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Seasonal movements and dispersal in Finnish Herring Gulls Larus argentatus

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The paper reviews, on the basis of ring recoveries, the general patterns of seasonal movements in different age-classes of Herring Gulls ringed on the south coast of Finland. The Herring Gulls studied are true migrants which shift in winter into a survival area essentially non-overlapping with the breeding area. All age-classes utilize the same survival area in winter but the length of the utilization period varies. No differences seem to exist in area use between two populations studied. The area utilized in the breeding season by non-breeding gulls is large, comprising the winter survival area and also areas north of the main breeding concentrations. With increasing age, the total area used in summer decreases.

Newly fledged Herring Gulls disperse in various directions in early autumn and probably move more than adults. The shift into the winter survival area is very late both in adults and first year birds, but very early in second year gulls. Post-nesting movements of adults is difficult to detect since c. 20 % of the adults recovered during the breeding season are recovered > 100 km from their natal site.

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1. Introduction

The Herring Gull *Larus argentatus* is a sturdy generalist gull which, during the last century, has been highly successful over most of its Holarctic breeding range (Drury & Kadlec 1968). Along the Finnish coast, thriving colonies of this species appeared c. 50 years ago resulting eventually in a large population (Kilpi et al. 1980, Bergman 1982). Being highly colonial, the Herring Gull is well suited for mass-ringing, and up to date some 80 000 young have been ringed. In all, the ringing has so far yielded about 6000 recoveries (c. 7.5 %). Kilpi & Saurola (1983a, b, 1984) have analysed several aspects of Herring Gull movements with the aid of these recoveries. This paper summarizes the results obtained so far and serves as a general outline of the patterns of movement found in Finnish Herring Gulls during the year.

2. Materials

The results presented here are based on c. 3800 recoveries of Herring Gulls ringed as flightless young. The recoveries have accumulated between 1950–1981 with older material being omitted (fur further details see Kilpi & Saurola 1983a, b, 1984). The ringing has been carried out in two main areas; the Gulf of Finland (GF) at 60° N between 24° and 26° E, and in the Archipelago Sea (AS) at 60° N and 21° to 23° E. The GF population is the largest and densest found along the Finnish coast, while the AS population is smaller and the colonies lie more scattered. Within the GF area, ringing was already intensive in the 1960s, while sizeable samples from AS are available since the early 1970s.

3. Results

3.1. Movements of first-year birds

Post-fledging movements

First-year (1 yr) Herring Gulls leave the breeding colonies in July accompanied by their parents. Of the recoveries during the following months (August–October), a large proportion are from areas close to the natal colony (Table 1). Some young birds disperse over a wider area in various directions, with very few encountered outside the gross breeding area of the Finnish population south of 59° N (compare Fig. 3). The movements are primarily coastal but a notable fraction is recovered in inland areas (Fig. 2). The recoveries cluster around urban areas and the majority of the birds remain within 500 km of the natal colony (95.5 % of those moving W-N-E north of 59° N, $n = 977$ combined for GF and AS in August–October).

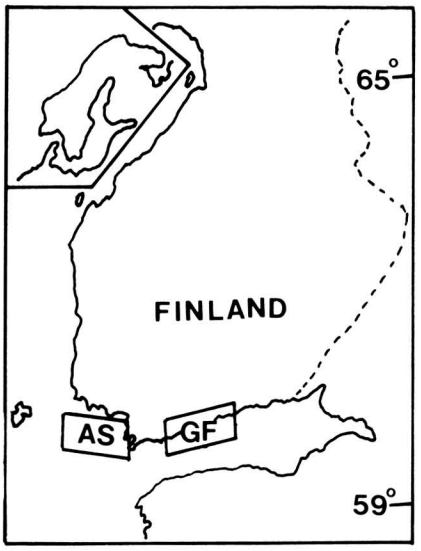

Fig. 1. Map showing the study areas.

Shift into winter survival area

The proportions of encounters in the area north of 59° N decreases rapidly in late autumn (Fig. 3). In December there is a clear shift in position to the southern part of the Baltic indicating a rapid shift from the fledging area to the winter survival area. Low numbers of recoveries in transitory areas between 58° N and 56° N support this (only 5.1 % of the October-November recoveries; $n = 401$, combined for GF and AS). Most 1 yr Herring Gulls utilize the southern part of the Baltic in winter, a few reach the North Sea, and some remain in, or close to, the breeding area of the Finnish population (Table 2). No spatial differences between winter recoveries of birds from GF and AS have been found in winter.

Areas exploited in summer by 1 yr birds

The 1 yr Herring Gulls studied here exploit a large area in summer. About half of the May recoveries come from areas south of 59° N (AS 53 %, $n = 21$; GF 45 %, $n = 21$) and in total 19.4 % (AS) or 24.7 % (GF) of all recoveries in May-July are reported from areas > 500 km from the natal site. The proportions encountered north of 59° N rises to 87 % (AS, $n = 16$) or 80 % (GF, $n = 25$) in July. The rise in this proportion from May to July indicates a late migration and arrival in the breeding area when breeding in adults is well underway. The distribution of recoveries in summer seems disjunct, with part of the birds remaining in the winter survival area and part returning to the natal area. Few recoveries have been reported in areas en route between these two areas. Of the 1 yr gulls returning to the natal area, about half are found within 100 km of the natal colony in May-July ($n = 57$ and 82, AS and GF, compare Fig. 5). The 1 yr birds returning to Finland, but found > 100 km from the natal site, are distributed roughly over the same area utilized by dispersing young in autumn.

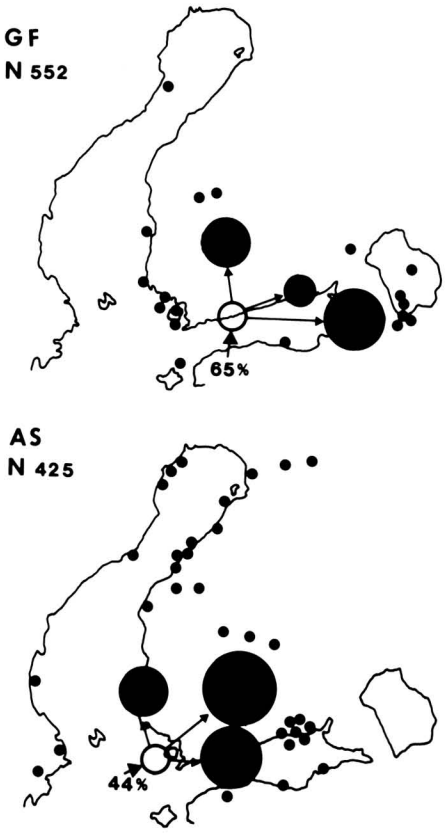

Fig. 2. Recoveries north of 59° N of 1 yr Herring Gulls in August-October. Small dots denote one recovery, larger dots denote several recoveries (area of dot proportional to the amount of recoveries). Two recoveries from the Norwegian coast, and one from the White Sea not shown. Compare also with Table 1.

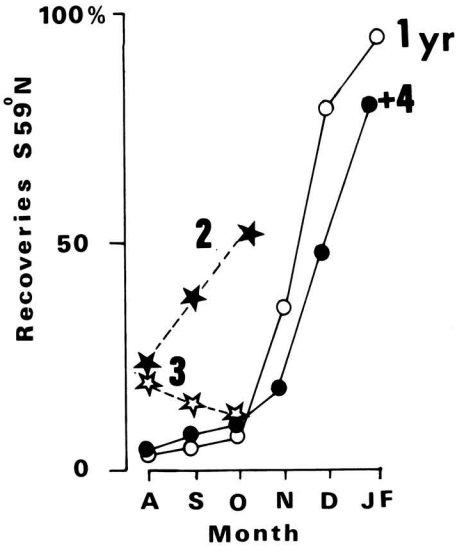

Fig. 3. The percentage of recoveries each month (August-January+February) made south of 59° N of Herring Gulls of different ages from the Gulf of Finland (GF). The graph illustrates differences in timing of departure from the gross breeding area. Note that the higher proportion of 2 yr and 3 yr gulls south of 59° N in early autumn is due to a number of birds not migrating back to the breeding area in summer. The material for 2 yr and 3 yr birds from November onwards is too small for analysis. Number of recoveries are as follows: 1 yr = 213, 204, 135, 70, 68, 69; 2 yr = 31, 27, 25; 3 yr = 13, 13, 16; +4 yr = 98, 61, 43, 29, 27, 43.

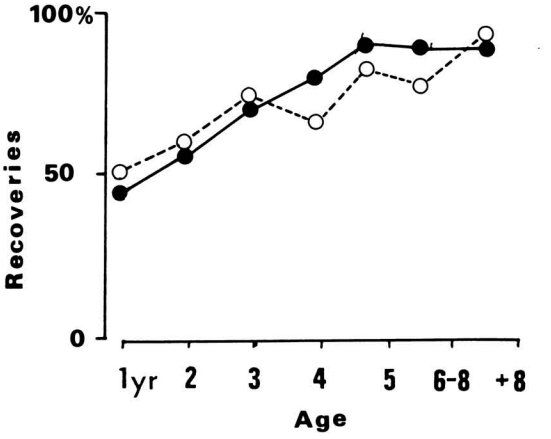

Fig. 4. Percentage of recoveries made within 100 km of the natal colony in May-July for different age-classes of Herring Gulls from the Gulf of Finland (GF, black symbols) and the Archipelago Sea (AS, open symbols).

Table 1. Recoveries (%) of 1 yr Herring Gulls in August-October from GF and AS. The proportion of recoveries made close to the natal site is significantly higher in GF gulls ($\chi^2 = 46.4$, $P < 0.001$, $df = 1$).

Population (recoveries)	Recovered <100 km from natal site	Dispersed >100 km north of 59° N	Recovered south of 59° N
GF (552)	65.5	23.7	10.8
AS (425)	43.8	44.9	11.3

Table 2. Winter (January + February) recoveries of 1 yr Herring Gulls from GF and AS.

Population	Recoveries	North of 59°	South of 56°
GF	69	15.9 %	72.5 %
AS	47	10.6 %	76.6 %

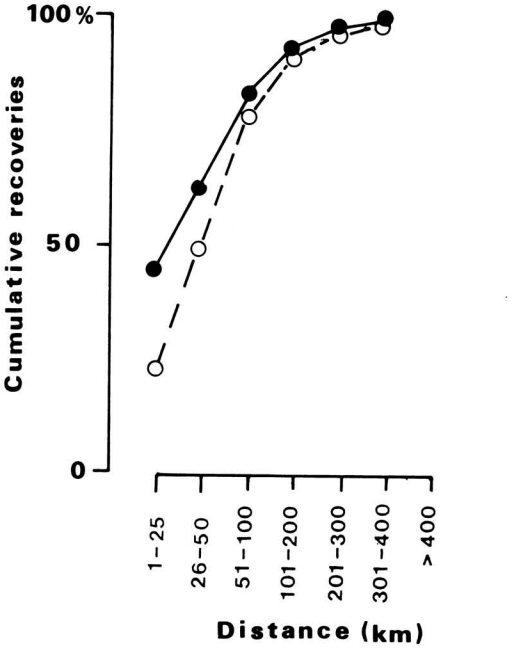

Fig. 5. Cumulative percentage of +4 yr Herring Gulls at various distances from the natal colony in May-June. Black symbols denote birds from the Gulf of Finland (GF), open symbols birds from the Archipelago Sea (AS).

3.2. Spatial distribution of older non-breeding age-classes

The recovery material so far analysed does not show any conspicuous differences in area used for survival during winter between 1 yr and older (2 yr, starting August 1 the second summer, 3 yr and 4 yr) non-breeding birds. The main differences are related to timing of movements. Departure from the breeding area in Finland is earliest in 2 yr Herring Gulls. Older immatures have progressively later autumn departure, resembling adults. Exploitance of the winter survival area is reduced temporarily compared with 1yr gulls, and the area used in summer is also reduced. The proportions of recoveries >500 km from the natal colony in May-July for 2 yr gulls is 10.4 % ($n = 55$) and 12.0 % ($n = 75$) for AS and GF respectively. The corresponding figures for 4 yr gulls are only 7.3 % ($n = 55$) and 4.1 % ($n = 97$) for AS and GF respectively. The area north of 59° N used by birds not exploiting areas close to the natal site is still roughly the same as in 1 yr birds.

3.3. Movements of adults

Herring Gulls on the Finnish south coast start breeding in normal years in the first half of April (Kilpi, unpublished). Two adults from GF (1.3 %, $n = 302$) and none from AS ($n = 78$) have been found in excess of 500 km from the natal site in May-June. A high proportion of the recoveries of +4 yr Herring Gulls are reported from areas <100 km of the natal site in May-June (Fig. 5), indicating that most are faithful to the general area of birth when breeding. Some birds seem to choose more distant areas (Fig. 5). The evidence is still far from conclusive, but the areas used by site-unfaithful adults coincide with the areas exploited by dispersing immatures both in autumn and summer suggesting a connection between locating suitable feeding grounds in non-breeders and subsequent selection of breeding area. Encounters of adults north of 59° N decrease later than encounters of 1 yr birds in autumn, suggesting very late shift into the winter survival area. No differences in the distribution of winter recoveries have been established between adults and other age-classes.

Post-breeding movements can not be rigorously followed with the present material. This is due to a fraction of the adults being unfaithful to their natal site when breeding. The spatial distribution of breeding season (May-June) recoveries is fairly similar to the distribution of autumn (August-October) recoveries. Preliminary results of trappings on large dumps in autumn suggest that the primary users of these are local breeding adults from within 20-60 km of the dumps. Adults probably do not disperse as widely as do 1 yr birds in autumn.

4. Discussion

The Finnish coastal Herring Gulls studied here are true migrants as defined by Lack (1968). Essentially there is little overlap between the breeding and the non-breeding areas. The separation of those two ranges is obligatory, since the breeding area cannot support gulls for at least part of the year. Movement, and migration in a broad sense ("migration is the act of moving from one spatial unit to another", Baker 1978), is a primary response to adversity (Gauthreaux 1982). Food shortage is probably the main adversity but it can be brought about by several different factors such as adverse weather or intraspecific competition and dominance (Gauthreaux 1982, Fretwell 1980).

The general outline of the migration and dispersal of Finnish Herring Gulls given here shows that their migration strategy is complex. The adults, tied to a certain schedule and a certain breeding locality, are the ones that show least variation both temporarily and spatially. This is an outcome of allocation of more time to reproduction (see Greenberg 1980). Herring Gulls have deferred maturity and during the first two years of life they are physiologically unable to breed. Even when able to breed, they may be forced to wait a few seasons before they can successfully establish a breeding territory in a colony (Coulson et al. 1982). The two youngest age-classes maximize survival and spend much time in the survival area outside the breeding concentrations from whence they originated. The factors influencing the spatial distribution of these pre-breeding birds are poorly known. What are, for instance, the gains in terms of survival in use of the main survival area during the breeding season as opposed to usage of the natal area? Juveniles possibly escape social dominance and competition for food near large breeding concentrations by staying in other areas. For older immatures, prospecting and finding a suitable colony is increasingly important. Thus the time spent in the breeding area increases with age. Experience of a larger area near breeding

concentrations may be important. Field observations indicate that immatures gather at sites where feeding opportunities are good and that they also exploit areas were the density of breeding adults is low. The inland area used by many dispersive first-year gulls (Fig. 2) is an area where the breeding population is currently low, but growing rapidly (Kilpi unpubl.). It would be of interest to know wether dispersive immatures using this area are those later responsible for the growing breeding population.

Although most adults seem to return to the natal site, or close to it, when breeding, a fairly large fraction of the birds is dispersive. Emigration may be a response to overt territoriality in densely inhabited areas. One of the benefits from dispersal could be the chance for reproduction at an earlier age (see Coulson et al. 1982) and also increased reproductive success. The benefits of dispersal are poorly understood which is unfortunate since site-in-fidelity is likely to be one of the main forces behind the evolution of migration (Alerstam & Enckell 1979). The fact that it is beneficial to leave the breeding grounds during the non-breeding season in the Herring Gulls studied here is merely an outcome of the advantages of dispersing to new breeding sites.

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