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Population and colony site dynamics in Black-headed Gulls *Larus ridibundus* breeding on the Finnish west coast

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Population and colony site parameters were examined in an inshore Black-headed Gull population over a period of 7 years. The population varied from 946 to 1445 pairs, but there was no significant difference in colony sizes between years. On average, the colonies contained 79–111 pairs each year. The gulls occupied a total of 24 breeding islands (26 colonies) in 7 years, which comprises 13% of the total islands in the study area. Each year 71–92% (mean 79%) of the colonies were situated in old sites, and 8–29% (mean 21%) in new ones. The most common reason for disappearance of colonies was overgrowth of the nesting islets, caused by manuring of the islands by the gulls.

1. Introduction

The development of the Black-headed Gull *Larus ridibundus* population in Finland has been characterized by a broadening of the breeding habitat distribution of the species and a rapid expansion northwards, parallelled by few other newcomers in the Finnish fauna (see von Haartman et al. 1963–72, Koskimies 1989, Ylkänen 1985). In fact, breeding Black-headed Gulls are nowadays found even on some of the most isolated offshore islands (my own observations; see also Fredrikson 1940, Hildén et al. 1978), although colonizing attempts in some extreme localities are known to have failed (Bergman 1953, Järvinen 1978, Kilpi 1984).

Locally, the Black-headed Gull is numerically dominant among the archipelago birds. For instance, in the Korsnäs archipelago on the Finnish west coast, about 6400 Black-headed Gull pairs were breeding in 46 colonies in summer 1988, their population being about 4.5 times as great as those of the second and third most common waterbirds (terns *Sterna* spp., 1445 pairs; Common Gull *Larus canus*, 1387 pairs) in the area (Ulfvens 1988a).

The Black-headed Gulls in Korsnäs were censused during the greater part of the 1980s. I performed the censuses in order to obtain descriptive data on the population development and colony site dynamics of the species. I was also interested in the overall effect of the gulls on the archipelago landscape and the waterbird community. Below, I try to use census data from a period of seven years to draw conclusions on the management and significance of larid colonies for bird protection.

2. Study area and methods

The study was performed in the Korsnäs inshore archipelago (approximately 69°49′N, 21°10′E) on the Finnish west coast. The area consists of two shallow bays, so-called *fjärds*, with a maximum depth of about 4 metres. These bays are sur-

rounded by numerous low moraine islets and some larger, wooded islands. Islands smaller than about 0.5 ha are usually low and treeless. The area is subjected to marked eutrophication (e.g. Sevola 1978, 1987), and dense reeds grow even on barren, stony shores (for details on the study area, see Ulfvens 1988b).

In the six seasons from 1983 to 1988, I counted all nests that I could find in each Black-headed Gull colony in the study area. I visited each colony once, usually in mid- or late May. In 1990, I performed a limited census, concerning only Black-headed Gull colonies, on the youngest treeless islets in the area (see also Ulfvens 1993).

The term "colony" here means two or more pairs on each breeding site. Single pairs were found in some years, but were excluded from the comparisons of colony numbers (Table 1). Likewise, I excluded some pairs whose nests I could not find within a reasonable time from the comparisons of colonies (however, these pairs are included in the total pair numbers; Table 1). In some cases (1–2 per year) I considered Black-headed Gulls nesting on two or several nearby islets to belong to one colony (see Bergman 1982, Fredriksson 1979); these islets were usually situated 5–20 metres from each other.

The nest counts most probably estimate the number of breeding larid pairs more accurately than a rapid count of the birds (see Haldin & Ulfvens 1987). In small colonies, up to say 150 pairs, the nests are easy to find and to count, but I am fairly sure that some nests in the largest colonies escaped notice; these colonies cover a large area and peripheral nests are sometimes difficult to find. The census result is therefore most probably an underestimate, but as there were approximately the same number of large colonies each year (i.e. 2–3), and the census method was the same throughout the study period, the annual results can be considered comparable.

Table 1. Some characteristics of the Black-headed Gull colonies found in Korsnäs in 1983–1988 and 1990. The census in 1990 was incomplete and concerned small islets only. In the column for total pair numbers, figures in parenthesis refer to single pairs or pairs whose nests were not found (explanation in the text).

Year	Total pair numbers	No. of colonies	Mean pair number per colony ± SD
1983	1115 (0)	13	85.8 ± 83.0
1984	1393 (0)	14	99.5 ± 104.7
1985	946 (0)	12	78.8 ± 52.6
1986	1186 (6)	14	84.3 ± 116.2
1987	1445 (0)	13	111.2 ± 151.5
1988	1292 (0)	13	99.5 ± 133.8
1990	222 (1)	9	24.6 ± 24.5

3. Results and discussion

3.1. Population changes and colony sizes

In 1983–1988, the total Black-headed Gull population in Korsnäs varied from 946 to 1445 pairs (Table 1). There was a marked decrease from 1984 to 1985, which could be related to the hard winter (e.g. Rinne 1989), as in 1985 other waterbirds in the study area also decreased in numbers (e.g. Ulfvens 1988b).

All in all, the Black-headed Gull population in Korsnäs does not show any steady decrease, as has been the case in some other populations of the species in Finland and Sweden (e.g. Risberg 1990, Saurola 1983, Ylkänen 1985). The total population in the Korsnäs archipelago, ca 6400 pairs in 1988 (Ulfvens 1988a), can be considered very numerous.

The number of colonies was fairly stable between years (Table 1). On average, the colonies contained 79–111 pairs in different years (Table 1), which is close to figures documented in the literature (see Fredriksson 1979, Götmark 1982, Ylkänen 1985). The average colony size increased significantly with increasing population size ($r^2 = 0.88$, $P < 0.01$). There was, however, no significant difference in actual colony sizes among the main study years 1983–1988 ($F = 0.15$, $df_1 = 5$, $df_2 = 73$, $P = 0.98$).

3.2. Characteristics of the colony sites

I found a total of 26 Black-headed Gull colonies on 24 different islands. The colonies occupied both small, treeless skerries and some wooded islands. In the latter case, the colony was always

situated on a treeless point. As the total number of islands in the study area is about 190, the larids at least once occupied 13% of the local islands. Of the total islands, 25 were forested, 25 had bushy vegetation and ca 140 were small and treeless islands.

The distributions of larid colonies among the three island types did not differ from random (χ^2 = 0.2, df = 2, P = 0.89). Thus there was no clear preference among the gulls for any of these island categories (see Fredriksson 1979; however, see also Helle et al. 1988).

There was a positive correlation between the sizes of the breeding islets and the numbers of Black-headed Gull nests, both regarding (A) average pair numbers during 1983–1988, and (B) maximum pair numbers (A: $r^2 = 0.60$, $P < 0.001$; B: $r^2 = 0.63$, $P < 0.001$). The positive correlation remained significant, when I excluded an outlier point concerning the largest colony in the study area (A: $r^2 = 0.23$, $P < 0.05$; B: $r^2 = 0.36$, $P < 0.01$).

3.3. Dynamics of the colony sites

In the years 1984–1988, the proportion of colonies established on previously used sites varied from 71% to 92% (mean 79%), while the proportion of new colonies ranged from 8% to 29% (mean 21%). There was no significant difference in these proportions between years ($\chi^2 = 1.7$, df = 4, P = 0.79). Thus, the same amounts of colonies were evidently old and new in each year, irrespective of changes in the Black-headed Gull population.

This observation is also supported by the fact that in 1985 and 1988, when the gull population had decreased from the year before, colonies not only disappeared but were also established in new sites (in 1985: 3 disappeared, 1 new; in 1988: 3 disappeared, 3 new). Thus population increases are not the only explanation of establishment of new colonies. In the main study years 1983–1988 there was a total of 23 colonies, and of these 12 (=52%) disappeared (4 of these were re-established after 1–2 years), whereas 10 (=43%) were certainly new (Table 2). Four colonies were occupied by the larids in all 6 years.

Turnover of colony sites is thus fairly clear, and of the 12 colonies which disappeared at least 9 most probably did so due to eutrophication and overgrowth of the breeding islets (see Fredriksson 1979), resulting in dense reeds even early in spring, which may prevent the larids from establishing a colony (e.g. Svärdson 1958). In areas such as the low, moraine archipelago in Korsnäs, dense larid colonies cause a marked change in the vegetation on the breeding islands (rapid growth of reeds, and disappearance of low herbs) as the ground is heavily manured by the birds. This change is related both to the exposedness of the colony site and to the population density (overeutrophication is most probable in dense or overpopulated colonies; see Bergman 1982). Some of the colony islets in Korsnäs are situated in very protected sites, for instance between larger islands. This promotes the increase of reed density, and ice movements and snow in the winter cause only minor changes on these islands.

In two cases disturbances by humans may have been responsible for the disappearance (there are summer cottages on the islands in question), and in one case only three Black-headed Gull pairs had associated with terns during one summer. Predation may also cause rapid disappearances of larid colonies (see Bergman 1986, Fredriksson 1979, Ylkänen 1985), but no observations pointing to this factor were made during the field work (the study area was subject to intensive observation during all years, see Ulfvens 1988b).

The disappearance of colonies usually occurred 3–4 years after establishment (Table 2). This suggests that the breeding skerries may not become overeutrophicated until the larids have spent some breeding seasons there. This pattern seems to hold true for very small islands in protected parts of the archipelago as well (sizes approximately 0.01–0.04 ha).

Two further observations deserve mention: 1) in some colonies which disappeared there was a very abrupt change in the number of pairs, i.e. from 105 or 160 pairs to 0 over one winter; 2) the newly established colonies usually increased in numbers over the years after establishment, in some cases even very sharply (Table 2).

The establishment of colonies in new and previously abandoned sites continued in 1990, when I found 3 colonies in new sites and 2 colonies in sites used 2–4 years earlier.

Thus the colony sites vary from year to year, but as the Black-headed Gulls re-establish colonies on islands they have once abandoned, the total proportion of islands occupied at least once by the colonies probably does not rise very much above the earlier mentioned figure of 13%, as long as the population does not increase markedly. Even in protected sites, the reeds may eventually be eroded by ice and snow, which allows repossession by larids (my own observations).

3.4. Concluding remarks

I have earlier pointed out that the Black-headed Gulls probably do not compete for food with many of the other waterbirds in the Korsnäs study area, as most Black-headed Gulls feed on land (Ulfvens 1988b, 1990). The Black-headed Gull colonies attract a large part of the other waterbirds in the area; in a study in which only small islets were considered, 88% of all the waterbirds present on such islets were found breeding in Black-headed Gull and tern colonies, or in colonies with both larid species (Ulfvens 1993).

Thus, Black-headed Gull colonies have a profound effect on both the archipelago landscape and the distribution of waterbirds, although the gulls do not compete directly with ducks and swans for food resources. The study also supports earlier findings that the Black-headed Gull has a broad habitat distribution (in this study no clear preference for any island type; see also Cramp & Simmons 1983), and that it is sensitive to certain changes on the breeding islets, which may even lead to abrupt disappearances of major colonies (see Bergman 1953, Järvinen 1978, Kilpi 1984).

From the point of view of conservation, the study allows several conclusions:

Firstly, as the Black-headed Gull colonies have profound effects on the distribution of waterbirds in the study area, a major part of all the waterbirds present in the area could be offered safe nesting sites by protecting a fairly small proportion of the islets, i.e. those occupied by Black-headed Gulls (see Ulfvens 1993).

Secondly, the manuring of the breeding islets no doubt causes an impoverishment of the vegetation, which may be considered undesirable. However, as the larid colonies occupy only a minor part of the islands in the study area, they

Table 2. Characteristics of the Black-headed Gull colonies which appeared or disappeared during the main study period 1983–1988. The pair number sequences refer to the number of breeding pairs in the six study years. See the text for further explanation.

Type of colony	Pair number sequence 1983–1988	Pattern / probable explanation
New	0–0–0–4–107–70	Increase
-"-	0–0–0–0–0–2	-"-
-"-	0–0–0–0–10–39	-"-
-"-	0–0–0–1–94–84	Increase + decrease
-"-	0–0–11–8–13–0 (?)	-"-
New, disappeared	0–13–72–66–51–0	-"-
-"-	0–0–0–90–0–0	Occasional + disturbance
-"-	0–14–0–36–5–7	Overeutrophication
-"-	0–0–0–3–0–0	Occasional in tern colony
Disappeared	300–305–92–0–0–0	Overeutrophication
-"-	52–50–105–0–0–2	-"-
-"-	160–0–0–0–0–0	-"-
-"-	60–56–0–0–0–0	-"-
-"-	30–70–70–7–0–88	-"-
-"-	45–75–4–0–4–0	-"-
-"-	8–9–0–0–0–0	-"-
-"-	50–0–0–50–80–82	Disturbance

do not, in general, seem to exert any major effect on the vegetation of the islands. Naturally, the effect should be quantified, and on islets with rare or endangered plants, larids could perhaps be prevented from establishing colonies.

Thirdly, as the presence of high reeds on inshore islands in spring seems to discourage the Black-headed Gulls from breeding, a suitable method of management might be to cut the reeds on such islands in winter (see also Ulfvens 1991). Such operations could entice the colonies to remain on certain islands and lessen the direct manuring of other islands.

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Sammanfattning: **Populationsdynamik och byten av häckningsskär hos ett bestånd av skrattmås i Österbotten**

Undersökningen behandlar utvecklingen av skrattmåsbeståndet i skärgården i Korsnäs kyrkoby i södra Österbotten under sju år. Beståndet varierade från 1115 par år 1983 till 1292 par år 1988 (variationsbredd 946–1445 par); år 1990 gjordes en ofullständig taxering. Antalet kolonier i området var 12–14 per år (Tabell 1).

Skrattmåsarna häckade på sammanlagt 24 skär under undersökningsperioden. Detta antal skär utgör 13% av hela mängden skär i undersökningsområdet. Varje år befann sig 71–92% (i medeltal 79%) av kolonierna på redan kända ställen, medan 8–29% (i medeltal 21%) av kolonierna var nya. Den allmännaste orsaken till att måsarna övergav ett häckningsskär var igenväxning, som förorsakades av den kraftiga gödsling som fåglarnas spillning leder till på de i regel små häckningsskären. Skrattmåsarna återetablerade sig i några fall på sådana skär som de tidigare övergivit. I några kolonier skedde försvinnandet mycket abrupt, så att parantalet sjönk från 100–160 par till 0 över en vinter (Tabell 2).

Skrattmåskoloniernas storlek korrelerade positivt med storleken på häckningsskären. Det fanns emellertid ingen signifikant skillnad i de enskilda koloniernas storlek mellan åren. I medeltal innehöll en koloni 79 till 111 par under olika år.

Naturskyddsbiologiskt kan man notera att en markant del av alla sjöfåglar i området häckar i skrattmåskolonierna. Sålunda kan man inom fågelskyddet nå klara optimeringsvinster genom att t.ex. skydda ett mindre antal skär med måskolonier.

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