire, on 11 January, 1972 differed from the preceding one in being grossly underweight, only 33 lbs., with blood oozing from the anus. On dissection the abdominal cavity was full of red fluid blood and smelt offensively, while a small bundle of feathers was found penetrating the wall of the distal end of the greater curvature of the stomach and projecting for half an inch on the outer surface. With some difficulty two of the feathers were identified as the highly distinct stiff, pointed central tail-feathers of a Razorbill, and two others with them were also compatible with that species. The seal's intestines were shrunken, and it contained no parasitic worms, so that it seems possible that it was a deserted pup which had eaten little else except the Razorbill.

It may be noted that J. Riley (Ibis 114: 102-104, 1972) has recently reported that Fulmars may carry immature nematodes belonging to species of *Anisakis* which normally mature in marine mammals. If these nematodes survive when marine mammals eat birds the birds might play an important role in their dispersal, for example by carrying them across the equator and between different oceans on migration.

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REVIEWS

Rehabilitating Oiled Birds

Publications of the Advisory Committee on Oil Pollution of the Sea Research Unit on the Rehabilitation of Oiled Seabirds, 1968-1972. Obtainable from the Department of Zoology, The University, Newcastle upon Tyne NE1 7RU, post paid.

The wreck of the Torrey Canyon revealed among other things that current techniques for the rescue and rehabilitation of oiled birds were woefully inadequate, to the extent that most of the larger organisations involved concluded that they were a waste of time and it was kinder to kill the birds immediately out of hand rather than prolonging their agony. When some of the excess money subscribed for these exercises was subsequently made available for a review of the situation by a new research unit at Newcastle, the reaction was therefore somewhat ambivalent, since while it was hardly possible to argue that the subject did not require more study, some of us were afraid that attention might be deflected from the over-riding need for much more effective pollution control. These doubts were not entirely resolved when the unit subsequently received massive support from the oil industry.

The publications of the new unit were therefore received somewhat critically. The first two, by Professor R. B. Clark and R. J. Kennedy, included a thorough review of the literature, "Rehabilitation of oiled Seabirds" (1969, pp.57, 50p.) and a summary of the scanty results of circulating a questionnaire to the people currently engaged in caring for oiled birds, "How oiled seabirds are cleaned" (1971, pp.48, 50p.), which elucidated the nature of the problem but indicated little effective was being done about it. There then followed three annual reports for 1970-1972 (pp.16, 40p. and pp.32 and 24, 50p.) describing attempts to elucidate the physical properties of feathers, to keep and clean oiled birds, autopsies when they died, and eventually their behaviour when

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they lived, and field trials of methods of dealing with pollution incidents. Finally, the last report was accompanied by a concise booklet "Recommended treatment for oiled seabirds" (1972, pp.10, 25p.) describing an effective cleansing technique. These are all neat and tidy publications revealing a great deal of serious study at a time when the unit was experiencing various vicissitudes, and the last probably gives the best advice now available in the world on how to deal with oiled birds when they come ashore. It has been adopted for general use by the committee of organisations dealing with ornithological oil pollution problems in Britain, and the unit are to be congratulated on their progress. It may be wondered where we now stand.

One of the most intractable problems presented by oil pollution is that the incidents occur at irregular intervals in unpredictable and often inaccessible places and often during bad weather or at night. It is therefore extremely difficult to know how to deploy such resources as are available for dealing with it speedily, economically, and efficiently. It may be difficult to get at many incidents at all, and if they are accessible, the responsible authorities may be confronted with difficult decisions whether to act early, before the position is fully revealed, or to wait until more information is available, by which time much damage may have been done. The ornithological situation is particularly difficult to assess, because the behaviour of birds is liable to be as unpredictable as that of the oil. If birds are affected, which is by no means always the case with even larger incidents (though on the other hand vast damage may be caused by otherwise insignificant ones) they seldom come ashore and allow themselves to be caught until they are in the last stages of exhaustion. They may then appear in large numbers, and may require rapid treatment if they are to survive.

In the circumstances, it is still possible to doubt whether the vast majority of oiled birds will ever become accessible to treatment, so that rehabilitation is still no answer to the oil pollution problem. However, some oiled birds do come ashore in easily accessible places and periodically present themselves in large numbers to distressed but hitherto often puzzled well-wishers. Here there has been an increasing tendency to write them off as incurable, but the unit now provides a valuable guide to effective action. They have performed particularly useful services in making it clear that if the birds are given effective first aid for 12-24 hours they may then be fit to travel long distances to properly-equipped central rehabilitation centres, where very thorough washing in the cheapest kinds of domestic detergent is just as effective as any other kind of cleansing. While personally I continue to doubt whether it is ever going to be possible to rescue the great majority of birds affected by oil pollution, and continue to believe that the highest priority should continue to be given to pollution control, we have now also been provided with an alternative to euthanasia for those birds which are accessible for treatment, and can salvage them at least. Humanitarians should be very grateful for this, and it is to be hoped that increasing resources will now be made available for it.

Two points in the last (1972) Report deserve comment. On page 9 it is suggested that a colour-ringed Kittiwake which returned to a north-eastern breeding colony is the first known record of a rehabilitated bird successfully rejoining the breeding population. In point of fact this has also occurred with at least three Guillemots, one rehabilitated on the north-east coast some years ago which was shot in a subsequent breeding season in the Faroes, and two released in Dorset following rehabilitation after the Torrey Canyon disaster in the autumn of 1967 which were subsequently recovered in their presumed area of origin along the north coast of Devon and Cornwall during the 1969 birdkill. In view of these recoveries it would appear that a past suggestion of my own that it might be useful to try to start new breeding colonies with

rehabilitated birds is unlikely to be successful, and it may be wiser to try and get them back to sea as soon as possible instead, though perhaps preferably in an area with a better food-supply than appears to have been available to Torrey Canyon birds liberated along the south coast of England in the autumn, where many of them soon came to grief.

It is also surprising to observe that the report of the occurrence of Guillemots with degenerate plumage lacking unusually large amounts of fluorine on pages 18-19 of the third Report makes no reference to the preceding lengthy discussion of these birds in "British Birds" (63: 34-36; 64: 229-230, 236; 65: 85-87), where it was pointed out that the phenomenon has been known for half a century and occurs in other species and areas as well; one of these birds did not contain much organochlorine, either.

W.R.P.B.

Conservation in Kent

The Nature Conservancy, 1971. Wildlife conservation in the North Kent Marshes: a report of a working party. Mimeographed, pp.85, 6 plates, 3 maps.

Harrison, J. (1972?). Wildfowl of the North Kent Marshes. pp.100, numerous plates. Obtainable from the Wildfowling Association of Great Britain and Ireland, Grosvenor House, 104 Watergate Street, Chester, CH1 2LF. 50p.

Harrison, J., Humphries, J. N. and Graves, G. (1973?). Breeding birds of the Medway Estuary. pp.32, numerous plates. Obtainable from WAGBI (address above) and the Kent Ornithological Society, 11 Nursery Close, Sevenoaks, Kent. 54p.

Although most of our more interesting low-lying coasts are now threatened with development, and some are receiving careful study in consequence, the information available about them is often scattered and hard to come by, and local ornithologists have seldom shown much capacity for directing attention to it. North Kent is a conspicuous exception; not only have the Harrison clan been writing about it for many decades, E. H. Gillham and R. C. Homes' "Birds of the North Kent marshes" (Collins, London, 1950) provided a model early account of the area in the days before threats to our coast received much attention, and recently local naturalists have shown an exceptional capacity for expounding the virtues of their territory and the problems affecting it.

Of the studies listed above, that by the Nature Conservancy is a model exposition of the area and its natural communities, the problems affecting them and possible ways of dealing with them. As is usual with that body, the ornithology is rather weak, with a bias towards waders and especially wildfowl. Jeffery Harrison's study of the wildfowl makes it clear why they receive most attention, though mainly of interest from our point of view for its bibliography, but the special report on the breeding birds of the Medway is of considerable interest for the data on seabirds. In point of fact it consists of four parts—the results of the fifth census of breeding birds of the Medway and Swale islands in 1972, accounts of the breeding birds of Kingsnorth Power Station and Chetney Marsh, and an assessment of the importance of the Medway for waterfowl and wading birds.

If we enquire how seabirds are doing, the results of the Medway and Swale censuses are summarised in table 1. It will be noticed that the numbers of Black-headed Gulls have tended to fluctuate (notably on the Medway in the two successive years 1966-67), but show an increase, whereas both the terns have declined steadily, as they have done in a good many of our estuaries. Several possible reasons are suggested for the last phenomenon. It is pointed out that while the growing number of gulls might be molesting the terns, the

Common Terns at least deliberately go and nest with the gulls, so this seems unlikely. On the other hand, the gulleries are apparently attracting a good many rats, which may be preying on the terns as well, as is demonstrated by a picture of one killed by a rat at its nest. The nesting site used by the Little Terns on the Medway has also become overgrown with herbage which they dislike. It is finally suggested that the terns may be affected by a food-failure, though no suggestion is made as to its possible cause; one wonders whether the gulls may be competing with them for food on the one hand, or whether it may be affected by pollution on the other. In any case, as with many other estuaries, it seems time the welfare of the terns received more attention, perhaps as suggested by the Conservancy working-party by creating new protected artificial breeding-sites for them.

One would also like to know why the Nature Conservancy were unable to produce a similar report on an area where the need for it was even more urgent, south Essex.

W.R.P.B.

Table 1: Gulls and terns nesting on the Medway and Swale islands.

Year	Herring Gull Medway	Black-headed Medway	Gull Swale	Common Tern Medway	Tern Swale	Little Tern Medway
1955	2	1,545	350	683	213	44
1961	2	2,398	1,612	331	152	23
1966	—	1,929	2,000	104	200	17
1967	2	1,052	?	143	?	3
1972	—	4,964	1,593	87	11	7

SIXTH REPORT OF THE SEABIRD GROUP, 1970-1971

The sixth year of the Seabird Group has been occupied with a review of progress, preparation of the report on the national census of breeding sea-birds, and the formulation of proposals for new research in the future. Stanley Cramp has continued as Chairman and Representative of the British Ornithologists' Union on the Executive Committee, C. M. Perrins represented the British Trust for Ornithology and David Lea the Royal Society for the Protection of Birds, W. R. P. Bourne served as Secretary, Editor, and Director of Research, John Crudass as Treasurer, and T. R. E. Devlin, G. M. Dunnett and Oscar Merne as elected members of the Executive Committee. R. G. Pettitt resigned in August after completing a review of the results of sea-watching, and the Committee have co-opted J. L. F. Parslow in his place until the Annual General Meeting. We owe a great debt of gratitude to Garth Pettitt for the enthusiasm, energy, and initiative that he has shown in promoting sea-watching activities, which played such a large part in the early development of the Group. We wish to place on record our appreciation of the amount of trouble which he has taken under the most trying personal circumstances to canvass opinion on the most suitable way to develop these studies in future since his return from abroad. We are greatly indebted to him.

The Secretary was joined at the Research Unit at Aberdeen in January by Tim Dixon, long a member of "Oil Pollution South-east Kent," who keep watch on the Straits of Dover. Between them they have now made nine voyages of varying length around the entire coastline of Scotland and north to the Faroes at all seasons of the year in the Fishery Cruisers and Research Ships belonging to the Department of Agriculture and Fisheries for Scotland. Through the good offices of the R.A.F. Ornithological Society Bill Bourne was also able to accompany two training flights by R.A.F. Shackleton around the coast of

Common Terns at least deliberately go and nest with the gulls, so this seems unlikely. On the other hand, the gulleries are apparently attracting a good many rats, which may be preying on the terns as well, as is demonstrated by a picture of one killed by a rat at its nest. The nesting site used by the Little Terns on the Medway has also become overgrown with herbage which they dislike. It is finally suggested that the terns may be affected by a food-failure, though no suggestion is made as to its possible cause; one wonders whether the gulls may be competing with them for food on the one hand, or whether it may be affected by pollution on the other. In any case, as with many other estuaries, it seems time the welfare of the terns received more attention, perhaps as suggested by the Conservancy working-party by creating new protected artificial breeding-sites for them.

One would also like to know why the Nature Conservancy were unable to produce a similar report on an area where the need for it was even more urgent, south Essex.

W.R.P.B.

Table 1: Gulls and terns nesting on the Medway and Swale islands.

Year	Herring Gull Medway	Black-headed Medway	Gull Swale	Common Tern Medway	Tern Swale	Little Tern Medway
1955	2	1,545	350	683	213	44
1961	2	2,398	1,612	331	152	23
1966	—	1,929	2,000	104	200	17
1967	2	1,052	?	143	?	3
1972	—	4,964	1,593	87	11	7

SIXTH REPORT OF THE SEABIRD GROUP, 1970-1971

The sixth year of the Seabird Group has been occupied with a review of progress, preparation of the report on the national census of breeding seabirds, and the formulation of proposals for new research in the future. Stanley Cramp has continued as Chairman and Representative of the British Ornithologists' Union on the Executive Committee, C. M. Perrins represented the British Trust for Ornithology and David Lea the Royal Society for the Protection of Birds, W. R. P. Bourne served as Secretary, Editor, and Director of Research, John Crudass as Treasurer, and T. R. E. Devlin, G. M. Dunnett and Oscar Merne as elected members of the Executive Committee. R. G. Pettitt resigned in August after completing a review of the results of sea-watching, and the Committee have co-opted J. L. F. Parslow in his place until the Annual General Meeting. We owe a great debt of gratitude to Garth Pettitt for the enthusiasm, energy, and initiative that he has shown in promoting sea-watching activities, which played such a large part in the early development of the Group. We wish to place on record our appreciation of the amount of trouble which he has taken under the most trying personal circumstances to canvass opinion on the most suitable way to develop these studies in future since his return from abroad. We are greatly indebted to him.

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Scotland in April and August, while he also went with a B.B.C. cameraman to inspect an oil pollution incident affecting the east coast of Shetland in a light aircraft on 3 June. A report of this investigation prepared with the Nature Conservancy Shetland representative, Laughton Johnston, will be found in the August Marine Pollution Bulletin (2:117-119). He also visited a number of breeding stations, where he received hospitality from Peter Corkhill on Skomer and John Parslow on Clo Mor, among others, and with the latter completed cover for the entire British Isles for Operation Seafarer by visiting Am Balg off western Sutherland. During the previous winter he visited Geneva again at the invitation of the World Health Organisation for discussions on avian influenza, while in September Tim Dixon visited south-west Norway to investigate the hunting of auks there and then Sweden on behalf of the Advisory Committee on Oil Pollution of the Sea in order to investigate the pollution of the Kattegat and the impressive methods devised to deal with it. In the light of the experience gained it is hoped shortly to produce proposals for further investigations by Group members.

The Organiser, David Saunders, has worked throughout the year on the report of the results of "Operation Seafarer". They will be published in the form of a book, including introductory chapters reviewing seabird biology and hazards to them, summaries of the information available for each species, illustrations, and maps of the distribution of breeding colonies. David Saunders has also organised a repeat census of Little Terns during the year, and Colin Bibby, who was appointed Bird Disasters Officer by the R.S.P.B. in January, repeat sample censuses of other species at selected breeding stations. It was found that the auks breeding around the Irish Sea are now recovering again from the decline following the mortality in the autumn of 1969, though Puffins were found to be declining in their turn at several stations off north-west Scotland, and especially St. Kilda, as reported by Jim Flegg in B.T.O. News. Colin Bibby also took charge of the R.S.P.B./Seabird Group beached bird survey in a year when there was fortunately little mortality, and visited Holland during the autumn to improve liaison with continental workers. A report on the first five years' results is in preparation.

We are indebted to Aberdeen University for the provisions of facilities for the Research Unit, and the Director of the Marine Laboratory, Aberdeen, Basil Parrish, for arranging the cruises and his constant support and advice. Together with Roger Bailey he agreed to represent the Laboratory on the Advisory Committee for the Research Project, which also includes the Director, Ronald Currie, and Tom Pearson from the Scottish Marine Biological Association's Dunstaffnage Marine Research Laboratory, and Stanley Cramp and Ivor Rees representing the Group. We are happy to be able to acknowledge again the unfailing support received from the National Ornithological Societies and too many individuals to list separately. A useful working relationship was established with a number of members of the staff of the Nature Conservancy during the year, and also with the parallel research project on sea ducks being organised by Harry Milne and Lennox Campbell at Aberdeen. We hope to be sending round regular circulars reporting its progress in future.

W. R. P. Bourne, Honorary Secretary.

THE SIXTH ANNUAL GENERAL MEETING OF THE SEABIRD GROUP

The Sixth Annual General Meeting of the Seabird Group was held at the Conference Centre, Swanwick, Derbyshire at 6 p.m. on 15 January, 1972. The President, Mr. Stanley Cramp took the Chair, and about thirty members were present.

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1. The Minutes of the Fifth Annual General Meeting held on 9 January, 1971, which are being circulated in the second Seabird Report, were agreed and approved on a motion proposed by Mr. J. L. F. Parslow and seconded by Mr. C. Headlam.
2. The Secretary commented briefly on the report for 1970-1971, previously circulated, which will be published in the Report and "Bird Study". Acceptance was proposed by Mr. M. A. Ogilvie, seconded by Mr. W. Cooper, and agreed unanimously.
3. The Treasurer briefly discussed the draft accounts for 1970-1971, which together with those for the previous year are still with the auditors. It was noted that owing to accurate initial budgeting and the care exercised by the previous Treasurer (who had secured a profit of £200 for the Group by placing funds in a deposit account on advantageous terms) the No. 2 Account covering Operation Seafarer was in a healthy state, which permitted employment of the organiser for an additional six weeks, and the transfer of £125 to help finance the Report. It was thought that the auditors' fees should be met from this account, since without it a professional audit would be considered unnecessary. The large expenditure on travelling expenses was explained partly by the attendance of the Irish member at meetings (financed in part by the British Trust for Ornithology) and partly by the attendance of the Chairman on the Advisory Committee of the Research Unit (also partly met from other sources). It was noted that the Group's subscription income was falling, probably partly due to the present hard times and partly to the recent fall in activity while we digest past results, but we hope to introduce new activities soon associated with a membership drive.
4. In the absence of alternative nominations, the nominees put forward by the Committee, Messrs W. R. P. Bourne, J. Crudass, T. R. E. Devlin, G. M. Dunnet, O. J. Merne and J. L. Parslow, were declared to be elected from the Chair.
5. Other business: It was concluded on reviewing the discussion of future research during the preceding open meeting that while the Group was at present solvent and should make a modest profit from the "Seafarer" book, there was need for the development of further activities and the recruitment of more members to participate in them. Mr. P. F. Bonham remarked that there was a need for more publications to maintain the interest of members, while Mr. T. R. E. Devlin remarked that owing to lack of news some seawatchers were losing interest. It was pointed out that another Report was already in press and should have been circulated before the meeting, while now it was hoped to send round a circular reporting the outcome with it. It was agreed that more circulars should be sent round to keep Members in touch and interest them in any proposed new activities. We hoped that members would feel free to put forward suggestions for them, and to offer to help organise them.

The official business was preceded by a short talk by C. K. Mead on auk ringing recoveries, and followed by two more by W. R. P. Bourne on the work of the research unit at sea off the north of Scotland, and J. L. F. Parslow on investigations of the occurrence of toxic chemicals in seabirds at Monks Wood Experimental Station.

Balance Sheet as at 31st October, 1970.

1969					
£	£	GENERAL FUND	£		
		Income and Expenditure Account—			
160		Balance 1st November, 1969 ...	258		
98		Surplus for year — ...	230		
	258			488	
		CENSUS FUND			
		Income and Expenditure Account—			
1,591		Balance 1st November, 1969 ...	1,443		
(148)		Surplus (Deficit) for year ...	446		
	1,443			1,889	
	<u>£1,701</u>			<u>£2,377</u>	

Represented by:—

		GENERAL FUND			
		Current Assets—			
205		Balance at Bank—Current Account ...	410		
127		Deposit Account ...	244		
			<u>£654</u>		
<u>£332</u>					
		Less:			
		Current Liabilities—			
58		Creditors ...	84		
—		Amount due to Census Fund ...	82		
16		Subscriptions in Advance ...	—		
			<u>£166</u>		
<u>£74</u>					
	258			488	

		CENSUS FUND			
		Current Assets—			
113		Balance at Bank—Current Account ...	—		
1,247		Deposit Account ...	1,830		
—		Amount due from General Fund ...	82		
83		(Cash in Hand) ...	87		
			<u>£1,999</u>		
<u>£1,443</u>					
		Less:			
		Current Liabilities—			
—		Bank Overdraft ...	110		
	1,443			1,889	
	<u>£1,701</u>			<u>£2,377</u>	

GENERAL FUND

Income and Expenditure Account for the year ended 31st October, 1970.

1969	£	£	INCOME	£	£
161			Subscriptions—Current year	128	
13			Previous year	20	
4			In advance	1	
		178			149
		7	Donations		7
		13	Sales of Bulletin		4
		20	Grants		25
		6	Deposit Account Interest		9
		—	Influenza Grant		209
		<u>224</u>			<u>403</u>
			EXPENDITURE		
			Administration Expenses—		
16			Postage	10	
2			Telephone	10	
32			Printing and Stationery	7	
—			Sundry Expenses	6	
26			Audit and Accountancy	—	
				<u>33</u>	
76			Costs of Bulletin	—	
43			Committee Travelling Expenses	8	
7			Influenza Research	132	
		<u>126</u>			<u>173</u>
		<u>£98</u>	EXCESS OF INCOME OVER EXPENDITURE		<u>£230</u>

CENSUS FUND

Income and Expenditure Account for the year ended 31st October, 1970.

1969	£	£	INCOME	£	£
2,300			Grants—World Life Fund	2,300	
—			Scottish Ornithologists'	100	
—			British Ornithologists' Union	100	
—			British Trust for Ornithology	25	
50		2,350	West Wales Naturalist Trust		2,525
		50	Donations		—
		72	Deposit Account Interest		50
		<u>2,472</u>			<u>2,575</u>
			EXPENDITURE		
1,276			Organiser's Fee	1,318	
367			Travel and Subsistence	238	
550			Grants paid out	304	
			Administration Expenses—		
69			Postage	44	
47			Telephone	33	
264			Printing and Stationery	136	
—			Audit and Accountancy	26	
47		2,620	Sundry	30	2,129
		<u>(148)</u>	EXCESS OF INCOME OVER EXPENDITURE		<u>£446</u>
			(DEFICIT)		

We have examined the accounts set out on pages 59 to 60 and have compared them with the relevant books and vouchers, and certify them to be correct and in accordance therewith.

28 Ely Place, LONDON, E.C.1.

TANSLEY WITT, MILLER PRIDEAUX
Chartered Accountants.

Balance Sheet as at 31st October, 1971.

1970	£	GENERAL FUND	£	£
		Income and Expenditure Account—		
258		Balance 1st November, 1970	488	
230		Surplus (Deficit) for year	(85)	
	488			403
		CENSUS FUND		
		Income and Expenditure Account—		
1,443		Balance 1st November, 1970	1,889	
446		Surplus (Deficit) for year	(1,189)	
	1,889			700
	<u>£2,377</u>			<u>£1,103</u>
		Represented by:—		
		GENERAL FUND		
		Current Assets—		
410		Balance at Bank—Current Account ...	3	
244		Deposit Account ...	261	
—		Amount due from Census Fund ...	249	
			<u>£513</u>	
£554				
		Less:		
		Current Liabilities—		
84		Creditors	110	
82		Amount due to Census Fund ...	—	
			<u>£110</u>	
166				403
	488			
		CENSUS FUND		
		Current Assets—		
—		Balance at Bank—Current Account ...	308	
1,830		Deposit Account ...	639	
87		Cash in Hand	2	
82		Amount due from General Fund ...	—	
			<u>£949</u>	
£1,999				
		Less:		
		Current Liabilities—		
110		Bank Overdraft	—	
—		Amount due to General Fund ...	249	
	1,889			700
	<u>£2,377</u>			<u>£1,103</u>

GENERAL FUND

Income and Expenditure Account for the year ended 31st October, 1971.

1970	£	£	INCOME	£	£
128			Subscriptions—Current year	111	
20			Previous year	1	
1			In advance	28	
		149			140
7			Donations	3	
4			Sales of Bulletin	15	
25			Grants	125	
9			Deposit Account Interest	17	
209		254	Influenza Grant	—	
					160
		403			300
			EXPENDITURE		
			Administration Expenses—		
10			Postage	17	
10			Telephone	—	
7			Printing and Stationery	26	
6			Sundry Expenses	16	
					59
33			Cost of Bulletin	285	
—			Committee Travelling Expenses	41	
8			Influenza Research	—	
132		173			£85
			EXCESS OF INCOME OVER EXPENDITURE		
			(DEFICIT)		£(85)
		£230			

CENSUS FUND

Income and Expenditure Account for the year ended 31st October, 1971.

1970	£	£	INCOME	£	£
2,300			Grants—World Wild Life Fund	—	
100			Scottish Ornithologists' Club	—	
100			British Ornithologists' Club	—	
25			British Trust for Ornithology	—	
—			Irish Wildlife Conservancy	100	
		2,525			100
		50	Deposit Account Interest		49
		2,575			149
			EXPENDITURE		
1,138			Organiser's Fee	955	
238			Travel and Subsistence	120	
304			Grants paid out	155	
			Administration Expenses		
44			Postage	26	
33			Telephone	13	
136			Printing and Stationery	39	
26			Audit and Accountancy	26	
30			Sundry	3	
—			Bank Charges	2	
		2,129			1,338
			EXCESS OF INCOME OVER EXPENDITURE		
			(DEFICIT)		£(1,189)
		£446			

We have examined the accounts set out on pages 61 to 62 and have compared them with the relevant books and vouchers, and certify them to be correct and in accordance therewith.

28 Ely Place, LONDON, E.C.1.

TANSLEY WITT, MILLER PRIDEAUX
Chartered Accountants.

SCIENTIFIC NAMES OF BIRDS MENTIONED IN THE REPORT

Great Northern Diver <i>Gavia immer</i>	Long-tailed Skua <i>Stercorarius longicaudus</i>
Black-throated Diver <i>Gavia arctica</i>	Great Black-backed Gull <i>Larus marinus</i>
Red-throated Diver <i>Gavia stellaris</i>	Glaucous Gull <i>Larus hyperboreus</i>
Fulmar <i>Fulmaris glacialis</i>	Lesser Black-backed Gull <i>Larus fuscus</i>
Cory's Shearwater <i>Calonectris diomedea</i>	Herring Gull <i>Larus argentatus</i>
Sooty Shearwater <i>Puffinus griseus</i>	Common Gull <i>Larus canus</i>
Manx Shearwater <i>Puffinus puffinus puffinus</i>	Audouin's Gull <i>Larus audouini</i>
Balearic Shearwater <i>Puffinus p. mauretanicus</i>	Black-headed Gull <i>Larus ridibundus</i>
British Storm-petrel <i>Hydrobates pelagicus</i>	Mediterranean Gull <i>Larus melanocephalus</i>
Wilson's Storm-petrel <i>Oceanites oceanicus</i>	Little Gull <i>Larus minutus</i>
Gannet <i>Sula bassana</i>	Kittiwake <i>Rissa tridactyla</i>
Cormorant <i>Phalacrocorax carbo</i>	Caspian Tern <i>Hydroprogne tschegrava</i>
Shag <i>Phalacrocorax aristotelis</i>	Common Tern <i>Sterna hirundo</i>
Velvet Scoter <i>Melanitta fusca</i>	Arctic Tern <i>Sterna paradisaea</i>
Common Scoter <i>Melanitta nigra</i>	Little Tern <i>Sterna albifrons</i>
Goosander <i>Mergus merganser</i>	Royal Tern <i>Thalasseus maximus</i>
Red-breasted Merganser <i>Mergus serrator</i>	Lesser Crested Tern <i>Thalasseus bengalensis</i>
Eider <i>Somateria mollissima</i>	Sandwich Tern <i>Thalasseus sandvicensis</i>
Brent Goose <i>Branta bernicla</i>	Black Tern <i>Chlidonias nigra</i>
Oystercatcher <i>Haematopus ostralegus</i>	Whiskered Tern <i>Chlidonias hybrida</i>
Curlew <i>Numenius arquata</i>	Razorbill <i>Alca torda</i>
Whimbrel <i>Numenius phaeopus</i>	Common Guillemot <i>Uria aalge</i>
Redshank <i>Tringa totanus</i>	Brünnich's Guillemot <i>Uria lomvia</i>
Spotted Redshank <i>Tringa erythropus</i>	Black Guillemot <i>Cephus grylle</i>
Great Skua <i>Catharacta skua</i>	Puffin <i>Fratercula arctica</i>
Pomarine Skua <i>Stercorarius pomarinus</i>	Little Auk <i>Alle alle</i>
Arctic Skua <i>Stercorarius parasiticus</i>	Rock Pipit <i>Anthus spinoletta</i>

THE SEABIRD GROUP

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

Work at the breeding stations

This includes a national census of breeding seabirds, "Operation Seafarer", in 1969, the results of which are due to be published in a book in December, 1973, continuing sample censuses at representative sites, continuing surveys of the distribution of problem groups such as the terns and petrels, and individual investigations of breeding behaviour.

Investigations of the distribution of birds at sea

These include observations of passing birds from the shore ("sea-watching"), enquiries into invasions of such species as the Great Shearwater, in the past a series of trial voyages to investigate the distribution of birds at sea, and currently a study of the ecology of birds at sea supported by the Natural Environment Research Council and based at Aberdeen University. It is hoped that this will lead to a further programme of cooperative investigations of the life of birds at sea.

Surveys of bird mortality on beaches

Since bird bodies float and are comparatively durable, their appearance on beaches provides good evidence of the hazards affecting birds and often other animals as well at sea. The Group cooperates with surveys of oil pollution and bird mortality along the shore organised by the Royal Society for the Protection of Birds, which now cover most coasts of Britain and Ireland simultaneously with other observations along the continental coasts. These surveys provided the main evidence for the number of birds killed in the Torrey Canyon oil pollution disaster, the birdkill in the Irish Sea in the autumn of 1969 which helped direct attention to the increasing pollution of the sea with polychlorinated biphenyls and other toxic chemicals, and numerous other incidents; the results are reviewed annually in the R.S.P.B. journal "Birds". Together with the sample breeding census, this enquiry provides a regular measure of the productivity and mortality, and consequently the change in numbers, of our seabirds.

The Seabird Report and Circular and the Annual General Meeting

The work of the Group was originally reported in seven cyclostyled Seabird Bulletins. Serious contributions are now published in a single annual printed Report, and current news in cyclostyled circulars. The Editors welcome appropriate contributions, which in the case of the Report should preferably be typed with double spacing and wide margins on one side of the paper only. The Annual General Meeting is normally held at the British Trust for Ornithology's Annual Ringing and Migration Conference in January, where members contribute some of the talks.