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Migration patterns of adult and juvenile Lesser Black-backed Gulls *Larus fuscus* from northern Norway

Morten Helberg[1], Geir H. Systad[2], Ingve Birkeland[3], Nils H. Lorentzen[4] & Jan O. Bustnes[2,*]



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To explore migration patterns of Lesser Black-backed Gulls *Larus fuscus* breeding in northern Norway, this study presents resightings of 16 adult and 83 juvenile birds marked in this region. Adults of the endangered nominate subspecies *L. f. fuscus* had a low probability of being observed (only 3.5% of marked birds were observed), probably because the adults winter in areas with few observers, such as eastern and central Africa. In contrast, birds of the greyish-mantled subspecies *L. f. intermedius* or *L. f. graellsii* had a high probability of being observed (45.5%). Adults of *intermedius/graellsii* had a western migration route and wintered mainly in western Europe and northwest Africa. Adults exhibited a high site fidelity to wintering areas. Birds marked as juveniles had two different migration routes. (1) 30% of the observed birds crossed the Scandinavian Peninsula to Finland and the Baltic countries, and then migrated to the eastern Mediterranean (Israel and Egypt) down to eastern and central Africa (Kenya and Cameroon). (2) The other 70% followed the European coast and overwintered in UK, the Iberian Peninsula, Morocco, Mauritania and Senegal. There were no indications that juvenile migration patterns differed among subspecies as juveniles from mixed and pure *fuscus* colonies exhibited similar patterns. The apparent differences in migration patterns between adult and juvenile *fuscus* may be a result of juvenile exploratory migration.

Key words: migration, Norway, site fidelity, dispersal, gulls

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INTRODUCTION

In contrast to most other gull populations in northern Europe, the Lesser Black-backed Gull *Larus fuscus* is a long-distance migrant that may winter as far south as central Africa (Cramp & Simmons 1983, Kilpi & Saurola 1984, Bakken *et al.* 2003, Bønløkke *et al.* 2006). Traditionally, Norway has been home to two subspecies of the Lesser Black-backed Gull; the black-mantled nominate *L. f. fuscus* in mid and northern Norway and the greyish-mantled *L. f. intermedius* in the south (Cramp & Simmons 1983). *L. f. fuscus* populations have declined during the last decades and the subspecies is now endangered all over its distribution range in the Baltic Sea and northern Norway (Bevanger & Thingstad 1990, Strann & Vader 1992, Hario *et al.* 1998, 2004). In contrast, the Norwegian *intermedius* population increased steeply during the 1980s and early 1990s (Lorentsen 2007), and since the late 1980s greyish-mantled Lesser Black-backed Gulls with a *L. f. intermedius* appearance have been found in colonies in northern Norway which were previously occupied solely by the nominate *fuscus* (Strann & Vader 1992, Bustnes *et al.* 2006). It is not known whether these new birds originate from expanding *intermedius* colonies in southern Norway, or from colonies of a third subspecies, *L. f. graellsii*, which has increased in the North Sea area and in Ireland (Creme *et al.* 1997, Garthe *et al.* 1999), as these two subspecies are difficult to distinguish.

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A large number of ring recoveries of Norwegian *intermedius* have consistently shown that they predominantly winter around the Iberian Peninsula, in the western Mediterranean, and down to Morocco and Mauritania (Bakken *et al.* 2003). The migration pattern and wintering areas of the Norwegian *fuscus* is, however, virtually unknown with only two recoveries from the Black Sea area being published. Based on these recoveries, it has been assumed that the Norwegian *fuscus* has a southeast migration (Bakken *et al.* 2003) in line with the Finnish and Danish *fuscus* populations for which a large number of recoveries have documented an eastern flyway through the Black Sea area and then south through the eastern Mediterranean, down the Rift Valley to freshwater systems in Ethiopia, Uganda and Kenya (Cramp & Simmons 1983, Kilpi & Saurola 1984, Kube *et al.* 2000, Hario *et al.* 2004, Bønløkke *et al.* 2006).

The aim of this study was to unravel the migration pattern of adult and juvenile Lesser Black-backed Gulls from northern Norway, and also to document whether *L. f. fuscus* and greyish-mantled birds show different migrations. To achieve these aims, a ringing program has been carried out in 12 colonies along the coast of northern Norway (Table 1).

STUDY AREA AND METHODS

We defined northern Norway as composed of the three northernmost Norwegian counties: Nordland, Troms and Finnmark (Fig. 1). In this region we marked birds in 12 colonies varying in size from two to 400 pairs (Fig. 1, Table 1). Nine of these colonies had a mixture of *fuscus* and *intermedius*/graellsii, while in three colonies only *fuscus* was breeding (Fig. 1, Table 1). In the mixed colonies there were about equal proportions of the black and grey-mantled subspecies (Table 1). The ringing program started in 2000 for an indefinite time. This study presents resightings from 2000 through early May 2008.

Adult birds were trapped during the incubation period in late June by using a walk-in nest trap. When caught, the birds were weighed, measured and equipped with alphanumeric colour rings and a metal ring. Colonies were visited a second time in late July to mark fledglings (>~300 g) with colour rings and a metal ring.

In colonies where both *fuscus* and greyish-mantled birds were found (Fig. 1), adults were determined to subspecies visually when birds were in the hand. Most birds were easily defined as black-mantled *fuscus* or greyish-mantled *intermedius/graellsii*. Juveniles could not be determined to subspecies. All resightings were opportunistic observations by different observers in many countries. Resightings in the breeding colonies are not covered in this study.

Migration routes were classified as eastern or western, with Denmark as a delineation point; birds observed east of Denmark were classified as eastern migrants while birds seen west of Denmark was classified as western migrants. When birds had been observed in

Table 1. Location of Lesser Black-backed Gull study colonies in northern Norway (see Fig. 1) with information on colony size and composition and marking effort.

Location	Number of breeding pairs	Population composition	Percentage of *L. l. fuscus*	Years of marking	Adults		Juveniles	
					Marked	Resighted	Marked	Resighted
Loppa	50	Mixed	40-60	2003-07	5	1	112	14
Nordfugløy	100	Mixed	40-60	2000-07	17	7	147	20
Sandvær	8	Mixed	40-60	2005-07	1	0	7	0
Musvær	20	Mixed	40-60	2007	0	0	32	3
Auvær	20	Mixed	40-60	2005-07	3	0	59	4
Eggløysa	8	Mixed	40-60	2003-07	1	0	13	1
Froholman	45	Mixed	40-60	2005-07	8	0	157	3
Lemmingvær	45	Mixed	40-60	2002-07	11	1	222	11
Svartskjæran	10	Pure	100	2005-07	3	1	26	1
Risøya	2	Mixed	50	2003	2	2	0	0
Måøya	25	Pure	100	2002	11	0	0	0
Horsvær	400	Pure	100	2005-07	137	4	509	26
Total	733				199	16	1284	83

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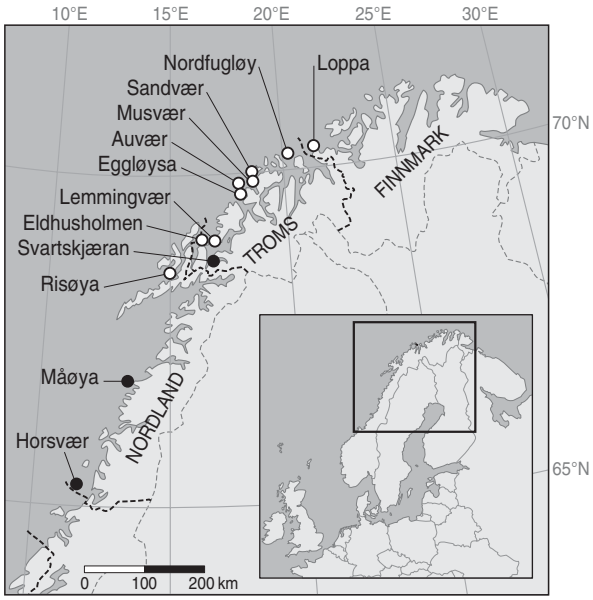


Figure 1. Study colonies of Lesser Black-backed Gulls in northern Norway. Open dots indicate colonies of mixed subspecies while black dots indicate pure *fuscus* colonies (see Table 1 for additional details).

more than one year or more than once in one non-breeding season, we selected the observation from the first year following ringing to construct Fig. 2. To classify winter areas we defined the overwinter period as 1 November through 31 March.

RESULTS

A total of 199 adults and 1284 juveniles were marked with colour-rings between 2000 and 2007. Sixteen (8%) of the adults and 83 (6.5%) of the juveniles were resighted outside the breeding colonies until early May 2008.

Birds ringed as adults

Of the 199 marked adults, 194 were classified to subspecies; 172 *fuscus* and 22 greyish-mantled birds. Of these, 3.5% of the *fuscus* and 45.5% of the greyish-mantled birds have been resighted outside the breeding colonies, respectively ($P < 0.0001$, Fisher exact test). When considering only mixed colonies (Fig. 1), the difference in resighting probability between subspecies was similar (45.5 vs. 4%; $P < 0.0012$, Fisher exact test).

One *fuscus* was seen in England and later that winter in Morocco, while another was observed in Portugal (Fig. 2). Evidence of eastward migration came from single birds seen in Israel, inland Central Norway, and in the Baltic Sea. The last bird was observed in southern Norway during spring migration (Fig. 2). Of the greyish-mantled birds, three were found in England, three on the Iberian Peninsula, and single birds in Morocco, Belgium, Italy and Libya (Fig. 2), demonstrating that these birds predominantly have a western migration.

Birds ringed as juveniles

There was a slightly higher probability of resighting juveniles from mixed colonies (7.5%, $n = 749$) than from *fuscus* colonies (4.9%, $n = 535$; $\chi^2 = 4.15$, $P = 0.048$). Juveniles were observed in 20 different countries; 30.1% of the resighted juveniles ($n = 83$) were classified as eastern migrants (observed in the inner parts of the Scandinavian Peninsula, in Finland, or in countries east of Denmark, Fig. 2), and 69.9% were western migrants (observed in the North Sea area, western Europe, down to western Africa, Fig. 2). The direction of migration was irrespective of the colony type (69.6% and 74.1% of juveniles were western migrants in mixed and *fuscus* colonies, respectively; $\chi^2 = 0.17$, $P = 0.68$).

Wintering areas

Twenty-nine juveniles from mixed colonies and 13 from pure *fuscus* colonies were resighted between 1 November and 31 March. The winter areas comprised 12 countries, with 83% of the birds resighted along the western migration route. There was no difference in routes between colony types; 23 (79.3%) juveniles from mixed colonies were found in the area between England/France and Mauritania, two in Italy, two in Israel and one in Cameroon (Fig. 2); from pure *fuscus* colonies, 11 (84.6%) were found between England and Senegal, while one was observed in Israel and one in Kenya (Fig. 2).

Seven greyish-mantled birds ringed as adults and four *fuscus* were resighted in winter areas. Birds were seen in western areas between Belgium and Morocco, apart from one greyish-mantled bird observed in Libya and one *fuscus* in Israel (Fig. 2).

Winter site fidelity seemed high in some of the adults; one of the *fuscus* was found at the same location in two winters following ringing, while of the six greyish-mantled birds observed in more than one year, five (83%) were seen at the same location. Two birds were observed at the same location in five consecutive years. Five juveniles from the same mixed colony were resighted in more than one winter, and all were observed at the same location; one in Italy, two in France and two in England.

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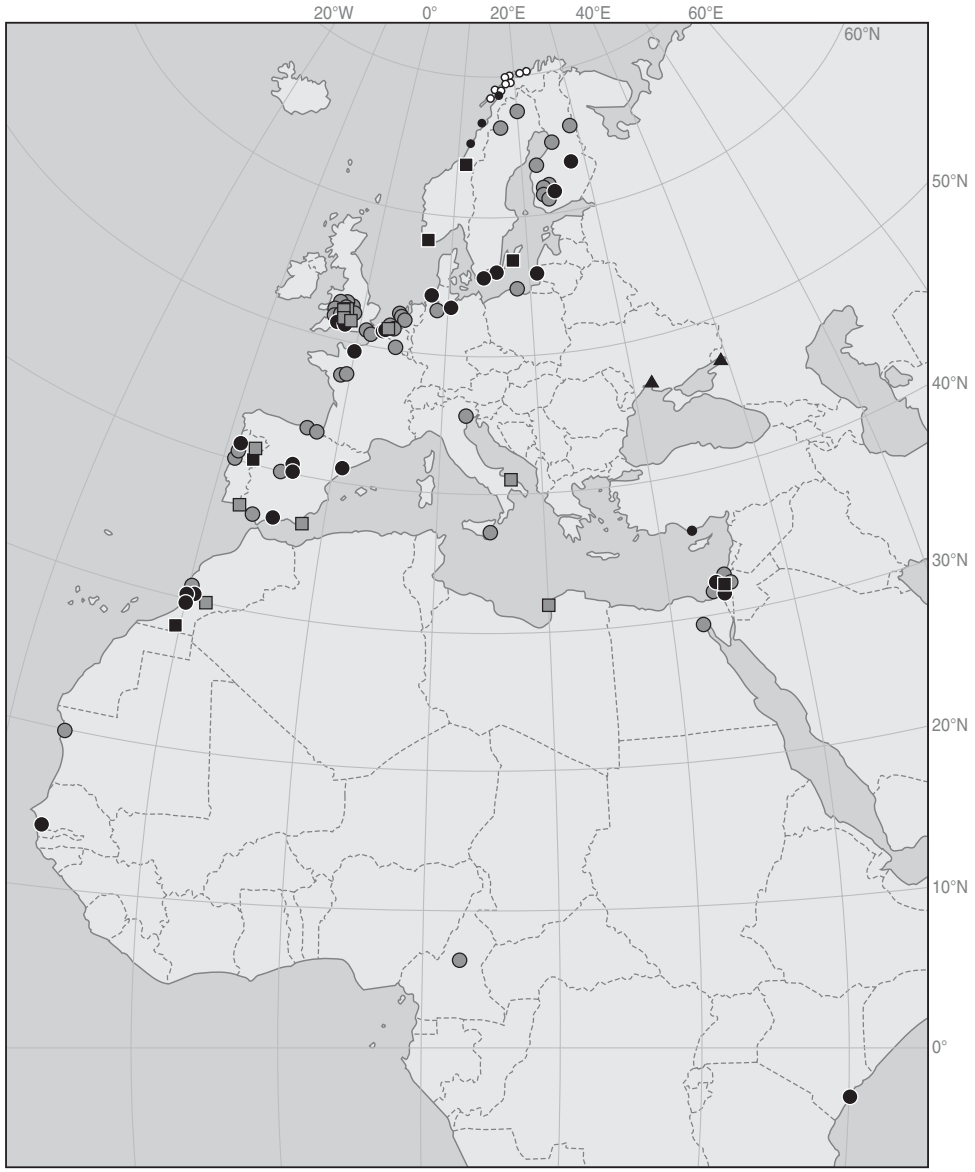


Figure 2. Resightings (one observation per bird) of Lesser Black-backed Gulls marked as adults (squares) or juveniles (circles) in the study colonies (small circles; Fig. 1) in northern Norway. Black squares refer to *fuscus* adults, grey squares to greyish-mantled adults. Black circles are birds marked as juveniles in pure *fuscus* colonies, grey circles are birds from mixed colonies (see Table 1). Black triangles denote previous recoveries of *fuscus* from Norway (from Bakken *et al.* 2003).

Summering areas of sub-adults

Thirteen one-year old birds (seven from pure *fuscus* colonies and six from mixed colonies; 1% of all marked juveniles) were resighted in summer (May to August). All birds were observed in western Europe, from Finland in the north to Belgium in the south. Of 246 juveniles colour ringed in a pure *fuscus* colony in 2005, four were observed in the summer of 2007; one in England, one in southern Norway and two in Finland.

DISCUSSION

This study is the first to document the migration patterns and wintering areas for different segments of the Lesser Black-backed Gull population in northern Norway. Greyish-mantled adults had a ten times higher probability of being resighted on migration or in winter than *fuscus* adults. The most likely explanation for this striking difference is that *fuscus* adults move to areas

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with few observers or stay in habitats where they are less likely to be observed, e.g. off-shore on freshwater lakes in eastern Africa. This is in accordance with the migration behaviour of *fuscus* from the Baltic Sea (Cramp & Simmons 1983, Kilpi & Saurola 1984, Kube *et al.* 2000, Hario *et al.* 2004, Bønløkke *et al.* 2006). There is also evidence of different migration routes and winter areas between *fuscus* and greyish-mantled birds from contaminant profiles; i.e. the ratio between DDE (a DDT metabolite) and PCB was higher in *fuscus* than in greyish-mantled birds (Bustnes *et al.* 2006), suggesting that the former were wintering in areas where DDE was the dominating compound, as in eastern Africa (Hario *et al.* 2004; Bustnes *et al.* 2006). Our resightings were too scarce to be conclusive about the migration route and wintering areas of adult *fuscus* as only one bird was seen along the eastern migration route (in Israel), and several individuals along the western route.

Forty-five percent of the marked greyish-mantled adults were resighted, most of them in western areas. This corresponds well with the previously established migration routes of *intermedius* from southern Norway and of *graellsii* from the UK and the southern North Sea (Cramp & Simmons 1983, Bakken *et al.* 2003, Galván *et al.* 2003). It thus seems that these greyish-mantled birds, which probably colonized northern Norway in the 1980s (Strann & Vader 1992), are keeping their traditional migration routes, seemingly different from most adult *fuscus* in the area. This is surprising since *fuscus* and *intermedius/graellsii* may be found in mixed breeding pairs (M.H. & J.O.B., pers. obs.).

The larger sample size of marked juveniles allowed to distinguish a clear dichotomy in the migration pattern; 30% of the observed birds were classified as eastern migrants and 70% as western migrants. As we suspect that the resighting probability is much lower for birds migrating to the east (see above) the actual proportion of juveniles migrating east must be higher than our observations suggest. Nevertheless, it is surprising that many *fuscus* juveniles (74% of the juveniles originating from a pure *fuscus* colony) had a western migration. This is different from the *fuscus* population breeding in the Baltic Sea, which has nearly an exclusive eastern migration (Cramp & Simmons 1983, Kilpi & Saurola 1984, Kube *et al.* 2000, Hario *et al.* 2004, Bønløkke *et al.* 2006).

Unfortunately we obtained only few repeated observations of the same juveniles over the years – in fact all five birds ringed as juveniles and resighted in more than one winter were from the same mixed colony. We can therefore not clear conclusions whether juvenile *fuscus* change their migration pattern from west to east as they grow older. Such a scenario might well be possible if sub-adults and adults migrate separately, and birds adopting the final migration route only at later age (Baker 1980, Galván *et al.* 2003). For example, Galván *et al.* (2003) found in the inner parts of the Iberian Peninsula mainly adult Lesser Black-backed Gulls were observed in more than one year, suggesting that young birds were moving to other areas. As we recorded that some adult *fuscus* followed a western migration route, it might be that these areas offer some benefits to wintering gulls, for example as a consequence of the proliferation of refuse tip and reservoirs in southwestern Europe (Galván 2003).

In conclusion, the nominate Lesser Black-backed Gull from northern Norway seems to have a migration pattern that is different from the pattern of *fuscus* from the Baltic Sea. Most striking difference is the importance of the western migration route for the Norwegian juveniles. Migration pattern of the northern greyish-mantled gulls is similar to the pattern described for *intermedius* breeding in southern Norway (Bakken *et al.* 2003) and the more southern *graellsii* (Cramp & Simmons 1983). More information about the migration routes of the North-Norwegian Lesser Black-backed Gull populations is needed, especially how they utilize the African continent in winter.

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SAMENVATTING

Twee ondersoorten van de Kleine Mantelmeeuw *Larus fuscus* broeden in het noorden van Noorwegen. Dat zijn de Baltische Mantelmeeuw *L. f. fuscus*, die de afgelopen decennia sterk in aantal afgenomen is, en de snel uitbreidende *L. f. intermedius/ graellsii* . Om het trekpatroon van de ondersoorten te onderzoeken zijn vanaf het jaar 2000 meeuwen in 12 kolonies langs de kust van Noorwegen gemerkt met kleurringen met een unieke code. De ondersoorten verschilden sterk in de kans om binnen een paar jaren terug gezien te worden. Voor adulte vogels van *fuscus* was dit 3.5% (n = 172) en voor *intermedius/graellsii* 45.5% (n = 22). Dit verschil werd toegeschreven aan de dichtheid van waarnemers die waarschijnlijk hoger is langs de trekroute en in het overwinteringsgebied van *intermedius/graellsii* (oostelijke Middellandse Zeegebied, oost en centraal Afrika) dan van *fuscus* (Engeland, de kust van de Atlantische Oceaan, het Iberisch schiereiland, Marokko, Mauritanië en Senegal). Van de 83 waargenomen vogels die als jong waren geringd, en waarvan daarom niet altijd bekend was tot welke ondersoort ze behoorden, werd 30% langs de oostelijke trekroute waargenomen, en 70% langs westelijke route. De herkomst van de jongen (afkomstig uit pure *fuscus* of gemengde kolonies) had geen effect op de verdeling, wat er op wijst dat het strikte verschil in trekroutes tussen ondersoorten zich pas op latere leeftijd ontwikkelt. (DH)

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