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Mortality in British Gulls

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SINCE 1967, recoveries of ringed birds reported to the BTO have been filed both as typewritten copies of the report sent to both ringer and finder, and in the form of 80-column punch cards. This paper reports a pilot study of the potential uses of the punch cards to monitor some recovery circumstances on a regular basis. Thus the results should be taken as a baseline against which future changes may be measured, rather than as definitive in themselves. Recoveries of birds ringed as nestlings in Britain and Ireland, and reported during the period 1967-1973, were scanned for the following species: Great Black-backed Gull *Larus marinus*, Lesser Black-backed Gull *L. fuscus*, Herring Gull *L. argentatus*, Common Gull *L. canus*, Black-headed Gull *L. ridibundus*, and Kittiwake *Rissa tridactyla*.

Only for Black-headed, Herring and Lesser Black-backed Gulls were recoveries available in sufficient quantity to permit an annual assessment, and even in these species decreasing ringing effort in the last few years has led to what may be considered an insufficiency of recoveries for annual inspection. As an example of the lack of variation between years, Table I shows the results year by year for the primary cause of death analysis of adult Black-headed Gulls.

TABLE I. ANNUAL PROPORTIONS (%) OF ADULT BLACK-HEADED GULL RECOVERIES TABULATED UNDER NINE PRIMARY HEADINGS

Year *heading*	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*sample size*
1967	0	12	0	3	71	5	9	0	0	*65*
1968	0	5	0	4	73	4	13	0	1	*83*
1969	1	2	0	1	69	6	16	0	5	*86*
1970	1	4	0	2	72	8	10	1	2	*125*
1971	1	3	0	1	74	1	17	0	1	*87*
1972	1	5	1	1	79	0	12	0	0	*82*
1973	0	7	0	3	67	7	17	0	0	*60*

During the study period, climatic conditions remained broadly stable, the only atypical impacts recorded were the 'red tide' dinoflagellate bloom in north-eastern England in May 1968 and the culls of Herring and Lesser Black-backed Gull in the Firth of Forth, carried out in May of recent years by the Nature Conservancy Council. Recoveries resulting from these precisely-timed and located culls have been excluded from all calculations. In the other species, recoveries received during the seven-year period were bulked.

Using a punch-card counter-tabulator, the recoveries of birds ringed as nestlings and reported recently dead were selected for each species, before being divided initially into age classes:

(a) recovered in (calendar) year of ringing

(b) recovered in second calendar year after ringing

(c) recovered in third calendar year after ringing

Black-headed and Common Gulls were considered to breed for the first time in their third year, and for these two species recoveries during the third and subsequent years were analysed together.

(d) recovered in fourth calendar year after ringing

Kittiwakes were considered to be breeding adults in their fourth and subsequent years, which were bulked for analysis.

(e) recovered in fifth calendar year after ringing

Lesser Black-backed and Herring Gulls were considered to be breeding adults in their fifth and subsequent years, which were bulked for analysis.

(f) recovered in sixth calendar year after ringing

Great Black-backed Gulls were considered to be breeding adults in their sixth and subsequent years.

For each of the above, and for each species, a primary sort to determine cause of death was performed based on the Euring (column 51) code 0 = unknown, 1 = shot, 2 = taken intentionally, 3 = taken accidentally, 4 = found dead, 5 = animal, 6 = collision, 7 = weather, 8 = other. Secondary sorts (column 52) were carried out on 5, 6 and 8 to determine where possible the species of animal predator, or the nature of the collision or other cause.

Again for each age—and year—class, recoveries were sorted to indicate month of death, and to measure life span in months elapsed between ringing and recovery. For Herring, Lesser Black-backed and Black-headed Gulls, the recoveries received in each year were sorted into 'distance' classes—the geographical separation of points of ringing and recovery—of 0—9 km; 10—99 km; over 100 km within Britain and Ireland; and overseas. For the other three species, the entire intake of recoveries for 1967-1973 was examined in this way.

In summary, and for future reference, the following counter-tabulator sorts were made during the analysis:

Column		
50	Retain	1 (dead), 2 (fresh dead or dying), and 3 (decaying) except those with overpunch 11 (=long dead).
18	Retain	1 only (pulli).

Divide the remainder into three age classes: first year, immature and adult by sorting on column 39 (year of recovery) and then 23 and 24 (year of ringing).
For each age class sort on columns 51 and 52 (cause of death), 37 (month of recovery), 41 (place of recovery), to separate overseas recoveries and finally 57, 58 and 59 for distance travelled by those birds recovered in Britain and Ireland.

Table II gives annual nestling ringing totals. Average overall recovery rates vary from 2.3% for the Kittiwake to 6.0% for the Great Black-backed Gull. The decreasing ringing input on Black-headed, Herring and Lesser Black-backed Gulls must give rise to some concern that in future annual monitoring will not be possible. For all except the Herring Gull, recoveries received in the last three years have not exceeded 100, which might be considered as a minimum figure adequate for this task.

TABLE II. ANNUAL TOTALS OF NESTLINGS RINGED FOR SIX GULL SPECIES

	GBBG	*HG*	*LBBG*	*CG*	*BHG*	*K*
1967	503	9140	3734	232	7344	1971
1968	454	11312	4141	407	6708	1474
1969	595	4481	2882	310	4020	1279
1970	677	3992	2298	568	2570	1534
1971	862	2683	1144	617	2712	1101
1972	1111	3400	1205	761	1994	3229
1973	833	2137	726	1148	2355	2895

TIME OF DEATH

Figure 1 shows in histogram form the month of death of three age-groups of the larger gulls—first year, other pre-breeding years, and adults. The patterns are broadly similar: as might be expected from their earlier breeding season, peak post-fledging mortality appears in August for the Herring Gull compared with

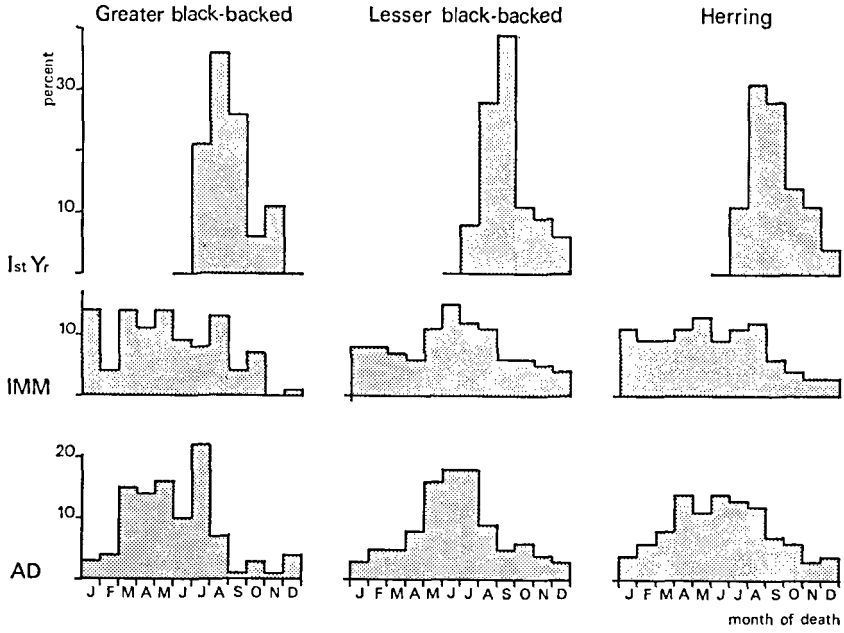


Figure 1. Pattern of seasonal mortality for different age-groups of three large gull species.

September in the Lesser Black-back, and in all cases winter mortality is low. The patterns for immature birds are irregular, with generally lower mortality in autumn and early winter months, and fairly uniform mortality in late winter and the summer months. For the adults, in all three species again, mortality appears highest during the breeding season. The earliest peak, in the Great Black-backed, conforms to that species' early breeding season, while the contrast between the sharper peak of the Lesser Black-back and the wide peak of the Herring Gull is associated with the truncation of the former's breeding season by migration periods, which do not affect the more sedentary Herring Gull. Again for all species, winter mortality as assessed by ringing is strikingly low.

For the three smaller species (Figure 2), first-year mortality patterns are broadly similar, with inexperience probably taking the major toll in the two months after fledging. There are insufficient Common Gull recoveries to allow investigation of immatures, and the Black-headed Gull pattern is broadly similar to those of the larger gulls, with perhaps a little more emphasis on winter recoveries. In the immature Kittiwake, there is a striking mid-summer peak, and closer examination reveals this to be composed almost entirely of birds shot off the coasts of Greenland, Labrador and Newfoundland. Wynne-Edwards (1935) commented on the change from pelagic to inshore waters of immature Kittiwakes in summer in the North Atlantic, and it may be that many of these recoveries

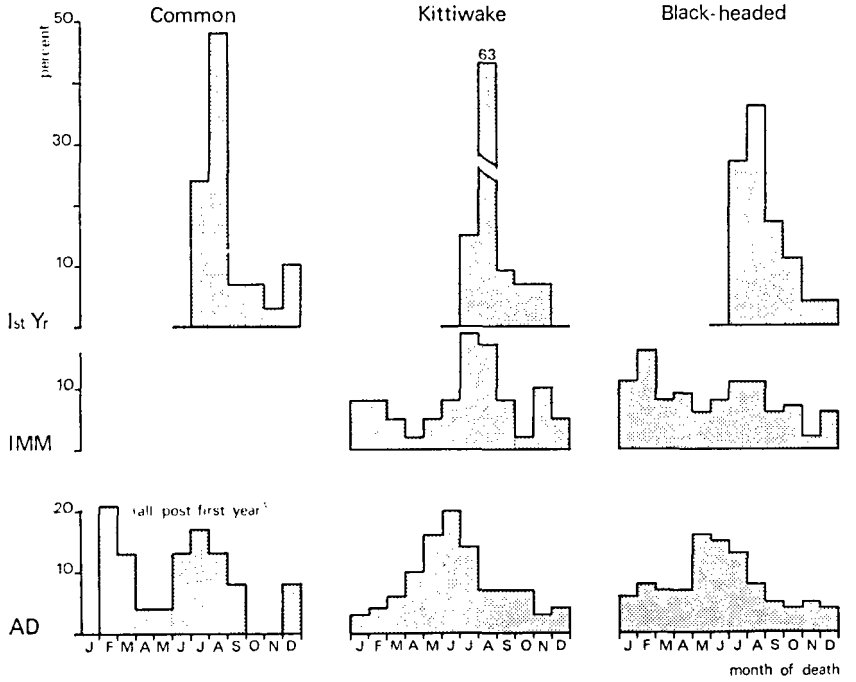


Figure 2. Pattern of seasonal mortality for different age-groups of three small gull species.

result from this move, being of birds shot for line-fishing bait. Alternatively, Peters and Burleigh (1951) say "They are easily shot, and are often caught on baited hooks. They are preferred for food above all other seabirds, and countless thousands must be killed about our coasts each year." Whilst Kittiwakes are pelagic, contacts with man are unlikely, and recoveries would not be expected in any numbers.

For the Common Gull, adult and immature (other than first year) recoveries have been bulked as numbers were small. The resulting histogram shows the only marked winter mortality peak—but more recoveries are necessary to determine whether this situation is real or due to chance.

In all three species there is a summer peak in adult mortality associated with the stresses of the breeding season, examined in greater detail for the Black-headed Gull in Flegg and Cox (1972 and 1975).

SURVIVAL PERIODS

One measure of survival is to determine the mean time elapsed between ringing the nestling and its recovery. A number of assumptions must be made, including the hope that the ringed bird is representative of the population as a whole, and that the same applies to the recovered bird despite the inevitable association of the recovery with man. Not least, one must assume that the ring is longer-lived than the bird: Coulson and White (1959) and Harris (1964) have shown otherwise for some of the rings in use at those times, thus these survival estimates should be regarded as minimal from this point of view. Any biases in such calculations may be reduced by a series of comparative studies, and the figures given here are intended solely as a baseline for future estimates to determine relative, rather than absolute, changes.

For each species, two figures are given in Table III: the first is an estimate of total life-span in months based on all recoveries from fledging, the second of total life span of those birds reaching breeding age—taken as two years in Black-headed Gull, three years in Kittiwake and Common Gull, four years in Herring and Lesser Black-backed Gulls and five in Greater Black-backed Gulls.

TABLE III. MEAN TOTAL 'LIFE-SPAN' IN MONTHS

	GBBG	*HG*	*LBBG*	*CG*	*BHG*	*K*
(a)	38	40	46	23	42	47
(b)	85	83	79	58	73	84

(a) all birds, (b) birds reaching breeding age

The pattern of mortality can be illustrated by 'extinction' curves: the time taken for a nominal population of 100 birds (with no recruitment) to become extinct (Figure 3). The three larger species have broadly similar patterns, with Great Black-backed and Herring Gull mortality somewhat higher in the early years, lower later, and Lesser Black-backed Gull rather the reverse. For the three smaller species, Kittiwake and Black-headed Gull show opposing trends, the higher later-years mortality of Kittiwake perhaps being an artefact due to the higher rate of ring wear (Coulson and White 1959). The Common Gull sample is too small for any accurate assessment.

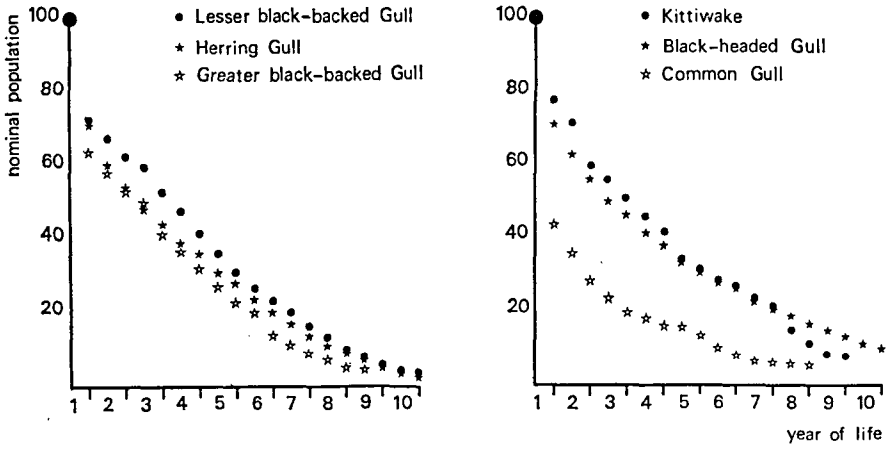


Figure 3. Year by year mortality in six gull species: disappearance of a nominal population of 100 birds without recruitment.

Average annual mortalities over the first six years of life derived from these data are 20% for Kittiwake, Black-headed and Lesser Black-backed, 24% for Herring, 25% for Great Black-backed and 34% for Common Gull.

CAUSES OF DEATH

The major problem with an analysis of causes for death (Table IV) is the swamping effect of the group returned as 'found dead' by the finders, with no useful detail. Overall this averages out at some 70% of recoveries, and the only markedly different figure is the 39% for immature Kittiwakes resulting from their presence in 'hostile' overseas waters for much of this period (see Time of Death).

Amongst first-year birds, Kittiwakes and Lesser Black-backs show the impact of persecution by man, and Black-headed and Common Gulls the greatest involvement in collisions with a variety of mobile or immobile, but inanimate, objects.

Generally speaking, the proportion killed by man is higher in the 'immature' years, when birds will be at their greatest distance from 'home' regions at all seasons. The average reported killed rises from the 7% of first year birds, of all species, to 20%. Kittiwakes and Lesser Black-backs, ranging into well-fished overseas waters (or in the case of the Kittiwake, to regions where they may be taken as food) are demonstrably more vulnerable. Here the bias due to an inevitable association of shooting with man may be offset by a reluctance on the part of the shooter to report killing a marked bird. Otherwise in this section of the table, the continuing high rate of Black-headed Gull collisions (mostly with vehicles and overhead wires, see Table V) is notable. The high 'other' figure for Kittiwake (here and when adult) reflects the impact of a 'red tide'—an outbreak of paralytic shellfish poisoning due to an unprecedented bloom of a dinoflagellate marine alga in the vicinity of the Farne Islands in 1968.

TABLE IV. PRIMARY CATEGORIES OF CAUSE OF DEATH 1967-73. TABULATED AS PERCENTAGES FOR EACH SPECIES AND AGE GROUP

	Unknown	*Shot or taken deliberately*	*Accidentally taken*	*Found dead*	*Killed by animal*	*collision*	*weather*	*other*
First Year								
BHG	1	6	1	72	3	17	0	1
K	0	10	4	78	0	4	2	2
CG	0	3	0	72	3	21	0	0
HG	1	4	1	83	1	10	1	2
LBBG	1	14	1	64	1	5	0	1
GBBG	0	4	2	85	0	6	0	2
Immature								
BHG	2	13	3	64	1	17	1	0
K	3	39	2	39	0	0	2	15
CG	—	—	—	—	—	—	—	—
HG	1	7	3	77	1	9	1	3
LBBG	3	27	3	77	0	7	0	5
GBBG	1	14	7	72	0	5	0	1
Adult								
BHG	1	5	2	62	4	13	0	2
K	3	12	1	71	1	0	0	12
CG	0	4	0	79	0	17	0	0
HG	1	9	4	76	1	9	1	1
LBBG	1	18	2	69	1	8	0	2
GBBG	0	20	1	73	0	4	1	0

Great Black-backed Gull deaths due to shooting rise steadily with age, and adult Kittiwakes and Lesser Black-backs continue to suffer under this heading, but overall, the proportion killed has dropped from that of younger age-groups to about 11%. Common Gulls (adults and immatures are lumped in this calculation) again feature with Black-headed as victims of collisions.

In Table V, deaths due to animals, collisions and 'other causes' are examined more closely. For each species these three groups are combined and the totals in each category expressed as percentages of the whole. It should always be borne in mind that these recovery categories constitute on average only 13% of the total recovery intake. The greater accessibility of many Black-headed Gull colonies is reflected in their vulnerability to mammalian predators (usually Foxes *Vulpes vulpes*), but the apparent avian predation on Common Gulls is based on a very small and thus unreliable sample.

TABLE V. BREAKDOWN OF DEATHS DUE TO ANIMALS, COLLISIONS, AND OTHER CAUSES 1967-73. ALL AGE GROUPS COMBINED. TABULATED AS PERCENTAGE FOR EACH SPECIES

	BHG	*K*	*CG*	*HG*	*LBBG*	*GBBG*
Animals						
Unknown	3	4	0	2	1	0
Cat	2	0	0	1	0	0
Dog	1	0	0	1	3	0
Wild Mammal	11	0	0	2	3	0
Bird of Prey	2	0	10	1	1	0
Collisions						
Road	37	0	80	32	30	17
Rail	4	0	0	8	4	8
Air	4	0	10	3	4	8
Building	1	0	0	1	0	0
Wires	31	8	0	33	36	50
Others						
Oil	4	58	0	13	11	17
Drowning	2	0	0	1	0	0
Red Tide	0	31	0	2	1	0
Poison	0	0	0	1	4	0
Sample size	194	26	10	172	70	12

The truly marine Kittiwake is the only species to escape considerable mortality due to collisions with vehicles and wires. The proportions of deaths in the other species are a reflection of how terrestrial they have become, and future analysis will be very interesting on this point. Flegg and Cox (1975) showed an increase from 8% in 1908-24, to 19% in 1946, 28% in 1953-68, and 35% in 1969-72 in recoveries in this category for the Black-headed Gull.

Oil features large only in the Kittiwake (and to a lesser extent in the Great Black-back)—another reflection of its marine existence. It should be noted that bodies can become oiled after death, thus this category is not precise. The impact of occasional naturally-occurring devastating phenomena is reflected in the deaths of primarily, Kittiwakes in the 1968 'Red Tide'.

DISTANCE TRAVELLED

Table VI gives for the six species the seven-year-average breakdown of recoveries into four distance classes. As the Kittiwake is a largely pelagic species the high proportion of overseas recoveries is to be expected, although overseas recoveries in the Great Black-backed—regarded generally as the most marine of the *Larus* gulls outside the breeding season—are surprisingly few. In future analyses it is likely that the proportion of long-range recoveries will be shown to have decreased still further as a reflection of the apparently increasing trend of this species to overwinter in association with refuse disposal.

TABLE VI. COMPARATIVE DISTRIBUTION OF RECOVERIES (%) IN FOUR DISTANCE CLASSES. MEAN VALUE 1967-73

	Under 9km	*10-99km*	*over 100km*	*overseas*	*sample size*
K	23	19	18	40	245
BHG	25	49	23	2	1033
CG	45	36	19	0	64
HG	18	53	27	2	1480
LBBG	15	38	15	32	783
GBBG	25	45	27	3	238

The Lesser Black-backed Gull has also been reported to be changing its migratory habits, many more birds overwintering in Britain and Ireland than previously (Barnes 1961, Hickling in prep.). Harris (1962) analysed recoveries for this species between 1909 and 1959. Although he considered birds ringed at any age, rather than restricting his analysis to nestlings, the number of Lesser Black-backed Gulls ringed after fledging is very small and unlikely to introduce any bias to a comparison of Harris' figures and those of today. He found that up to that date 50% were reported from overseas and concluded that the recoveries did not support the hypothesis of increasing overwintering. It would seem, however, that the present analysis figure of 32% *does* support the conclusion that a decrease in overseas movements has occurred.

TABLE VII. RECOVERY DISTANCE OF NESTLING HERRING GULL AS % OF TOTAL RECOVERIES IN THE YEAR

	under 9km	*10-99km*	*over 100km*	*overseas*	*Total*
1967	18	51	28	3	212
1968	17	52	29	2	213
1969	16	52	30	2	231
1970	18	50	28	4	225
1971	14	53	31	2	158
1972	24	55	20	2	184
1973	20	57	21	1	157
mean	*18*	*53*	*27*	*2*	
Provisional 1974	30	47	22	1	

Table VII examines year by year the recovery-distance pattern of the Herring Gull. After 1971 the uniformity is disturbed (and the same applies to the Lesser Black-backed Gull), with a drop in the proportion of longer-range recoveries. This trend is reinforced by the provisional figures for 1974. Since 1969, the numbers of nestling Herring and Lesser-backed Gulls ringed annually have been falling-- 1973 totals being less than 20% of 1968. In consequence the proportion of marked

older birds in the population has been increasing, and most surviving 1968 nestlings will have become breeding adults by 1972. The winter dispersal or migratory ranges of adults are probably considerably less than of immature birds (cf. Flegg and Cox, 1972), and adult gulls in general show strong trends to breed near their own birthplace (Harris 1962, Flegg and Cox 1972) so that average summer recovery distances will also become smaller as the proportion of old birds in the marked population increases.

ACKNOWLEDGEMENTS

The recoveries on which this report is based represent some of the results of hundreds of ringers, often working under difficult circumstances. Without them, our knowledge of the gulls—an interesting and highly important group of birds—would be much the poorer, and they deserve special thanks. Much monotonous effort, demanding concentration and accuracy, goes into the transformation of the letter reporting the finding of a ringed bird into our 80-column punch card; to those responsible at the BTO and our friends and colleagues at the Biological Records Centre, Institute of Terrestrial Ecology, Monks Wood, we also extend our thanks.

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