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Cover photo Little Stint Calidris minuta Estonia 22 September 2007 (c) Annika Forsten

Plumage development and ageing of Baltic Gull *Larus fuscus fuscus*

ANTERO LINDHOLM and ANNIKA FORSTEN

In this article we describe the plumage development and age-related plumage variation of Baltic Gull (nominate Lesser Black-Backed Gull) *Larus fuscus fuscus.* The material consists of gulls ringed in Finland as pullus and later photographed in the same country. We describe Baltic Gull as it is during the summer in Finland. Baltic Gull, in contrast to the other gull species of the area, does not moult very much in summer nor does the plumage develop much. We are not trying to reconstruct the moult and plumage development, which occurs in the winter quarters, which are mostly located in the tropics for this species.

This article concentrates on third calendar-year and older birds. During their birth year Baltic Gulls are easy to age, and the same is true for the majority of second-calendar year individuals. Information about the latter based on known-age individuals can be found in Rauste (1999) and Koskinen & Rauste (2006).

The primaries are numbered outwards. The age of the bird is noted in calendar-years, which is very convenient when concentrating on birds in the summer half of the year. The bird is in its second calendar-year, 2cy, in the summer when it is about one year old.

Material & Methods

For this article we studied over 1,000 photos of 366 different individuals of *Larus fuscus fuscus*. The photos were taken between 12 May 1999 and 2 August 2009, mostly at Tarastenjärvi landfill, Tampere, in South-Central Finland (61°33' / 24°00'), but some are from other parts of Southern Finland. The birds were photographed because the ring was seen, no other selection was made at the time. We estimated values for 39 variables describing the appearance of the birds (*cf* Appendix 1). Photos of the same individual taken during the same day have been combined as the same record, the photos from different dates have been kept separate. There were 577 records. Naturally, all variables were not seen for most of the records. In the majority of our analyses, any one individual has been taken into account only once for a year: the date when the biggest number of variables were seen– or the relevant variables

There are some caveats that should be remembered when evaluating photographs in general. The most problematic is that the views and lighting are variable and non-standardised. For example, all photos that show the moult limits on the wing of a bird cannot be included in the moult data – only the ones good enough so that the lack of moult limits would show in a similar photo.

Description of the age classes

2cy

During its second calendar-year, Baltic Gull is relatively easy to age. Second calendar-year birds quite rarely show a distinctly yellow base to the bill, 3cy birds always do. 2cy birds have no adult-like uniformly blackish mantle and scapulars, 3cy do. The eye of a 2cy bird has not yet become pale, in a 3cy it normally has. If there is a moult limit in the outer primaries of 2cy individuals, it is much more conspiciuous than in the primaries of normal 3cy birds (the outer primaries of 2cy birds are in this case worn juvenile feathers). Second calendar-year birds often show some streaking or other dark patterning on the nape, 3cy rarely. In addition, 2cy birds have no mirror on the outermost primary (or rarely a small one), while about 80% of 3cy birds have.

3cy

Baltic Gull is very variable in its 3cy summer aspect. The head is almost always white and unpatterned, as are the underparts. Very few show some slight streaks on the nape (2%, n=115). Most have adult-like scapulars (98%, n=112) or in sitting birds visible greater (75%, n=110), median (86%, n=113) and lesser (82%, n=113) coverts. A minority has distinctly brown greater coverts, more rarely also median and lesser coverts.

Typical for the age class is a conspicuous moult contrast on the outer primaries (on P5 - P10, that is the primaries visible on a sitting bird), which most individuals show. Three individuals (13%, n=23) of those whose wing moult could be studied on all primaries, did not show the moult contrast at all. In one the outermost new generation primary was P1 and in the other P4, so their moult contrast was not visible on the closed wing. The rest, 77% showed the contrast even on the closed wing. Among such birds, the outermost new generation primary was P5 (12%, n=66), P6 (33%), P7 (21%), P8 (24%) or P9 (2%). Otherwise, the primary pattern is adult-like in most birds, but some show uniformly blackish-looking outer primaries with no terminal or subterminal markings. The mirror on the outermost primary may be lacking (20%, n=60), or may be small (33%), or adult-like large (47%). On P9 a mirror is only rarely visible, in our material only in one of 26. *Cf.* also Table 1.

The underwing may be similar to an adult (44%, n=18), but the coverts, for example the primary coverts, often show some dark markings, but not much. The tail often shows some black, but not normally a uniform dark band (a complete or almost complete tail band in 12%, n=41). Quite often the tail is wholly white as in adults (44%).

The legs are most often distinctly yellow (78%, n=119), either bright yellow or slightly duller. The rest have legs which are reddish-tinged or almost without any noticeable tone. In our material, the bill was always yellow-based, and it always showed red on the gonys and often some black on the upper mandible (46%, n=105), less often a black band or tip (26%), and quite often it was

	3cy	4cy	5-7cy	8-10cy	11-16cy
P9 mirror n=	26	33	52	33	26
P9 mirror	4%	12%	23%	24%	19%
Innermost black n=	19	31	46	34	27
Innermost black P1	0%	0%	4%	0%	0%
P2	8%	13%	4%	9%	4%
P3	31%	38%	33%	41%	35%
P4	35%	39%	59%	50%	63%
P5	0%	0%	0%	3%	0%
Innermost band n=	26	29	48	35	27
Innermost band P3	0%	3%	0%	0%	4%
P4	27%	79%	60%	71%	77%
P5	46%	18%	19%	29%	19%

Table 1. Primary markings of Baltic Gulls. Innermost black refers to the innermost primary which still shows some black area subterminally. Innermost band refers to the innermost primary with a uniform black subterminal band reaching from edge to edge of the feather. Among 3cy birds, black markings were not at all visible in 27% of birds, which do not have wingtip markings developed to adult-like.

completely without dark markings. The eye was often adult-like (or slightly duller) yellow (68%, n=93), quite often variably dark-tinged (28%) and only rarely almost black.

4cy

Baltic Gulls in their fourth calendar year always have an adult-like white and unpatterned head (n=92). They show no subadult type brown on the coverts or scapulars. There is quite often a brownish tinge on some of the coverts or scapulars, especially in late summer, which the individuals of the older age classes may also show.

All primaries are normally of a similar colour tinge, without moult contrasts. Some have an active or suspended moult in the inner primaries during the summer. When all the primaries could be studied, four birds out of nine showed no moult contrast. In the remaining five birds, the outermost primary of the new generation was P1, P2 or P3 (among these were also two birds from May, which indicate that the moult commenced before the birds arrived in Finland). In addition to these, one bird with an incomplete set of primaries studied, had a clear moult contrast between P6 and P7, which would be very typical for a bird one year younger. The mirror on the outermost primary is normally quite large and almost reached both edges of the feather (92%, n=61), but can be smallish (8%). *Cf.* also Table 1.

The underwing-coverts are normally wholly white, one bird showed some black on the primary coverts and one other slightly more extensive markings on the underwing (n=12). The tail is almost always white (87%, n=23), or it may show some black markings (13%).

The legs are normally yellow (89%, n=93), but the yellow tinge may be lacking. The bill is yellow, but many have some black on the upper mandible (30%, n=89) and some have a greenish tinge in the yellow, especially in autumn.

Older age classes

There were birds from every age class until 16cy in the material. All older than 4cy were in adult plumage with the following details: gonys with red, bill base bright yellow, legs yellow (possibly dull yellow in older age classes too, however), underwing-coverts, head and tail wholly white, tertials, upperwing-coverts and scapulars adult-like, although coverts possibly with a brown tinge even in old age classes. Some black on the bill occurred in many age classes until 13cy, one 5cy and one 11cy showed dark spotting in the eye. However, Baltic Gull may show black markings on the tail even in 6cy (a photographed and ringed bird which was not included in our material, J. Haapala *in litt.*) In addition, one photographed 12cy which was not included in our material, had subadult type dark areas on the under primary coverts (M.Kangasniemi *in litt.*)

Adult birds may show a moult contrast in the inner primaries because of the winter moult, and during autumn they often moult some inner primaries before the migration. A 3cy-type moult contrast visible on the outer primaries occurred in two 5cy birds (P5 and P6 were the outermost new primaries) and one 6cy bird (P6). All older than 3cy birds showed a mirror on P10, but it was quite small in, for example, one 8cy and one 11cy bird. There is more variation in the other patterns of the wing, *cf.* Table 1. It can be seen that after 4cy there is hardly any further change in the pattern. Birds older than 2cy have almost always black on seven to nine primaries, only one individual with black restricted to six primaries and one with black on all ten. In all age classes, the most usual is that seven primaries show black markings.

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Aged as	Criteria	Remarks
1cy	Juvenile plumage, variable amount of scapulars moulted during the autumn.	All can be aged
2cy	Combination: bill not bright yellow, scapulars not adult like uniform blackish-grey, eye not yellow or pale yellowish, if there is a moult limit in the outer primaries, it is very prominent, no large mirror on P10.	Virtually all can be aged.
+2cy (older than 2cy)	Yellow bill with red on the mandible, adult-like scapular-covert – area.	Often practical age class in the field.
3cy	Combination: in a sitting bird, noticeable moult limit on outer primaries, underwing coverts with some black markings (for example, under primary coverts), tail with some black, upperwing-coverts with some brown feathers. If the last three characters not present, the bird can still be aged, if the eye has clearly darker areas and there is a band of black on the tip of bill. Also birds with no visible adult-like primary pattern (black subterminal areas, white tips and mirrors), are of this age.	Not all can be aged.
+3cy	Combination: white tail, adult-like lesser upperwing-coverts, no black on bill and no moult contrast between P5-P10.	Not all can be aged
4cy		Cannot be aged
+4cy		Old adult cannot be separated from young adult.

Photo 1. CJX3, 2cy, Typical for its age with a full set of post-juvenile primaries. (c) Annika Forsten, Tampere, 2 August 2009.

Photo 2. CHYE, 2cy. Different, but still quite a typical individual. The outermost primary is still juvenile. This bird fledged at Pälkäne 2002. (c) Annika Forsten, Tampere 7 June 2003.

Photo 3. CJJR, 2cy. Another example of normal (large) variation within the age class. This bird fledged at Kuhmalahti 2004. (c) Annika Forsten, Tampere 19 June 2005.

Photo 4. CZ07, 3cy. Typical advanced individual with the outermost primaries of an older generation. Extensive black on the bill is also a mark of a subadult. This bird fledged at Luopioinen 2005. (c) Annika Forsten, Tampere, 7 July 2007.

Photo 5. CJJR, 3cy. A less advanced bird with lots of subadult-coloured coverts and no yellow tinge on the legs. The same individual as in photo 2. (c) Annika Forsten, Tampere, 2 September 2006.

Photo 6. C6UA, 3cy. An advanced bird, impossible to age from this photo. The bird fledged at Kangasala 2004. (c) Annika Forsten, Tampere 6 August 2006.

Photo 7. C8CM, 3cy. An advanced bird. The combination of a small mirror on P10, moult contrast between P7 and P8 and black band on the bill is an indication of 3cy age. The bird fledged at Ruovesi 2001. (c) Annika Forsten, Tampere, 7 June 2003.

Photo 8. C04H, 4cy. Less advanced and quite untypical, impossible to age, easily mistaken for 3cy. Note almost uniform outer primaries without adult pattern, but small mirror on P10. No typical 3cy moult contrast, but P1 and P2 missing or growing. This bird fledged at Kangasala 2006. (c) Annika Forsten, Tampere, 4 July 2009.

Photo 9. C6UA, 4cy. Both plumage and bare parts fully adult. The same individual as in photo 6. (c) Annika Forsten, Tampere 7 July 2007.

Photo 10. CAJS, 4cy. In full adult plumage. Black on eight primaries with P4 the innermost with a complete black band. The bird fledged at Kangasala 2003. (c) Annika Forsten, Tampere, 3 June 2006.

Photo 11. C2NN, 9cy. This bird fledged at Kangasala 2001. (c) Annika Forsten, Tampere, 19 April 2009.

Photo 12. CE03, 13cy. This bird fledged in 1993 at Korpilahti. (c) Annika Forsten, Tampere, 13 April 2005.

Appendix 1. Studied variables,

Black colour on bill: 1. All black like juvenile, 3. Black tip, 5. Black band reaching both mandibles, possibly not much on the lower, 8. A small amount of black distally on the red gonys patch or on the tip of the upper mandible, no band, 9. No black, like full adult.
Colour of bill base: 1. Black or blackish, 2. Dull flesh colour or greenish 3. Dull yellow, 9. Yellow, like full adult.
Leg colour: 1. Dull reddish, like juvenile, 2. No yellow or red tinge, 6.Both yellow and red tinge,
8. Dull yellow, 9. Bright yellow, like full adult.
Eye: 1. Dark, pupil hardly discernible in the field, 3. Widely brown, 6. Yellow, but clearly dark-spotted or otherwise with dark tinge, 8. Dull yellow, 9. Yellow, like full adult.
Primaries 1-10: 1. Looking like brown, worn, juvenile feather, 4. Medium brown, 7. Dark brown,
8. Blackish or dark brownish slaty coloured, like adult, but more worn and faded, 9. Black or dark brownish slaty coloured. Like full adult.
Primaries 1-10: 1. At most a very faint whitish tip, 5. Very small, but clear-cut white tip, 8. Clear-cut white tip, but worn, 9. Clear-cut white tip.
Moult contrasts: Outermost primary of newer generation. (0 if no contrasts).
Moult contrasts: Innermost primary of older generation. (0 if no contrasts).
Primary 10 mirror: 1. No, 5. Small, but not reaching close to the edges of the feather or very narrowly close to the edge, 9. From edge to edge or close to.
Primary 9 mirror: 1.No 9.Yes
Innermost primary with black on the tip.
Innermost primary with complete black band subterminally
Underwing: 1. Most of the underwing-coverts patterned brown, 5. Some brown patterning on the underwing-coverts, 7. Brownish colour restricted to the primary coverts, 9. Underwing-coverts all white, like in full adult.
Head-neck: 1. Widely spotted or streaked (from crown to mantle), 5.Faintly spotted or streaked (on a narrow area), 9. White, like full adult.
Tertials: 1. Juvenile, 5. Postjuvenile, brown, patterned basally, white distally, 9. Blackish, white distally.
Greater coverts: 1. 90-100% of feathers brownish-patterned, 2. Over 90-100% of feathers subadult-like brown, 5. 10%-90% of feathers subadult-like brown, 7. Over 90% but not all of feathers adult-like blackish, 9. All adult-like blackish or brownish-tinged blackish, like full adult.
Median coverts: 1. 90-100% of feathers brownish-patterned, 2. 90-100% subadult-like brown, 5. 10%-90% subadult-like brown, 7. Over 90% of feathers adult-like blackish, but not all, 9. All adult-like blackish or brownish-tinged blackish, like full adult.
Lesser coverts: 1. 90-100% of feathers brownish-patterned, 2. 90-100% subadult-like brown, 5. 10%-90% subadult-like brown, 7. Over 90% of feathers adult-like blackish, but not all, 9. All adult-like blackish or brownish-tinged blackish, like full adult.
Scapulars: 1. All feathers distinctly brownish-patterned, 2. 90-100 % of feathers brownish, with pale edges, 3. 90-100% Uniformly coloured, distinctly brownish, 7. 90-100% uniformly coloured, with a grey tinge, like adult, but paler, more brownish, or with shaft-streaks, 9. All blackish, like adult.
Tail: 1. Juvenile-type with broad, complete band, 3. Complete or nearly complete band with white base, 7. Some widely black feathers, 8. Mostly white, some black on some feathers, 9. All white, like full adult.

Timing of primary moult in large gull taxa at five locations in Europe

ROSS AHMED, ANTERO LINDHOLM, ANNIKA FORSTEN and ALBERT CAMA

It has been suggested that large gulls of the genus *Larus* show differences in moult at different locations within Europe (Malling Olsen & Larsson 2004). Geographic variation in moult timing is said to be related to the timing of breeding and migration (Ginn & Melville 1983), which in turn is linked to environmental factors, such as daylight hours, climate, short-term weather conditions and food availability. Non-environmental factors affecting moult may include sexual differences.

Ginn and Melville (1983) found evidence to show that Scandinavian *argentatus* moult at different time to British *argenteus*; they state that northern Scandinavian *argentatus* start primary moult in early May at the end of egg laying, birds in North a little later than those in South. According to them, most adult *argenteus* in Wales start primary moult in early June. Differences in moult have also been found in the timing within subspecies; for example Malling Olsen & Larsson (2004) state that individuals of both subspecies of Herring Gull *Larus argentatus* present at more northerly latitudes moult later than those present at more southerly ones, while eastern birds generally moult later than western birds. It has also been suggested that similar differences occur in Yellow-legged Gull *L michahellis*, the species that occurs around the Mediterranean Basin; Malling Olsen & Larsson (2004) stated that moult in *michahellis* is earliest in southern Mediterranean populations.

Some studies, however, have failed to find marked geographic variation in moult timing. Barth (1974) found adult *argentatus* collected in Norway during 1 -30 June (mean date 15 June) had recently began primary moult, similar to adult *argenteus* in the Netherlands (Walters 1978) where the onset of primary moult occurs on average in the first half of June.

The aim of this study is to provide evidence which supports or refutes the suggestion that moult in large gulls differs according to location.

Material and Methods

We photographed gulls specifically for this study between 4 and 12 July 2009 at two sites in Finland, one in Sweden, one in the UK and one in Spain. The sites were chosen for their widespread locations and the different environmental conditions affecting each site. In early to mid July, it was assumed that the majority of adults should be breeding, and all ages should be of the local taxon. Only birds of the local taxon were photographed, and were identified as such using criteria outlined in Malling Olsen & Larsson (2004). In Finland and Sweden the taxon is the nominate *Larus a. argentatus*, in the UK *L. a. argenteus* and in Spain *L. michahellis.* It should be noted that no individuals of the northernmost Herring Gull populations from northern Norway or Russia were included. Although duplication could not be completely ruled out, measures were taken to minimise the risk as much as possible, as outlined in the site descriptions below.

The sites in Finland

Photographs were taken at two locations.

(i) The landfill in the Helsinki area, Ämmässuo (situated in the municipality of Espoo, at 60º14', 24º32', Uusimaa, Finland), 5 July 2009 by Pasi Pirinen. The Baltic coast lies 15-20 km from this site and most of the breeding birds visiting the area should come from the sea. This is site “Finland E”. Double counts were eliminated to some extent through comparison of individual characteristics of the birds in the photos.

(ii) The landfill area in Tampere, Tarastenjärvi, at 61º33' / 24º00', 4 July 2009, Häme, Finland by AF.

The site is surrounded by several large lakes with a population of Herring Gulls, 680 breeding pairs, within a radius of 50 km in 2003 (Juvaste et al. 2004). This is site "Finland T". The photos were taken during six hours at the feeding site, mostly birds opening their wings when feeding at the steep mounts of organic waste, and assuming that there was enough movement to and from the site to eliminate most double counts, as there normally is. The double counts were further eliminated by comparing individual characters of the birds in the photos, but all of the photos were not compared against each other.

Both sites held thousands of Herring Gulls during the study days. The breeding taxon in Finland is the nominate *argentatus*. The two places are about 150 km apart. In the Tampere area the lakes freeze every winter and Herring Gull is a true migratory species, and in mid-winter there are no gulls using the landfill. They return in March, but the large lakes, and the breeding sites, are normally ice-bound into May. Near Helsinki, the Gulf of Finland will not completely freeze most winters, and during such winters Herring Gulls stay in the area and visit the Ämmässuo landfill the entire winter. This was also the case in the winter of 2008-2009. The ice conditions cause differences in the breeding schedule (*cf* Discussion) and possible differences in the moult timing.

The site in Sweden

The photos were taken 6-12 July 2009 at Simrishamn, Scania (55º33' / 14º21'), by Hans Larsson. The site is a fishing harbour with about 20 breeding pairs of Herring Gull. About 50 individuals were present when the photographs were taken. The breeding taxon in Sweden is the nominate *argentatus*. Double counts were eliminated to some extent by comparison of the photos.

The site in the UK

All photos were taken during the afternoon of 6 July 2009 at Marine Park Lake, South Shields, Durham, UK at 55º00', 1º25' by RA. Herring Gulls from a nearby colony bathe here and individuals are considered to visit the lake in the breeding season for periods of less than ten minutes during the space of at least 3 hours. It was felt therefore that the risk of duplication was low, but to minimise the risk further, only birds leaving the lake in flight, to return to the colony were photographed. The breeding taxon in the UK is *argenteus*.

The site in Spain

All photos were taken on 6 July 2009 by AC at Tarragona harbour (41º06'N 1º14'E). This area is situated in northeast Spain and holds a small breeding population of Yellow-legged Gull (ca. 30 breeding pairs). However, thousands of pairs of Yellow-legged Gulls breed at the nearby Ebro delta. The breeding taxon at Tarragona harbour is nominate *michahellis.* Photos were taken of resting birds during a short period, after having flushed them a short distance. Birds which flew long distances when flushed were not included in order to avoid duplication.

Study methods

Photos were taken of all age groups, and were then divided into three groups – 'adults', 'immatures' and '1st-summers'. Ageing 2nd, 3rd and 4th summers (and other immatures) with certainty is difficult meaning any birds not 1st -summers or adults were lumped into this ageing category. In Finland and Sweden, immatures older than 1st summer were not scored because of their low numbers. Birds with no or very little brownish on the primary coverts were classified as adult (even 7th summer, and probably mature, Herring Gulls can show some brownish on the primary coverts, Lindholm & Forsten 2005).

Photos were edited (cropped, lighting changed) to allow an easier assessment of moult score. All photos in which the moult score of each primary could not be determined were discarded, so in practice, only flight photos or birds with open wing were used.

Birds were moult scored according to BTO guidelines (http://www.bto.org/ringing/resources/downloads/moult.pdf):

0 an old feather
1 old feather missing or new feather completely in pin
2 new feather just emerging from sheath, up to one third grown
3 new feather between one and two thirds grown
4 new feather more than two thirds grown, but waxy sheath still at its base
5 new feather fully-grown with no trace of sheath at its base

The following modifications were made:
- scores 1 and 2 are not always separable in photographs (versus in the hand). Therefore if there are two adjacent primaries lacking, the innermost of these gets score 2 and the outermost score 1. If there is only one primary seemingly lacking, it gets score 1. (The rationale is that this type of scoring will give the closest results to scoring in the hand).
- The waxy sheath is not normally visible in the photos. Therefore we modify the score 4 and 5 this way:
4 new feathers more than two thirds grown, but not full-grown (as can be seen in a photo).
5 new feathers fully-grown

Results

The results are presented in Tables 1-3 and Figures 1-2. Comparisons between age groups show that moult in 1st-summers is most advanced, followed by immatures, with adults least advanced. Timing of primary moult is similar at all sites within each group, except within adults in the UK in which there is a considerably lower mean date (compared to the Finnish, Mann-Whitney U-test, U-values 8744 for FT/FE and 3016 for the UK, $p < 0.001$). Spanish birds within all age groups are the most advanced (compared to the Finnish birds, Mann-Whitney U-test, U-values 2506.5 for FT/FE and 4353.5 for SP, p=0.003). On average, the Spanish birds are roughly half a primary feather ahead of the Finnish and one and half primary feathers ahead of the UK birds. The immatures in Spain are more advanced than those in the UK (Mann-Whitney U-test, U-values 1634.5 for SP and 721.5 for UL, p=0.001). There is little variation in the means of the moult scores of 1st summer birds. There are no clear differences between the inland site and the coastal site in Finland, and the samples were combined for further analysis (*cf* discussion). If the samples of the Baltic area (Finland and Sweden) are combined (group BA), the two extreme groups based on mean value are the Baltic (mean 28.23) and the Spanish (mean 29.91) and the null hypothesis that there are no differences in moult score cannot be rejected (Mann-Whitney U-test, U-values 1083 for BA and 967 for SP, p=0.666).

Discussion

The study indicates that the timing of the primary moult across Europe in Herring Gull and Yellow-legged Gull shows relatively little variation; the exception to this is adults in the UK. In particular moult scores of 1st summer birds are almost identical, despite the long distances between the sites and large latitudinal difference. This therefore contrasts to what has previously been suggested, although Lindholm & Forsten (2005) showed similar results (including in Caspian Gull *Larus cachinnans*).

The mean moult score of adults in the UK is notably lower than adults in all other locations. The lateness of adults in the UK is partly attributable to the moult score of 19 adults being zero, that is, all of these birds had not commenced moult. That these birds had not yet commenced moult in July is unexpected, and is assumed to be a result of them being engaged in breeding activities. Unlike many bird species, Herring Gull is known to moult primaries when incubating and feeding young, but this study possibly indicates that at least some Herring Gulls do not do so. Lindholm & Forsten (2005) did, however, demonstrate that the rate of moult slows (and even suspends) prior to increasing again, as adults begin to feed young in late June-early July. Further study is needed into

Photo 1. Herring Gull *Larus argentatus*. Adult bird with primary moult index 11 - close to the mean value. Tampere, Tarastenjärvi. 4 July 2009 (c) Annika Forsten

Photo 2. Herring Gull *Larus argentatus*. Adult bird with primary moult index 10. Primary moult suspended after P2. Tampere, Tarastenjärvi. 4 July 2009 (c) Annika Forsten

the effect of breeding on the rate of moult in large gulls. Although it was assumed all adults would be breeders, it is not known whether the birds contained within the sample relate to breeders or non-breeders; it is possible both sets of birds have quite different moult schedules. The use of colour rings and satellite tags would be required for such a study. Rate of moult could also differ between sexes within a breeding pair. In a relatively small sample, such as that used in this study, the balance of males and females could potentially skew the mean.

We noted no clear differences between the moult timing at the inland site and the coastal site in Finland, although some might have been expected. There is about 4-5 days difference in the timing of the first breeding between the Helsinki area and the Tampere area; the mean hatching date on the northern coast of the Gulf of Finland is 23-25 May and in Häme it is 28-29 May (R. Juvaste *in litt,* from ringing data, using wing length of the chick for age assessment), but there are annual variations. In early July however, renewed nesting attempts, failed nestings and a potentially sizeable number of non-breeders, perhaps leads to a situation in which variations in the nesting timing are no longer visible in our moult data.

Further study of moult timing of Herring Gulls breeding in the northernmost breeding areas of this species is needed, further north than the sites included within this study. In a small sample from Varangerfjorden, Northern Norway, photographed by AF during 8 – 10 July 2008, there were adult birds with the following number of old primaries left: 4,4,4,5,5,5,6,6,6,6,6,6,7,7,8, The average is 5.67, which corresponds to moult score 16-18. They seem to be not much behind, at least.

Conclusion

Within each age group, timing of primary moult is similar at all sites except the UK where moult in adults is considerably later than adults at all other sites. Comparing timing between age groups, adults are latest, followed by immatures and 1st-summers are the most advanced. Differences in timing of primary moult between age groups may be connected to the fact that adults are involved in breeding, unlike all other age groups. Further research is needed to establish the causation of these differences.

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	Finland T (n=50)	Finland E (n=48)	Sweden (n=8)	UK (n=120)	Spain (n=70)
Mean	13.6	12.15	16.75	8.58	15.27
Std. deviation	3.2	3.95	5.37	5.22	5.56
Minimum	8	3	11	0	3
Maximum	20	21	28	19	25
Range	12	18	17	19	22

Table 1. Primary moult scores of adult birds.

	UK (n=62)	Spain (n=38)
Mean	17.16	20
Std. deviation	4.98	5.41
Minimum	1	8
Maximum	28	29
Range	27	21

Table 2. Primary moult scores of subadult birds.

	Finland T (n=6)	Finland E (n=48)	Sweden (n=28)	UK (n=26)	Spain (n=25)
Mean	27.33	28.06	28.71	28.46	29.91
Std. deviation	3.56	2.55	3.76	2.78	4
Minimum	22	21	23	22	18
Maximum	31	34	37	35	33
Range	9	13	14	13	15

Table 3. Primary moult scores of 1st summer birds.

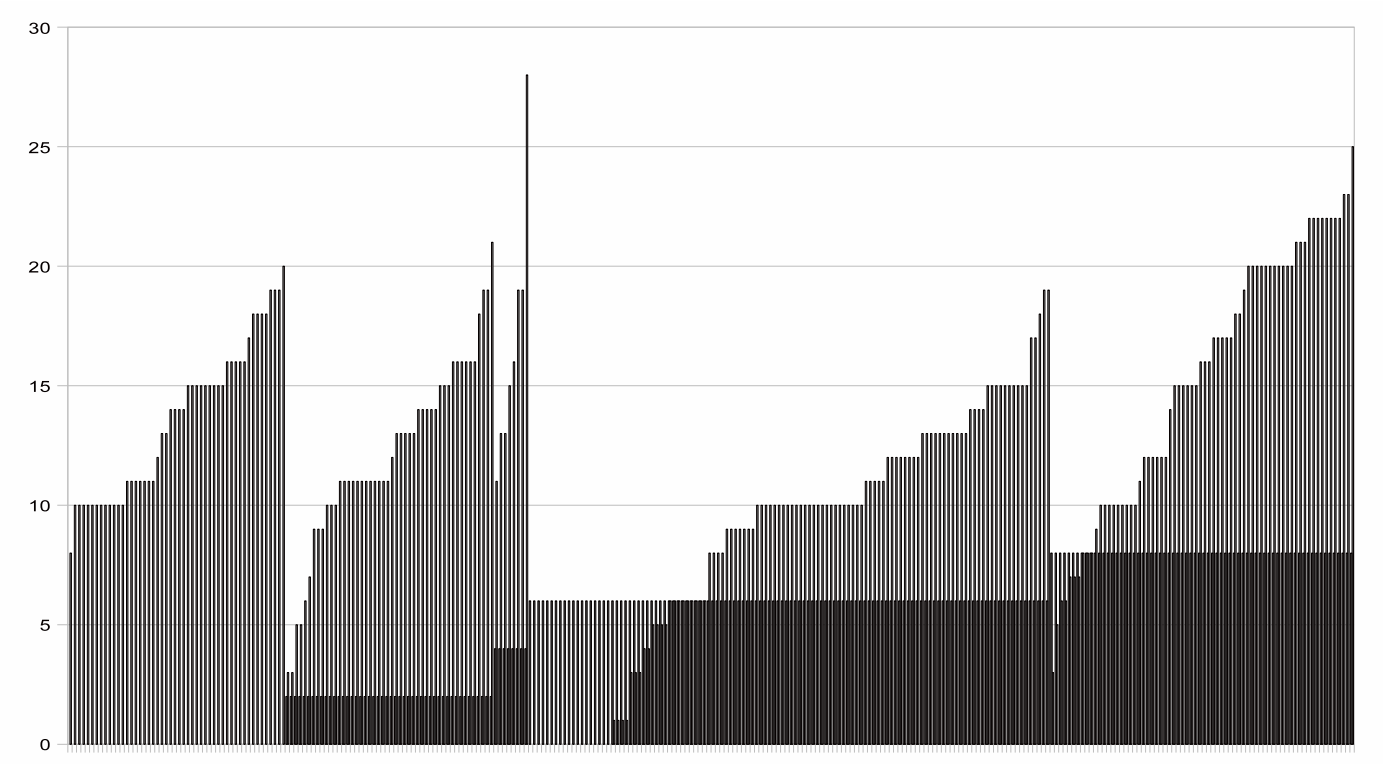

Figure 1. Moult score of adult Herring Gulls at each site. The sites from left to right: Tampere, Finland; Espoo, Finland, Simrishamn, Sweden, South Shields, UK and Tarragona, Spain.

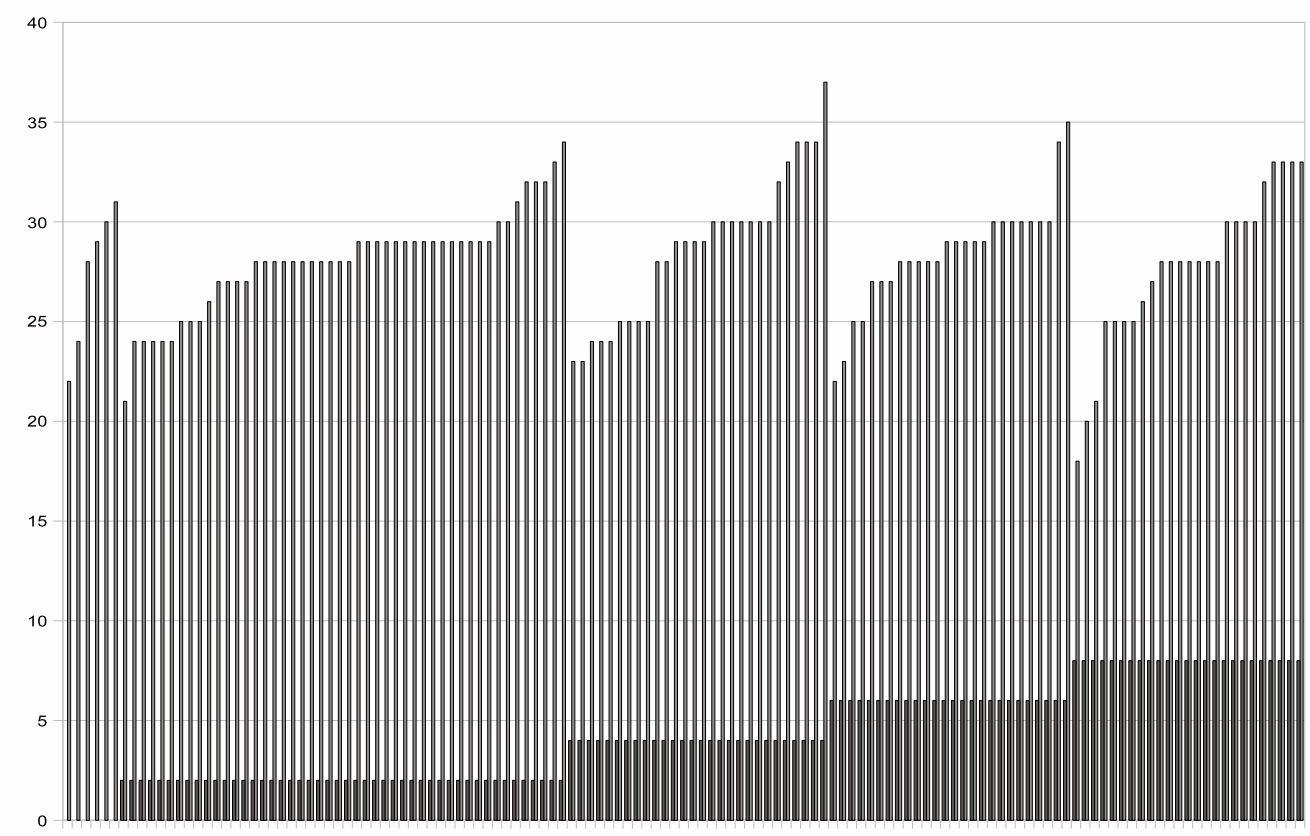

Figure 1. Moult score of 1st summer Herring Gulls at each site. The sites from left to right: Tampere, Finland; Espoo, Finland, Simrishamn, Sweden, South Shields, UK and Tarragona, Spain.

Semipalmated Sandpiper *Charadrius semipalmatus* Cape May, New Jersey, USA 17 September 2009 (c) Annika Forsten