GHENT UNIVERSITY
FACULTY OF SCIENCES
BIOLOGY DEPARTMENT

ACADEMIC YEAR 2008-2009

Gulls (Laridae) along the Belgian coast

with focus on Herring Gull (*Larus argentatus*) and Lesser Black-backed Gull (*Larus fuscus*).

by Davy Bosman

Promotors: Prof. Dr. Magda Vincx and Dr. Eric Stienen
Supervisors: Geert Spanoghe, Peter Adriaens and Wouter Courtens
Volunteers: Pieter Vantieghem, Davy De Groote, Nico Geiregat, Marc Van De Walle, Simon Feys, Nicolas Vanermen, Stijn Baeten, Maarten Jacobs, Wout De Rouck, Joris Elst, Hilbran Verstraete, Nicolas Van Rossem, Wouter Faveyts, Krista Wettinck, Joost Mertens, Diederik D'Hert, Benny Cottele, Luc Teugels, Tomas Willems, Jan Putteman, Wouter Vansteelant, Miguel Demeulemeester, Johan Buckens, Jurgen Dewolf, Marijn Bauters, Filiep T'Jollyn, Edward Vercruysse, Kenny Hessel, Stefaan Claeys, Eef Thoen, Joachim Bertrands, Jonas Mortelmans, Maarten Dermout, Karl Van Ginderdeuren, Jan Ranson, Klaas Debusschere, Klaas De Keyser, Wout Opdekamp, Paul D'hoore and Roland Francois.
Drawings: Lore Rabaut

Thesis submitted in fulfillment of the requirements for the degree of Master in Science (Biology)

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A. INTRODUCTION

1. Background

The ranges and numbers of many gull species around the world increased strongly during the second half of the twentieth century. This is particularly true for the North Sea, where the most numerous species – Common Gull *Larus canus*, Herring gull *Larus argentatus* and Lesser Black-backed Gull *Larus fuscus* – all have increased considerably in the past 50 years (Belant, 1997; Seys et al., 1998; Spaans 1998, Garthe et al., 1999; Bijlsma et al., 2001; Kubetzki & Garthe, 2003). These increases have been attributed generally to protection from human disturbance, reduction in environmental contaminants, the ability of gulls to adapt to human-altered environments and the availability of anthropogenic food. Food availability has been increased by the supply of discards and offal from fisheries and possibly also by the overfishing of large predatory fish, resulting in an increase of smaller species. Additional food has been made available at refuse tips in both coastal and inland areas (Kubetzki & Garthe, 2003). Food supply plays an important role in animal population dynamics, being a major factor limiting reproductive success and survival, and in seabirds in particular, evidence indicates that food availability acts as a proximate factor on breeding population size and can ultimately limit the overall population size (Pons & Migot, 1995; Kim & Monaghan, 2006). Therefore, the opportunism and generalist feeding behaviour of gulls largely account for the success of these species.

More specifically the breeding numbers of Herring Gull increased exponentially during the second half of the twentieth century (Camphuysen, 1995; Garthe, 1997; Bijlsma et al., 2001; Schwemmer & Garthe, 2005), e.g. in Belgium from one pair in 1960 to 1703 pairs in 2001. Even more spectacular was the increase in the number of breeding Lesser Black-backed Gulls from one pair in 1985 to 2863 pairs in 2001. In the case of the Lesser Black-backed Gull these numbers signify nothing less than a spectacular growth of an average 99,3 % per year since 1992. The rapid increase of the Belgian breeding populations of both species seems to be primarily the result of the occupation of new nesting habitat in the harbour of Zeebrugge. At first due to immigrants from foreign colonies and later on due to own recruits as a result of a high reproductive output in an ideal food situation in Zeebrugge, numbers of nesting gulls there kept on increasing until a peak was reached in 2004-2006 (Stienen et al., 2002; Stienen & Devos in Vermeersch et al., 2004). However, during the past decade the increase of larger gulls have halted and numbers of Herring Gull even strongly decreased by more than 40% in many European countries.

Increasing gull abundance and an increasing tendency of gulls to breed in urban areas, has resulted in numerous conflicts with people. For example, gulls cause damage to buildings from nesting material and defecation. Although roof-nesting by gulls has occurred for about 100 years, widespread use of roofs and other urban areas by gulls has occurred only recently (Belant, 1997; Spaans, 1998; Cadiou et al. 2004; Rock, 2005). Gulls nesting on roofs often are considered a nuisance because they harass maintenance personnel, defecate on nearby vehicles, obstruct roof drain systems with debris and cause structural damage to buildings and nearby cars (e.g. rubber of window wipers and windows is used as nesting material). Ongoing industrial development in the outer harbour of Zeebrugge will eventually lead to the complete loss of large areas of suitable nesting habitat in the heart of the Belgian breeding populations

of these gulls. Probably this will lead to a further occupation of available roofs along the coast and to increased nuisance caused by gulls. Gulls are also considered a general nuisance because of their noise (up to 60 dbA), defecation (reduced aesthetics, e.g. fouling table and park benches), and harassment of people (frightening people, stealing food from patrons of outdoor restaurants, tearing open garbage bags, etc…) (Belant, 1997; Francois, 2002; Rock, 2005).

Therefore gull management will become more and more important. Until now virtually all gull control efforts have been employed to address specific local problems. These site-specific control activities can be effective at the site where the gull problem occurs, but uncoordinated management efforts may only cause relocation of the problems to surrounding areas and will rarely solve the problem across a larger scale. Therefore an integrated approach is advised. A working group which includes representatives from the public, affected business or government agencies, politicians **and wildlife professionals/biologists** could be formed to document the extent and nature of the problem, **determine relative aspects of the ecology of the nuisance species**, assess available control techniques to develop an integrated management strategy and periodically evaluate the effectiveness of the control program (Belant, 1997).

2. Framework

Against this background, gull research is important and socially relevant. Moreover, being the most abundant and noticeable group of birds on our beaches, they demand and deserve our attention. During the past 40 years a lot of ecological studies have been carried out at the Belgian coast, including several ornithological studies (e.g. Hoekstein et al., 1998; Bonte et al., 2001). Gulls, however, until recently received little attention except for the breeding populations along the coast, which were monitored closely from the beginning (e.g. Stienen et al., 2002). But knowing the numbers and the origin of gulls occuring along our coastline throughout the year is equally important to assess in how far they can be a nuisance and how this can be dealt with (Belant, 1997; Spanoghe, 1999; Rock 2005). Nevertheless, it was not until the end of the 1980s that some attention was given to the presence of gulls on our coast outside the breeding season. This resulted in the first total counts being organised along the whole Belgian coast in December 1989 and in June and September 1990 (Devos & Debruyne, 1990, 1991). From 1992 onwards, seabirds were counted on the Belgian part of the North Sea (BNS) and adjacent waters by the Research Institute for Nature and Forest (INBO) (e.g. Offringa et al., 1995; Courtens et al., 2006). Although gulls proved to be the most abundant group, so far very few data existed on their distribution and numbers on dykes, breakwaters and beaches. After a gap of almost ten years, several counts of the total number of gulls along the Belgian coast were carried out during the period 1998-2001 (Spanoghe, 1999; Spanoghe & Devos, 2002). These counts revealed that the Herring Gull is the most common species along our coast and represents 60 to 70 % of the total number of gulls. The least abundant species is Great Black-backed Gull *Larus marinus* (5% of total numbers). The counts also gave a clear picture of seasonal differences in number between species, as for the Lesser Black-backed Gull (summer visitor) and Common Gull (winter visitor). During the winter season most gulls along our coastline are adults (e.g. 60 to 70 % of the Herring Gulls; Spanoghe & Devos, 2002). More of these counts over an interval of several years will be needed to find out if the seasonal pattern of gull numbers along the Belgian coast is more or less constant or is fluctuating between years. In 1999, a colour-ring project on Herring Gull

and Lesser Black-backed Gull was launched at the Belgian coast within the context of the research of the breeding biology and the post-nuptial distribution of gulls. Among other things, this project aims at obtaining information on (1) exchange between gull populations, (2) distribution of local breeding birds after the breeding season and (3) site fidelity of Belgian Herring and Lesser Black-backed Gulls to their breeding and wintering grounds. For this purpose both chicks and breeding adults of both species were ringed in the colony of the outer harbour of Zeebrugge. Also some Herring Gull chicks from roof-nesting birds in Oostende and a few wintering birds from different places along the Belgian coast were equipped with a colour-ring. This project showed that our Herring Gulls originating from Belgian colonies stay close to the breeding site outside the breeding season, while Lesser black-backed Gulls are strongly migratory and winter in the south of Spain and northwest Africa (Van Waeyenberge et al., 2002). By detailed observation of colour-ringed birds Stienen et al. (2007) also found that when gulls are forced to move, in this case because of the destruction of large areas of suitable breeding habitat in Zeebrugge, (1) they join existing colonies in the immediate vicinity of the destructed colony, (2) the colonisation of new areas is mainly influenced by distance to the old colony and nesting habitat quality of the new area, and (3) gulls tend to concentrate in existing breeding areas provided the area is big enough and has proved to be very suitable as a breeding site in the past. On the basis of these results Stienen et al. (2007) predict as a negative ecological consequence, among other negative effects, the occupation of suitable breeding habitats (‘sternenschiereiland’ and the ‘baai van Heist’) which were created and reserved by law as breeding grounds for terns.
So to make predictions about the future behaviour of gulls and the ecological and socio-economic consequences thereof, and to interpret trends in their abundance and the link with nuisance, it is important to study the natural distribution of gulls.

3. Research questions

- How do numbers of gulls fluctuate year-round and are there species-specific differnces? Can spatio-temporal trends in their abundance and distribution be distinguished?
- What is the age structure of the populations of the different species? Does this differ between adults and immatures?
- How does the coastal population of the 5 most common gulls relate to the population found at sea. Are there similarities and/or differences in their trends? What is the effect of a breeding population (if present) on the identified trends and how does it relate to the other populations?
- Where do Herring Gulls and Lesser Black-backed gulls found along our coast come from? To what extent are local gulls really Belgian gulls? Can one calculate the ratio of the different nationalities and can trends in this ratio be related to trends in absolute numbers?
- How well do trends in numbers of colour-ringed Herring Gulls reflect trends in numbers of the entire population? Do they give rise to skewed distribution patterns and if so can one identify the reason why their trends deviate from reality

B. Methods

1. Study area

The Belgian coastline has a total length of 65,4 km, stretched out between the Dutch and French border. Only near the outer port of Zeebrugge (C) is the beach broken over a distance greater than 100m, namely 3,3 km, so that the total length of the entire beach measures 62 km. In my analysis I will subdivide the coastline into 4 different beach zones in each case bordered by large harbours (presence of breeding colonies and/or large high tide roosts => 'SUCTION'-effect), except at the Dutch and French border (figure 1). I believe this to be a much more biologically sound approach (more natural borders) of how gulls experience our coastline than working with the 3 administrative (artificial) units like West Coast (French border to Middelkerke), Middle Coast (Middelkerke-De Haan) and East Coast (De Haan-Knokke). The latter subdivision was always used in past research (e.g. Spanoghe, 1999). Beyond the beach lies the sea dyke with behind it either dunes or buildings. Urban development along our coast has increased strongly in the last few decades from 25% in 1947 to already 58% in 1995. On top of that the coast has to cope with a lot of tourism. The amount of hotel bookings in the tourist season ads up to a total of 25 million, not including thousands of day trippers attracted by our sandy beaches. A striking feature of the Belgian beach are the many breakwaters, a total of 142 with 14 on beach zone 1, 44 on beach zone 2, 59 on beach zone 4 and 25 on beach zone 4. The Belgian beach also broadens from east to west, with the broadest stretches found on beach zone 1 and 2. Exceptions are the broad sand bars (joining the beach) at both sides of the outer harbour of Zeebrugge and the stretch of beach between De Haan and Wenduine on beach zone 3. Three big harbours (Zeebrugge, Oostende en Nieuwpoort) and a small one (Blankenberge) can be found along our coast.

Figure 1: Our study area with indication of beach zones and harbours

2. Simultaneous counts

Twelve monthly counts of the total numbers of gulls of the different species present along our coastline were organised from February 2008 until January 2009. For these counts the Belgian coast was subdivided into smaller parts of which the number depended on the amount of volunteers that participated each month. All the parts were counted simultaneously by one volunteer or sometimes two, but always at low tide in the morning. All beaches were subdivided into doable stretches of about 6 km long, which took on average two hours to count. Volunteers counted and indentified all gulls they encountered on the beach, in the surf, on the breakwaters and on the dyke. For each individual gull they encountered, they recorded the species and whether it was an adult or an immature. When colour-ringed birds were encountered, their rings were read (time allowing). Simultaneously the harbours of Oostende, Nieuwpoort , Blankenberge and Zeebrugge and the Yzer estuary and the Zwin Nature Reserve were also counted. Afterwards the results were digitalized. An additional environmental dataset contained the climatological factors (temperature, humidity, atmospheric pressure, rainfall, wind force and direction) recorded on the moment of the count. The degree of disturbance was also measured being the number of people present on the beach during the count (A: less than 10, B: between 10 and 100, C: between 100 and 200, D: more than 200, E: more than 500). These data were only used to interpret weird or unexpected trends. To measure the importance of breakwaters for the different gull species, numbers counted on each part every month were afterwards linked to the amount of breakwaters found in that part. A multivariate analysis in Canoco for Windows 4.5 was performed to find out for which gull species numbers were related to the presence of breakwaters.

3. Visible legs counts

Independently of the simultaneous counts, visible legs counts were organized. For these counts the beaches were subdivided into 8 parts (French border-Koksijde, Koksijde-Nieuwpoort, Nieuwpoort-Raversijde, Raversijde-Oostende, Oostende-Wenduine, Wenduine-Zeebrugge, Zeebrugge-Knokke, Knokke-Dutch border), 2 parts per beach zone (see above). One or two parts were counted at low tide in one morning each month from February 2008 until January 2009 (except June and July 2008). Due to a lack of time the visible legs counts of December and January were lumped. So for each of the 8 parts there were 9 visible legs counts carried out in the course of this research year. Harbours were not counted, except for the harbour of Oostende on two occasions at high tide. For each part the total number of colour-rings and the total number of Herring Gulls *Larus argentatus*, Lesser Black-backed Gulls *Larus fuscus* and Yellow-legged Gulls *Larus michahellis* with both their legs visible (the so-called 'visible legs' population) were counted and when present the code of the colour-ring was read. For each bird with both legs visible the age was recorded (first, second, third and fourth calendar-year, adult). Birds of which the legs were not visible (sitting, swimming, foraging in deep water, etc…) were ignored in these counts, because together they could act as a confounder in possibly skewed relations between the colour-ringed and the entire population. To find out whether the age structure of the 'visible legs population' was correlated with the age structure of the real population (including all gulls present with legs visible or not), 5 random samples were taken for each part each month and numbers of adults and immatures + sample location (surf, breakwaters, beach) were noted. In these samples the adult/immature ratio of the 'visible legs' and the adult/immature ratio of the total group were recorded simultaneously. Afterwards correlation graphs were drawn. From Octobers onwards

the location of all ‘visible legs’ gulls was recorded, not only for those found on the sample locations. An additional environmental dataset contains the climatological factors (temperature, humidity, atmospheric pressure, rainfall, wind force and direction) recorded on the moment of the counts. Also the degree of disturbance is measured as the number of walkers present on the beach during the count (see above). Again these data were only used to interpret weird or unexpected trends. This task was performed by one researcher for which a mountain bike was provided by the Research institute of Nature and Forest (INBO).

4. Movements

The results of both the simultaneous as the ‘visible legs’ counts will also be used to analyse dispersal movements of Herring Gulls (per age class) over the different beach zones and how Lesser Black-backed Gulls use the different beach zones during their migration. Due to the unequal size of this zones (beach zone 1: 14,5 km; beach zone 2: 16 km; beach zone 3: 21,25 km and beach zone 4: 10,25 km) numbers of gulls will be expressed per running km.

5. Nationalities

Ring readings on our shore made by volunteers during the course of the research year, i.e. not only during the counts, were linked to the results of the simultaneous counts to calculate the ratio of nationalities. To be able to perform these calculations I asked and received the ringing efforts of Herring Gulls and Lesser Black-backed Gulls of all ringers (except one) whose colour-ringed birds were seen on the Belgian shore between February 2008 and January 2009. Before I could use these ringing efforts, I had to correct them for loss of rings due to mortality. Therefore ringing efforts were asked for adults and pulli separately as they have different survival rates. Of 200 birds ringed as pullus or adult in 2000 for example only a proportion will be alive in the course of 2008. Table 1 gives an overview of the survival rates I used. Survival rates for Herring Gulls are based on the findings of Vercruijsse (1999). For Lesser Black-Backed Gulls I only found information on adult survival (Wanless et al., 1996) and used the same immature survival rates as for Herring Gulls. For my calculations I assumed that survival rates remained constant between years.

	Herring Gull	Lesser Black-backed Gull
1cy	70%	70%
1y	65%	65%
2y	82,7%	82,7%
3y	82,7%	82,7%
4y	82,7%	90%
Adult	91%	93%

Table 1: Survival rates of Herring Gull and Lesser Black-backed Gull for different age classes

I will demonstrate with a simplified example how I used these ringing efforts to correct the partition of nationalities. Imagine two colonies A and B with different ringing efforts. In a group of 100 gulls along the Belgian coast 1 colour-ringed individual is seen from population A and 10 from population B. If I do not correct for ringing effort, I will conclude erroneously that ± 10% of these gulls are A-gulls and ± 90% are B-gulls. In table 2 each cell of the last column contains the sum of the entire row and the correct percentage of A-gulls is found by

multiplying 1 with 110 and divide the outcome by the ringing effort. This results in the corrected numbers of 11 rings seen on a total of 22 and thus 50% of the group are A-gulls.

	A	B	
RINGS SEEN	1	10	11
RINGING EFFORT	10	100	110
CORRECTED	11	11	22
PERCENTAGES	50	50	100

Table 2: Calculation matrix

The underlying assumptions are 1) that the proportion of ringed birds in a breeding population that arrive at our shore equals the proportion of all (ringed or not) birds from that same population that wander to our coastline and 2) that the different nationalities or even 'regionalities' in the total ringed population and in our coastal population are the same. I received no ringing effort for Herring Gulls of Norman Van Swelm and these birds were therefore excluded from the analysis.

Figure 2: Ready to count © Pieter Vantieghem

6. Taxonomy and identification of large white-headed gulls by Peter Adriaens

6.1 Introduction

Of all birds, the (large white-headed) gulls are among the most difficult to identify. However (or precisely therefore, perhaps), relatively little attention is paid to them in 'standard' field guides, such as Jonsson (1992) and Grant et al. (1999). A species like Caspian Gull *Larus cachinnans*, for instance, is not even mentioned, although it is fairly common in Western Europe.

There are several reasons why identification of large white-headed gulls can be problematic:

- The different taxa have evolved relatively recently. Gull taxonomy is still in its infancy and visible differences between the species are often subtle and sometimes not well understood. Another consequence of their recent taxonomic evolution is that some species may hybridize in certain areas on a fairly regular basis and that hybrids may be fertile (see e.g. Cottaar, 2004), which may seriously hamper identification or even make it impossible.
- Large gulls take several years (3 to 5) to gain their adult plumage. Simply speaking, their plumage gradually and slowly evolves from all-brown to white with grey and/or black throughout the years. Their general aspect therefore not only varies according to species but also with age. Correct ageing is therefore an important or even essential step in the identification process. It is also worth remembering that in adult birds the primary pattern may change with age: the amount of black on these feathers may decrease the older the bird gets (Coulson et al., 1984 pers. obs. on colour-ringed birds).
- There is also extensive regional variation in most species. This has led to the recognition of different subspecies for most taxa, but such a classification has not always been done (yet) or may even be impossible in some cases. Adult Herring Gulls *Larus argentatus* breeding in the north of the Netherlands, for instance, look slightly different compared to birds from Belgian colonies, which is most likely a result of intergradation between the subspecies *argenteus* and *argentatus* (cf. Adriaens & Mactavish, 2004).
- Adult and subadult birds do not have many identification features, and may often be more difficult to identify than younger birds (contrary to popular belief). The primary pattern is one of the main features, but is more easily studied from photographs than in the field.
- In addition, there is a lot of individual variation within each species. The plumage varies so extensively that in some cases two individuals of the same age and same species may look completely different. As a result, all plumage features overlap with those of similar species and identification will not normally be possible on the basis of a single feature only. Careful examination of plumage details will therefore be necessary (feather by feather) and identification should be based on a combination of as many characters as possible. The good news is that gulls are often quite approachable and lend themselves well to such detailed study.

Five gull species are treated: Herring Gull, Lesser Black-backed Gull (*Larus fuscus*), Yellow-legged Gull (*Larus michahellis*), Caspian Gull and Great Black-backed Gull (*Larus marinus*). Each species account is divided into a short introduction, some notes on general impression at each age, and the main identification section (plumage and moult details and how they differ

from similar species). The identification section is subdivided into age categories, with notes on regional variation, if relevant from a Belgian perspective, and notes on individual variation (for the advanced or curious reader…). These notes do not pretend to form an all-inclusive list of all possible variations.

6.2 Topology

Detailed examination of a gull's plumage is only possible if the important parts of that plumage can be named. On the upperparts and, especially, wings the feathers are arranged in rows and each row has its own name. The outermost, longest feathers (*primaries*) of the wing can also be conveniently numbered. This is normally done from the inside out, 1 being the innermost primary and 10 the outermost visible one. Gulls have actually 11 primaries, but the 11th is only a vestigial, outermost primary and can only be seen in the hand.
In the following photographs, the most useful parts of the bird to look at are illustrated:

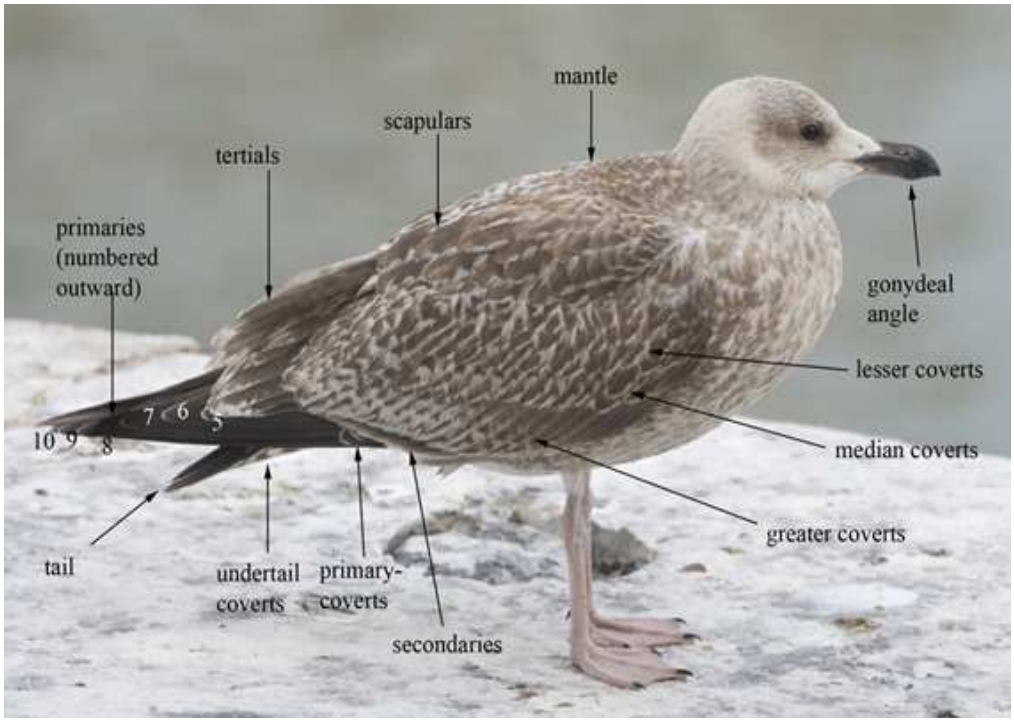


plate 1. Herring Gull, juvenile, Oostende, 11 October 2008 (Peter Adriaens). Possibly a Northern European bird as the plumage is still fully juvenile and quite fresh

.

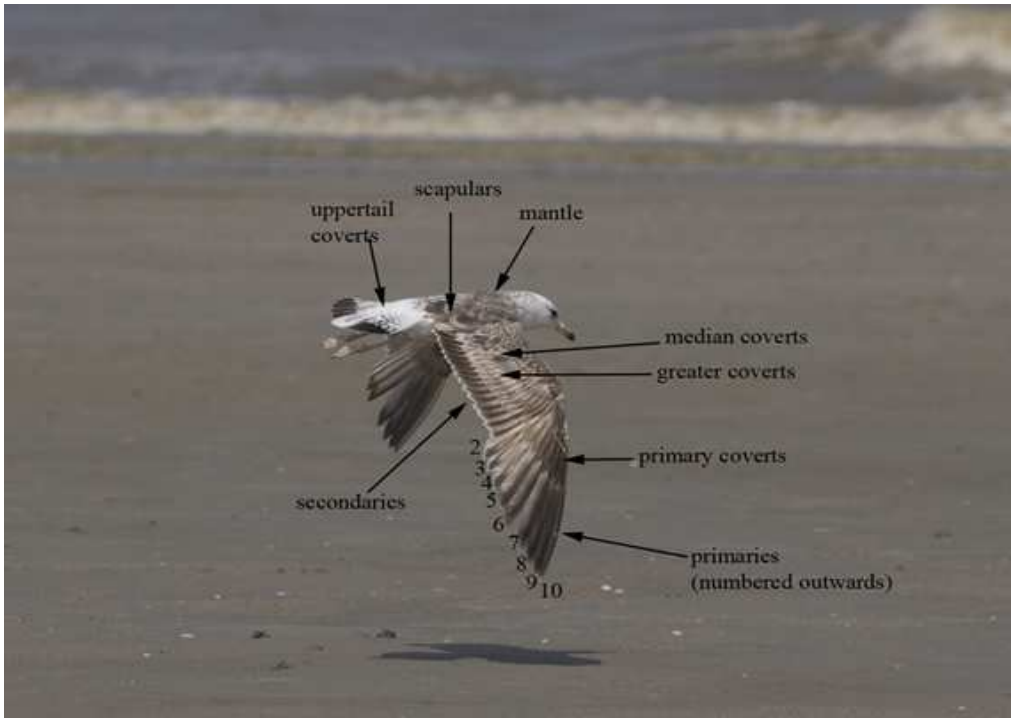


plate 2. Lesser Black-backed Gull, at start of second-cycle, Koksijde, 24 May 2008 (Peter Adriaens).
Active primary moult has started (P1 has been shed) and the central tailfeathers were moulted in winter. This bird has unusually pale inner primaries.

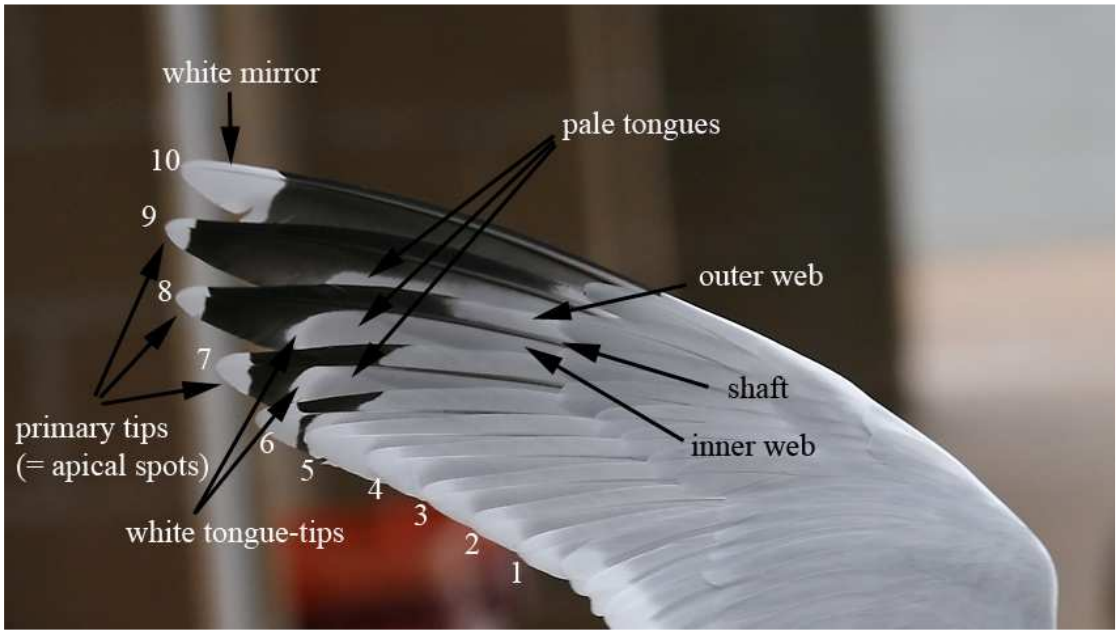


plate 3. Herring Gull, adult, Oostende, 30 March 2008 (Peter Adriaens).

For more information on gull topography, see Howell & Dunn (2007), pages 18-20.

6.3 Moult

From their approximate age of one year on, large gulls replace their entire plumage once every year. Thorough knowledge of this moulting process greatly helps when trying to age and identify gulls.
Traditionally, European field guides follow the moult terminology introduced by Dwight (1925), distinguishing two moults every calendar year: a partial one (i.e. limited to body feathers and wingcoverts) in late winter to early spring, and a complete one (including remiges and rectrices) from late spring to (early or late) autumn. According to this system, each moult results in a distinct plumage; e.g. the partial moult in the first spring leads to the *first-summer* plumage, the following, complete moult during summer results in the *second-winter* plumage, and so on. However, moult in large gulls is often a slow and protracted process (the complete moult may take about six months) and the two moults (partial and complete) may overlap to some extent, which makes it difficult to perceive how many moults really occur in a year, especially in first-year gulls. In addition, recent observations have shown that there is actually only one single moult in most first-year large gulls, meaning that there are no distinct "first-winter" and "first-summer" plumages. For these reasons, it is easier to adopt the (American) Humphrey-Parkes system, which is based upon plumage cycles and is not linked to seasons. A plumage cycle starts at the beginning of the primary moult and ends when a new primary moult begins (about one year later in most species). The first cycle starts when the juvenile plumage is acquired and ends when the first primary (usually the innermost, i.e. P1) has been shed; at that moment, the second cycle begins. This is a clear and simple terminology for ageing gulls and describing their moult processes. It does not require making a distinction between winter and summer, and, contrary to the terms "first year", "second year" etc, it has well-defined start and end points (i.e. the start of the new primary moult). If necessary, the Humphrey-Parkes system also allows for the distinction between two moults a year after the first year (i.e. from second cycle on): a partial, *pre-alternate* one and a complete, *pre-basic* one. The pre-alternate moult leads to the alternate (= breeding) plumage, while the pre-basic moult results in the basic (= non-breeding) plumage. In the field, however, it can be very difficult or even impossible to distinguish between the two plumages and moults. Some immature Lesser Black-backed Gulls (particularly of the races *fuscus* and, to a lesser extent, *intermedius*) moult some or even all primaries, secondaries and tailfeathers during winter already; in their first winter, this is probably best considered as an unusually extensive pre-alternate moult (which is complete rather than partial).

First cycle

During the first cycle, most taxa undergo a partial moult between late July and May, starting with some mantle feathers and scapulars and sometimes slowed or suspended over midwinter. In Herring Gulls and most Great Black-backed Gulls, typically only body feathers are replaced and all wingcoverts are usually retained at least until April. Some (northern) *argentatus* and Great Black-backed Gulls, however, seem to skip or postpone this moult, retaining full juvenile plumage until March. In Yellow-legged and Caspian Gulls, the partial moult is not limited to the body, but often includes some or even all wingcoverts too. In a very few Yellow-legged Gulls, a few tailfeathers may also be replaced (usually the central ones). In Lesser Black-backed Gulls, the moult is really variable. In *graellsii* it may include a number of wingcoverts; in many *fuscus* and some *intermedius* it is postponed or suspended during autumn migration and resumed in the winter quarters. It may then be very extensive, including all wingcoverts, some or all tailfeathers, some or all secondaries, and a variable number of primaries (Winters 2006).

Second cycle

The second cycle starts with the moult of the primaries (usually the inner ones). In most taxa, except many *fuscus* and some *intermedius*, this starts in April or May (or late March in some Yellow-legged Gulls and the odd Great Black-backed Gull [*pers. obs.*]). It may overlap with the end of the partial moult of the first cycle. Exceptionally, a few *graellsii* Lesser Black-backed Gulls may moult one or two inner primaries during early spring (earlier than usual, possibly even on the wintering grounds already) and then suspend (Stewart, 2006). Moult of the tailfeathers starts about when P7-8 are growing in (usually in July), which is roughly the moment when the secondaries start moulting too. Primary moult finishes by September – October, by which time the rest of the plumage has also been replaced. Between August and May (overlapping with the end of the complete moult), body feathers and a number of wingcoverts are replaced again in a partial moult, which may be suspended in midwinter.
This sequence is not followed by many *fuscus* and some *intermedius* though. As birds of these taxa may have moulted already some or all primaries during their first winter, primary moult of the second cycle may be postponed until June – July and may be suspended in late summer, when birds migrate south again with a few (outer) juvenile primaries left. Before moult is suspended, a third moult cycle may start in a few autumn *fuscus*, resulting in three different generations of primaries… For more information on the complicated moult in these taxa, see Jonsson (1998) and Winters (2006).

Third cycle

Moult is similar to second cycle but slightly later: primary moult usually starts from late April – late May and ends by October – late November. The plumage acquired by the complete moult is highly variable; newly grown tailfeathers, for instance, may range from all-white to all-dark. See section on ageing. A few *graellsii* temporarily suspend their primary moult during spring (Stewart 2006).
Again, many *fuscus* and some *intermedius* follow a different moult timing and strategy. As in second cycle (and older), these taxa tend to partly postpone primary moult to later in the year (e.g. to summer rather than spring) and then suspend for migration. Primary moult continues in the wintering quarters. See Jonsson 1998.

Fourth cycle

Moult is similar to third cycle but slightly later: primary moult usually starts from mid-May to mid-June and ends in mid-October through mid-November, about a month earlier than in most adults. This timing does not apply to many *fuscus* and some *intermedius*. Some *graellsii* temporarily suspend their primary moult during spring (Stewart 2006).

Adult cycle

The fifth cycle leads to the adult plumage and starts between mid-May and early July (or from mid-April on in some adult Yellow-legged Gulls), when the inner primaries are shed. Tail moult and secondary moult start approximately in late July to September. Dusky winter head markings usually appear about when P7-8 are shed. The complete moult finishes when the outer primaries become full-grown, usually in October – (early) December. At this time, a partial moult starts and is followed by gradual whitening of the head (due to moult and wear/bleaching). This results in the full breeding plumage, usually somewhere between December and March. Bare parts become brighter too.
Adult *fuscus* and *intermedius* may postpone the complete moult to early autumn, moult a few inner primaries and then suspend for migration. Their primary moult continues in the winter quarters. See Rauste (1999) for more information. Some adult *graellsii* appear to moult one or

two inner primaries earlier than usual (sometimes even as early as February – March, prior to northbound migration) and then temporarily suspend (Stewart, 2006; Muusse et al., 2006).

I would like to conclude with some general remarks on moult. It is important to know that the appearance of feathers acquired in the same moult cycle can change depending on the hormonal state of the bird. For example, new scapulars grown early in the second cycle will usually have a rather 'immature' look (e.g. pale, with a dark brown anchor pattern) while those acquired later in the same cycle may be plainer and greyer (slightly more adult-like). Thus, feathers of the same generation may look very different in some cases.
It is also important to realize that moult is a process that may vary depending on external factors, probably the most important of which is the daylight period (Dawson, 2002). When the days are getting longer (or brighter), moult is stimulated. Thus, the choice of the wintering areas may strongly influence the moult activity and pattern. A gull that winters in the Southern Hemisphere (as some *fuscus* do) will be more prone to replace its plumage in winter than a gull staying much further north.
Lastly, factors like illness, lack of nutrition, etc. may cause a bird to get behind in its moult schedule. Moult requires a lot of energy. However, it is a yearly necessity or else the feathers would be inadequate for insulation and flight. For large gulls, which have numerous and often large feathers to replace, moult is a default, ongoing activity that is only interrupted during energy-demanding phases, such as breeding and migration.

6.4 Ageing

In many cases, ageing is an important step in the process of gull identification. It is not an easy step though: because large gulls take about four or five years to mature and moult almost continuously, characters that may be useful for ageing are tremendously variable. In addition, characters such as colour of the bare parts, pattern of scapulars and wingcoverts etc. also depend on the hormonal state of the bird, not only age.
Among the most useful and consistent ageing features are the shape and colour of the primaries. It is recommended to look at these feathers first, before examining the bare parts and the rest of the plumage.
Another important aspect is wear. Feathers are constantly exposed to the elements and are prone to wear. Juvenile feathers in particular are less resistant and durable than older feathers. This may even cause an essentially brown gull to become whitish in some parts near the end of its first cycle. Worn feathers show frayed edges and tips, as if they have been affected by moths.

First cycle

Juvenile primaries are characterized by their rather thin and pointed shape. They are often also less blackish, more brownish-black than older primaries. The rest of the plumage shows a regular pattern; the greater coverts, for instance, show neat dark bars that run parallel to one another (except in Caspian Gull). The dark tertials have moderately thin, pale tips. The juvenile median and lesser coverts usually have large dark (brown) centres, and this is also true of the juvenile scapulars. New scapulars (acquired during the first-cycle moult) are pale, with a thin dark anchor pattern. They look significantly fresher than the juvenile wingcoverts. The iris remains dark (it may become paler near the end of the first cycle in a few birds) and the bill usually lacks an obvious pale tip.

Second cycle

Second-generation primaries are broader and more rounded than juvenile ones. They may have thin pale edges in the shape of a crescent moon. The outer primaries are quite blackish, while the inner primaries look more dirty greyish or brownish, at least on their inner webs. Some birds already show a white mirror on the outermost primary (P10). The plumage looks less regular than in first cycle; the greater coverts show many thin, dark, wavy bars that converge and diverge (like vermicelli or spaghetti). The tertials show broad whitish tips, and so do the secondaries. The median and lesser coverts are pale, with a dark anchor pattern. The scapulars often consist of several types of patterns: some have prominent dark anchors, others only a broad dark shaft streak, and still others are quite plain. They do not look fresher than the wingcoverts. Many (but far from all!) birds of this age acquire adult-like mantle feathers and scapulars, creating a bluish-grey or blackish saddle (depending on the species) that makes them obviously different from first-cycle birds. The bill often has a wide pale tip or may gain some yellow colour, especially towards the end of the second cycle.

Third cycle

The primaries generally differ from second-generation feathers in their prominent, rounded white tips, visible at rest. However, some birds have a more retarded look and in that case the inner primaries need to be studied: they are blue-grey or blackish-grey (depending on the species) with sharply demarcated, broad white tips (i.e. adult-like), while in second cycle they are dirty greyish or brownish without the prominent white tips. A few third-cycle birds look so retarded allover that the colour of the inner primaries may be the only clue to their real age. Generally though, third-cycle birds have acquired more adult-like wingcoverts and tertials than younger birds, as well as rather adult-like bare parts. A few birds may show two white mirrors already on the outer primaries (P9-10), which is never the case in second cycle. Yet another few birds may look so advanced at this age that they cannot reliably be told from fourth-cycle birds.

Fourth cycle

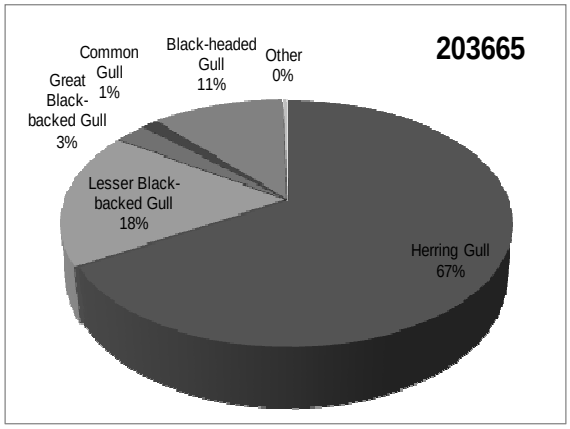
As in adult birds, the outer primaries have prominent, rounded white tips and at least one mirror (on P10). The rest of the plumage and the bare parts are usually as in adult too, but fourth-cycle birds more often retain blackish markings on the primary coverts and prominent blackish markings near the bill tip. Such immature markings may however be shown by the occasional full adult too (Muusse et al., 2006) and can therefore not be relied upon too much. Critical examination of the outer primaries (e.g. in photographs) may reveal a larger amount of black than is usual in adults, but in many cases distinguishing between fourth-cycle and adult will not be possible. At the other extreme, retarded birds of this age – retaining e.g. brown markings in the tertials or greater coverts – may not be possible to tell from third cycle.

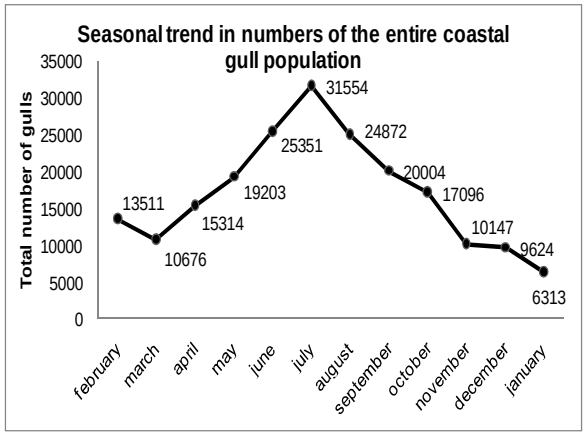
Adult cycle

The upperparts are bluish-grey or blackish (depending on the species), without any brown markings. The tail is all-white. There are usually no dark markings on the bill nor on the primary coverts (but see previous paragraph). The underwing-coverts are all-white (including the primary coverts).

C. RESULTS

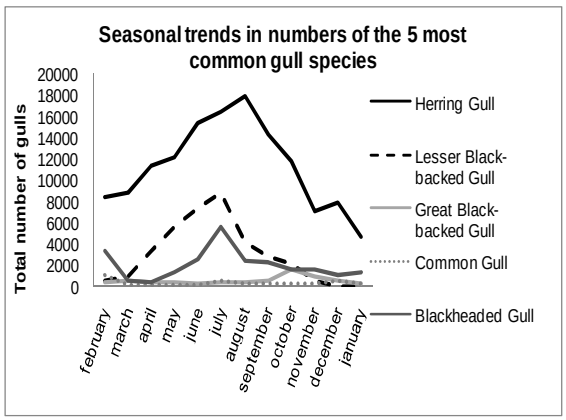
1. Simultaneous Counts

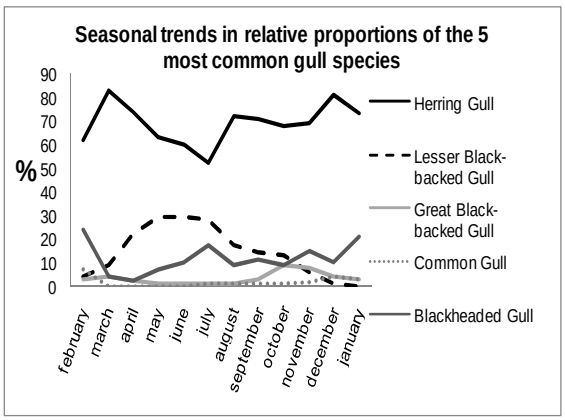




Graph 1 and 2: Pie diagram of the proportions of the different gull species present along the Belgian coast during the period February 2008-January 2009 (left panel) and the seasonal trend in numbers of the entire coastal gull population (right panel).

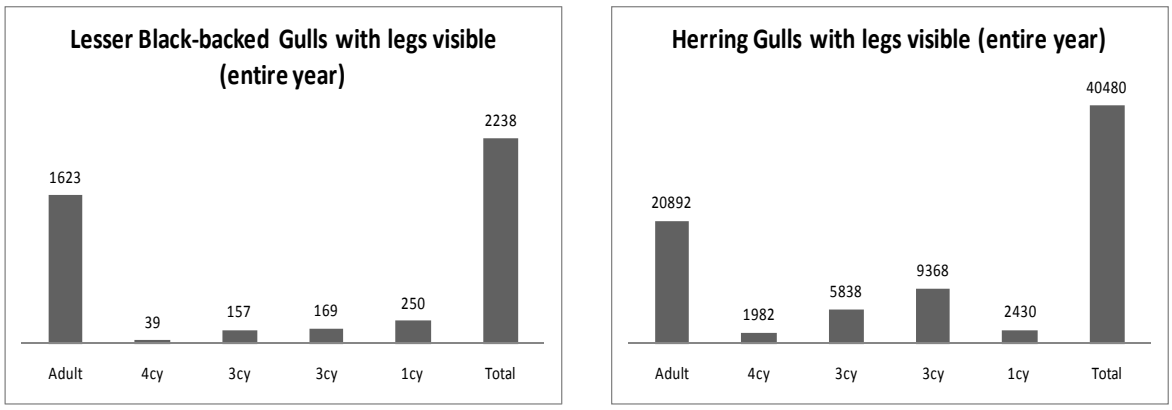
A total of 203,665 gulls was counted from February 2008 until January 2009 (Graph 1). An overwhelming majority of these gulls (67%) were Herring Gulls. Lesser Black-backed Gull is a distant second with 18%, closely followed by Black-headed Gull with 11%. The three most common gulls all peak during summer (Graph 3) which results in a strong peak in gull abundance in July (Graph 2). Although absolute numbers of Herring Gulls peak in the summer months, their relative abundance reaches it's minimum with just over 50% of all gulls being Herring Gulls (Graph 4).





Graphs 3 and 4: trends in total numbers (left) and in percentages (right) of the five most common gull species along the Flemish coast.

2. Visible legs Counts



Graphs 5 en 6: Histograms of sampled numbers counted over the entire year for Lesser Black-backed Gull (left) and Herring Gull (right) for the different age classes

During the visible legs counts 40.480 Herring Gulls with both their legs visible were counted (Graph 6). This is a lot more than the total that was counted for Lesser Black-backed Gull (Graph 5). The adult/immature ratio in Herring Gulls is about fifty-fifty, whereas adults dominate the ratio of Lesser Black-backed Gull. In Herring Gull, second calendar-years are the most abundant immature age class on our beaches.

3. Ring Readings

	February		March		April		May		June		July		August		September		October		November		December		January	
ADULT	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG	HG	LBBG
BELGIUM	14	1	18	3	7	2	12	1	2	0	9	2	58	8	61	9	69	3	52	2	18	0	15	1
ZEELAND	0	0	1	0	2	0	0	0	0	0	0	0	9	1	14	2	13	0	13	0	8	0	2	0
GERMANY	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
YMUIDEN + WADDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	1	0	1	1	1	0	1	1
ROTTERDAM	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	1	2	0	1	2	0	0	0	0
BRITAIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	2	0	0	0	0
DENMARK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
IMMATURE																								
BELGIUM	14	0	28	0	21	0	30	0	13	1	35	4	82	13	56	7	34	7	35	1	20	1	13	0
ZEELAND	4	0	4	0	18	0	12	0	4	0	13	1	28	0	14	2	9	0	10	0	2	0	2	0
YMUIDEN+WADDEN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0
France	0	0	2	0	2	0	2	0	0	0	1	0	1	0	0	0	4	0	0	0	2	0	0	0
BRITAIN	1	0	0	0	1	0	2	0	1	0	2	0	2	0	3	0	0	0	1	0	2	0	0	0
ROTTERDAM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0
RUSSIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
NORWAY	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0
GERMANY	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0

Table 3: Total number of rings of Herring Gull (HG) and Lesser Black-backed Gull (LBBG) read along the Belgian coast of each ringing project per month and subdivided for adults and immatures.

D. DISCUSSION

To avoid confusing cross-references, the results will be discussed for each of the large white-headed Gulls in a separate chapter. The smaller gulls are discussed together.

HERRING GULL *LARUS ARGENTATUS*

1. Introduction

Herring Gull *Larus argentatus argenteus* is one of our most common gulls and a familiar sight, particularly in coastal areas, where it outnumbers all other gull species throughout the year (Graph 3). In this chapter I will discuss in significant detail how numbers of Herring Gull of different age classes fluctuate year-round along the Flemish coast. I will distinguish between birds present at the beaches and in harbours and will comment on seasonal trends. The results of the simultaneous counts and visible leg counts were linked to ring-readings (from both Belgian and international colour-ringing projects) made at the same time (see material and methods p.10). These ring-readings not only allowed us to present rough (preliminary) indications of how different nationalities make use of the Belgian coastline in relation to time of year and age class, but also to investigate the possible causes of skewed distribution patterns when analyzing colour-ring data. Next, our counts along the coast will be compared to counts made by the Research Institute of Nature and Forest (INBO) on the Belgian Continental Shelf (from 1992 onwards). Furthermore an extensive paragraph on how to identify the different age classes of Herring Gull *L. a. argenteus* has been written by identification expert Peter Adriaens. In addition an overview is given of its status as a coastal breeding bird in Flanders and some information of past research along the Flemish coast on feeding ecology and dispersal patterns necessary to interpret the results.

2. Taxonomy and identification by Peter Adriaens

Herring Gull has two subspecies: *L. a. argenteus* and *L. a. argentatus*. Within the latter subspecies, there is extensive regional variation, with birds from the Eastern Baltic region looking slightly different from those in Norway and Sweden. Birds breeding in the Netherlands, Northwest Germany and Denmark show mixed characters of both subspecies. The descriptions below refer to the subspecies *argenteus* unless otherwise stated. At all ages, many birds of this subspecies have a rather pear-shaped head, strong but not extremely heavy bill, rather short primary projection and strong, moderately short legs. The upperparts are never blackish. Some birds of the subspecies *argentatus* are clearly larger (approaching Great Black-backed Gull *Larus marinus* in size), with longer bill, angular head with rather flat forehead, and prominent tertial step. Birds from the eastern Baltic region can have slightly longer wings than other Herring Gulls.

2.1 General impression

In first cycle the plumage is dull brown, lacking strong contrasts. In flight, pale inner primaries stand out as a pale ‘window’ in the wing. The plumage may become somewhat paler in second cycle, but still lacks strong contrasts. Many birds acquire a pale grey saddle at this age. From third cycle on, the pink legs and pale grey upperparts become the main characteristics.

2.2 Identification

First cycle

The pattern of the inner primaries (visible in flight) is the most consistent feature. These feathers are pale greyish or brownish across both webs, clearly paler than the secondaries and outer primaries, and each has a dark subterminal spot. They stand out as a large, pale patch ('window') in the upperwing. The upper tail is usually less contrasting than in the other species; it is dull whitish with a dark brown tail band and many scattered brown spots and thin dark bars. The greater coverts are paler than the secondaries, which means there is only one distinct dark band visible on the wing in flight (the secondaries). The underwing (including the axillaries) is dull brown and heavily marked.
At rest, the initial focus should go to the tertials and greater coverts. The brown centres of the tertials typically have an irregular shape, like a wholly leaf or an oak leaf. The greater coverts are regularly barred throughout, including the outermost visible ones. Juvenile scapulars have irregularly shaped, large brown centres, while new (first-basic) scapulars are usually dull whitish with a thick, dark brown anchor pattern. The head and underparts often have a lot of dull brown streaking. The partial moult does not normally include any remiges, tailfeathers, wingcoverts or tertials, so if any of these feathers are replaced before April they are a good indication that the bird is not a Herring Gull (beware of birds that had to replace damaged feathers though).

⇨ <u>Individual variation (first cycle)</u>

- The pattern of the inner primaries is fairly consistent, but exceptionally the outer webs can be dark brown, obscuring the dark subterminal spot. This is the case, e.g., in a very few birds from the eastern Baltic region.
- The tertials range from pale with dark barring to having very dark (blackish) centres with smooth edges, lacking the typical oak-leaf shape. At the pale extreme, they can be almost similar to the tertials of Glaucous Gull *Larus hyperboreus* (especially in the subspecies *argentatus*, see below); at the dark extreme, they are quite similar to Yellow-legged Gull.
- The greater coverts vary from entirely barred throughout (= typical) to almost uniformly dark throughout. However, any uniformly dark coverts usually retain a brownish tinge and are only rarely as blackish as in typical Yellow-legged and Lesser Black-backed Gulls.
- The upper tail is quite variable. In some, a dark tail band can be almost lacking, and is replaced by a number of thin dark bars instead. At the other extreme, the tail can be entirely dark (right up to and including the bases of the feathers). In a few birds, the tail band is solid and blackish, and contrasts strongly with mostly white, unmarked upper tailcoverts and rump. It is then similar to Yellow-legged Gull.
- The underwing ranges from very dark brown to pale brownish.
- The pattern of newly moulted ('first-basic') scapulars is quite variable. These feathers are usually whitish or pale greyish, with a dark anchor pattern, which may be thick or thin. Some birds show only a dark shaft streak or dark centre, without the transverse bars of the anchor pattern. The ground colour of the new scapulars can be rather dark greyish in some.
- The head ranges from dark brown with heavy streaking to entirely whitish.
- The underparts range from uniformly brown (usually with some spotting or streaking discernible, especially on breast) to largely whitish.

- Moult of a few, random wingcoverts during September - December was noted in about 3% of Dutch first-cycle Herring Gulls (Altenburg & Muusse, 2004).

⇨ Geographical variation (first cycle)

First-cycle *argentatus* are extremely variable, probably even more so than *argenteus*. Many cannot safely be told from the latter, but a few typical 'types' are identifiable (on current knowledge). Moult stage may also be helpful to a limited extent; birds from northern Scandinavia retain the juvenile plumage (with lots of juvenile scapulars) longer than many *argenteus*, and remain quite fresh throughout winter. However, *argenteus* from Iceland do not differ much in this respect. The 'pale type' of *argentatus* differs from *argenteus* in its prominent whitish fringes to the primaries (at rest), paler tertials (e.g. very whitish, with dark barring instead of a solid dark centre), white greater coverts with only thin, widely spaced dark bars (often no more than three on each covert), and an extensively pinkish bill base. The centres of the juvenile scapulars can have extensive pale internal or side markings. The tail band may be less solid or may be entirely replaced by thin dark bars. The outer primaries have rather pale inner webs, creating a largely pale underside of the wingtip. 'Dark type' *argentatus* are less distinctive (a few *argenteus* are quite dark too) and need to be identified using a combination of plumage, size, shape and retarded moult stage. The body is densely marked with dark brown, sometimes contrasting with a whitish head, the general plumage colour can look quite cold (lacking warm brown tones), the tertials have large dark centres, and the tail band can be very broad. The outer greater coverts can be uniformly dark brown, but usually the other greater coverts remain rather white, with just three dark bars on each feather. The bill base can be extensively pinkish. A few birds are actually quite similar to Great Black-backed Gull but note the latter's more contrasting, black-and-white plumage, white tail with thin but solid, black tail band, heavier bill with strongly curved upper mandible (curve of almost 90° at tip), and darker inner primaries. Some (or many?) birds from the eastern Baltic region seem to start their partial moult as early as in *argenteus* (scapular moult in July – August). They also often acquire a whitish head early on in their first cycle and this, together with their somewhat long-winged appearance and sometimes contrasting tail pattern may make them more similar to Yellow-legged Gull than other *argentatus.* The pattern of the inner primaries is still a fairly reliable character in such birds though.

Second cycle

The inner primaries are always pale (greyish or brownish), but this is less helpful than in first cycle because they can be quite pale in other species as well, such as 2nd-cycle Yellow-legged Gull and Caspian Gull. Many birds acquire adult-like scapulars and/or mantle feathers at this age and these are pale grey. The tertial centres are brownish or blackish, not very extensive, and show some irregular barring or scalloped edges. The greater coverts are largely barred ('vermicelli pattern'). Head and underparts retain a lot of brown streaking. The upper tail pattern typically does not look solid: the dark tail band disintegrates into thin dark bars towards the base. Sometimes the upper tailcoverts and rump are still heavily spotted. The underwing remains largely brownish. The bill is often largely pale.

⇨ Individual variation (second cycle)

- Some birds do not acquire any plain grey scapulars or mantle feathers yet. Instead, the feathers are whitish to pale brownish with dark anchors, dark bars and/or irregularly shaped dark centres.

- The tertials may be pale, with dark bars instead of a dark centre. At the dark extreme, they can be mostly dark brown or blackish.
- Especially the outer, but sometimes all greater coverts can be uniformly dark.
- Head and underparts range from extensively dark brown to almost white.
- The tail can be completely dark.
- The underwing and axillaries may become rather whitish towards the end of the second cycle, but usually retain some brownish mottling.
- The bill may still be all-dark.

⇨ Geographical variation (second cycle)

Many *argentatus* do not acquire adult-like scapulars at this age but if they do, these feathers are often darker grey than in *argenteus*. Pale birds can sometimes be told from *argenteus* by their more prominent pale fringes to the primaries (but note that 2nd-cycle *argenteus* usually shows thin whitish edges there as well), a whiter ground colour to the tertials and wingcoverts, reduced dark centres on the secondaries, paler inner primaries and inner webs to the outer ones, and a thinner tail band. Some birds already show a small but prominent white mirror on P10, which is only rarely seen in *argenteus* of this age. Size and shape may also be helpful.

Third cycle

The upperparts and upperwings are largely pale grey. The tertials show irregular brown markings. The legs are pink. The tail pattern is typically a mixture of irregular blackish patches and bars on a white background. Winter birds show prominent, brown head and neck streaking.

⇨ Individual variation (third cycle)

- Some (retarded) birds show all-brown wingcoverts and tertials as in second cycle. Ageing of such birds is possible by the adult-like inner primaries (visible in flight).
- The outer primaries usually show rounded, white tips but in 'retarded' birds these can be lacking. Again, ageing is done on the basis of the inner primaries.
- The number of white mirrors (on P9-10) ranges from 0 to 2.
- The primary coverts usually show extensive dark marks, but may already be entirely grey in some birds.
- The tail pattern is really variable at this age; it ranges from all-white to completely blackish.
- The secondaries may have brown or blackish centres, or they can be adult-like grey. A mixture of brown and adult-like grey feathers is also quite normal.
- The underwing varies from largely brown to largely white.
- The tertials can show rounded blackish spots, irregular brown to blackish centres, or they can be entirely grey (adult-like).
- The greater coverts can be entirely grey, barred ('vermicelli') or uniformly dark.

⇨ Geographical variation (third cycle)

In many *argentatus* of this age, the upperparts are darker grey than in *argenteus.* The bill colour may look a bit more immature (pinkish or dull greenish), but there is overlap. Other differences should be looked for in the primary pattern: the white mirror on P10 (and sometimes P9 too) is often quite large already, and black subterminal markings on P5 may be incomplete or lacking entirely. A broad white tongue-tip on P8 is a good indication that the bird is not an *argenteus*. Note also body size and shape.

Fourth cycle

The upperparts are pale grey, the legs pink, and head and neck show heavy brown streaking in autumn – late winter. The bill colour is usually quite dull yellowish, with an orange gonys spot confined to the lower mandible. The iris is typically pale yellow and the orbital ring has a dull colour. Note that the amount of black in the outer primaries is often larger than in adult birds, which means that the primary pattern is often very similar to that of adult Yellow-legged Gull.

⇨ Individual variation (fourth cycle)

- Bill colour can be bright yellow in some birds. Most, but not all, show blackish markings near the tip.
- Iris colour ranges from all-dark to whitish.
- Orbital ring can be bright orange or even reddish in some.
- The tertials and some wingcoverts can retain brown markings (recalling advanced 3rd cycle and making ageing difficult) or can be grey (adult-like).
- The tail is either all-white or retains a small amount of dark markings.
- The primary coverts show dark markings or can be entirely grey.

⇨ Geographical variation (fourth cycle)

Many *argentatus* of this age can be identified using a combination of large size, shape, darker grey upperparts, larger white primary tips, larger white mirrors, and smaller amount of black in the primaries. Good indications of the subspecies at this age are a long grey tongue on P10 (> 50% of the length of the feather), a large, all-white mirror + tip of P10, a large, all-white mirror on P9 (across both webs), a prominent, broad white tongue-tip on P8, and/or the complete lack of black markings on P5. Correct use of the primary pattern requires some experience though, and many characters overlap with *argenteus* (especially adults of this subspecies!). Also, keep in mind that many birds from the Netherlands and NW Germany show mixed characters of both subspecies, emphasizing the importance of using as many identification features as possible in combination.
For characters of birds from the eastern Baltic region, see adult cycle.

Adult cycle

The upperparts are pale grey, the legs pink, and head and neck show heavy brown streaking in autumn – early winter. The orange or pale red gonys spot is usually confined to the lower mandible. The iris is typically pale yellow and the orbital ring has a dull colour. The primary pattern typically shows a black spot on the outer web of P5, while the inner web is entirely grey (but see Individual variation).

⇨ Individual variation (adult cycle)

- Head and neck become white during winter. Some birds can be in full breeding plumage from as early as mid December.
- Exceptionally, the iris can still be dark.
- Especially in breeding plumage, the orbital ring can be bright orange or reddish.
- Especially in breeding plumage, the orange or red gonys spot may bleed slightly onto the upper mandible in a few birds (4% in Dutch colonies, as found by Muusse et al.; 2006).

- Some adult *argenteus* (22%) (Adriaens & Mactavish, 2004) show a complete black band on P5, across both webs. At the other extreme, P5 may lack black markings altogether (in 17%).

⇨ Geographical variation (adult cycle)

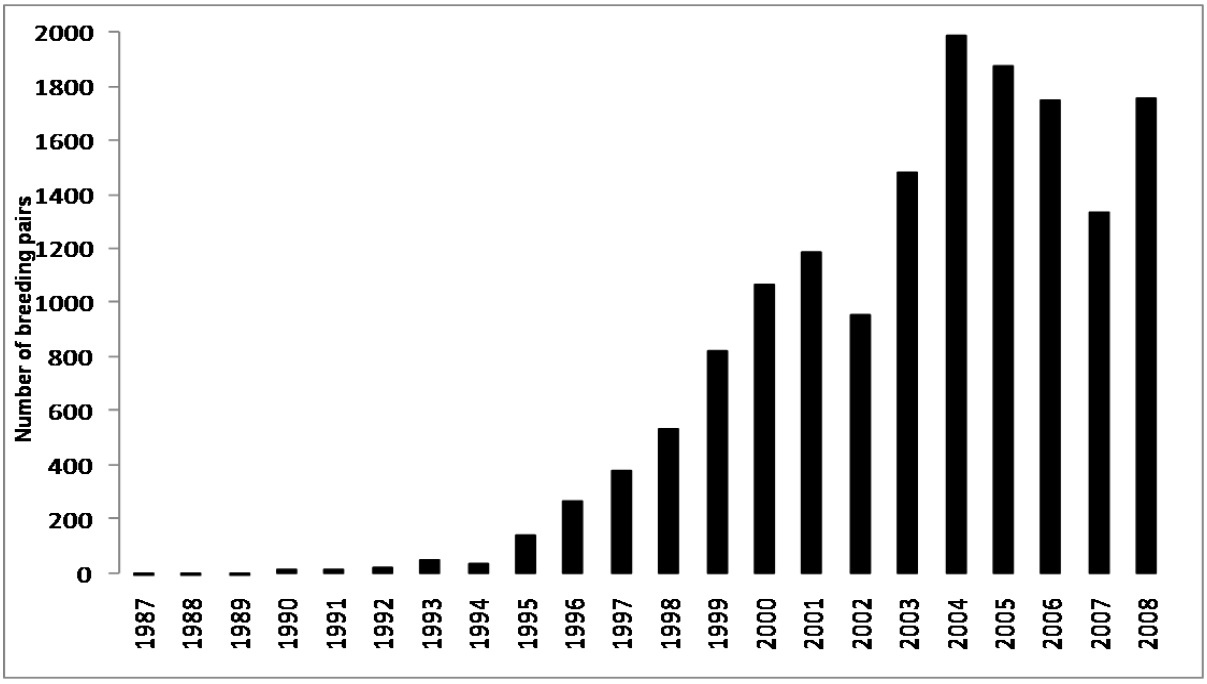
Many *argentatus* of this age can be identified using a combination of large size, shape, darker grey upperparts, larger white primary tips, larger white mirrors, and smaller amount of black in the primaries. Good indications of the subspecies at this age are a long grey tongue on P10 (> 50% of the length of the feather), a very large, all-white mirror + tip of P10, a large, all-white mirror on P9 (across both webs), a prominent, broad white tongue-tip on P8, and/or broken black markings on P6 (instead of a complete black band across both webs). When present, the long grey tongue of P10 may even be visible at rest, on the underside of the wingtips. In (pure) *argenteus*, the tongue of P10 does not normally cover more than 50% of the length of the feather. The bill colour of adult *argentatus* can be quite dull in winter (e.g. mostly pinkish rather than yellow), and the legs may be a brighter pink than in *argenteus.* Keep in mind, however, that many birds from the Netherlands and NW Germany show mixed characters of both subspecies, emphasizing the importance of using as many identification features as possible in combination.

Adult birds from the eastern Baltic region differ somewhat from other Herring Gulls because many show greyish to yellowish legs and a subtly different primary pattern. A dark iris is not as exceptional as it is in *argenteus*; about 1 bird in 1000 shows it. The primaries have slightly more black than other *argentatus*: in about 30%, there is a complete black band on P5 (Adriaens & Mactavish, 2004) (in the Gulf of Finland, this seems to be even more common: 43.5% showed a complete black band in a sample examined by Panov & Monzikov, 1999). This is more than in adult *argenteus* even (see above), and much more than in other *argentatus* (only 3%). Compared to *argenteus*, the grey tongues (including the one on P10) are longer and the upperparts slightly darker grey. Size and shape may also be different. These eastern Baltic birds may represent a valid, separate taxon but, if so, it has not been officially described to this date. The situation is complicated by the occurrence of hybrids of Caspian and Herring Gulls in Central Poland (Neubauer et al., 2007) and of yellow-legged *argentatus* in northern Norway (with very dark grey upperparts and little black on the primaries), which have caused taxonomic confusion. See Jonsson 1998 for an overview.

3. Status as a coastal breeding bird in Flanders

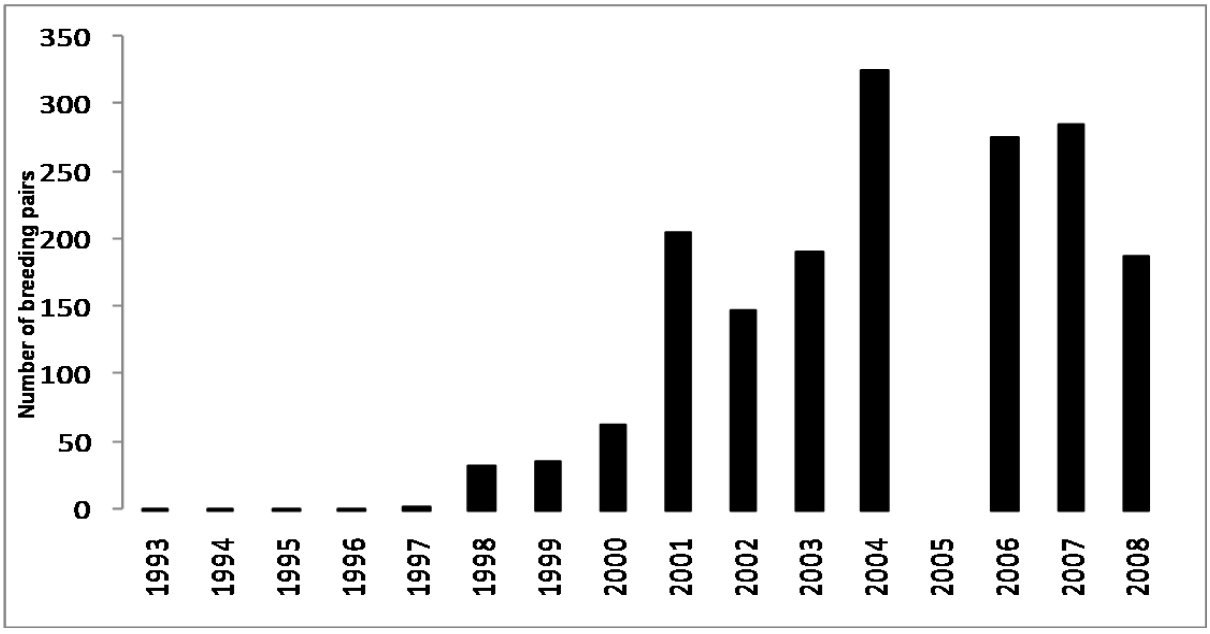
The colonisation of the Flemish coast, in fact the first breeding record of Herring Gull in the whole of Belgium, started in the Zwin nature reserve with only one pair in 1960. Although numbers in the Zwin increased afterwards, the number of pairs never exceeded 74 and for some years now this colony has been abandoned. The colony at the inner port of Zeebrugge (maximum 225 pairs in 2001) is now greatly reduced. However, a strong increase in the breeding population was found at newly created land in the outer port of Zeebrugge (from 1987 onwards) where a peak of 1,986 breeding pairs was counted in 2004 (Graph 7). This steep increase in number of breeding pairs seems to be primarily the result of the occupation of new nesting habitat by immigrants from foreign countries (see below) in addition to a high reproductive output as a consequence of a good food situation in Zeebrugge (Stienen et al., 2002). However, ongoing industrial development in the port of Zeebrugge resulted in the loss of large areas of nesting habitat. Therefore numbers of breeding pairs of Herring Gulls in the outer harbour have more or less stabilized since 2004 (Graph 7) due to concentration of pairs

in smaller and smaller areas suitable for breeding (Stienen et al., 2007). The lower numbers in 2007 (and possibly even earlier) were caused by predation and disturbance by foxes, which found their way to the outer harbour of Zeebrugge. In past years the recent range expansion of foxes was most likely also responsible for the steep decline and the disappearance of the colonies in the inner harbour and the Zwin nature reserve respectively.



Graph 7: Trend in number of breeding pairs of Herring Gull in the outer harbour of Zeebrugge.

In 1998, the first roof-nesting Herring Gulls for Belgium were recorded at Oostende (François, 2002) following indication of breeding in earlier years (a few pairs since 1993?). Since then, breeding numbers increased from 33 pairs in 1998 to little over 300 pairs estimated in 2004. In 2005, 3 pairs of Herring Gulls were found breeding on roofs in the other harbour of Zeebrugge and in 2008 already 99 pairs were counted.



Graph 8: Trend in number of roof-nesting pairs of Herring Gulls in Oostende.

4. Feeding ecology

Herring Gull foraging is strongly influenced by the tide as these birds predominantly feed in the intertidal zone and their main preys are molluscs, crustaceans and other invertebrates (Garthe et al., 1999). Spanoghe (1999) counted maximum numbers of Herring Gulls in the nearshore area two hours before and after low tide, after which numbers decreased steadily or abruptly depending on weather conditions. Diurnal rhythm did not influence Herring Gull feeding activity in his study (November 1998 – March 1999), although foraging was stopped by incoming darkness. Spanoghe suggested that along the Belgian coast breakwaters were more important feeding areas than the beach/surf, as peak periods of feeding activity were higher and lasted longer in the former. However, on particular days feeding frenzies with high concentrations of Herring Gulls do occur on the beach when bivalves (particularly *Ensis* ssp.) and starfishes wash ashore en masse. Beach nourishments also represent attractive sources of food (Bijlsma et al.; 2001, pers. obs.).

5. Dispersion

Already in October the first Herring Gulls return to the breeding grounds in Zeebrugge, but numbers stay relatively low until February (Van Waeyenberge et al.; 2002). During the period April-July Belgian birds are present in or near the colony, but start to disperse from August onwards. Dispersion is in all directions, as far south as the Seine estuary in France, as far west as the south-east of the UK and as far north as Schleswich-Holstein in Germany, although there is a marked tendency for south-westward movements. The majority of Belgian-ringed Herring Gulls stay along the coastlines of Northern France, Belgium and the Dutch Delta area during winter (Figure 3). In the literature, there is some discussion on whether or not adults and immatures exhibit different dispersal patterns. Some studies suggest that immatures winter father south than adults (a.o. Parsons & Duncan, 1978; Vauk & Pruter 1987), whereas other studies suggest that there is no difference in 'wintering' areas between young and adult birds, but only a difference in the duration that birds stay at the 'wintering' grounds (Coulson & Butterfield, 1985; Vercruijsse, 1999; Calladine, 2002; Van Waeyenberge et al., 2002). A graph (Stienen in Vanaverbeke et al., 2007) showing the average distance from the colony in relation to the age of Herring Gulls from Zeebrugge (Figure 4) rather suggest the opposite, namely that young Herring Gulls on average stay closer to the colony than adults. In their first year, Herring Gulls from Zeebrugge stayed at more than 50 km from the colony, but progressively moved

Figure 3: Recovery locations of Herring Gulls *Larus argentatus* ringed as chicks in Zeebrugge.

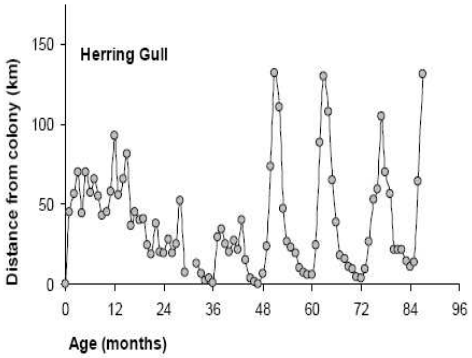
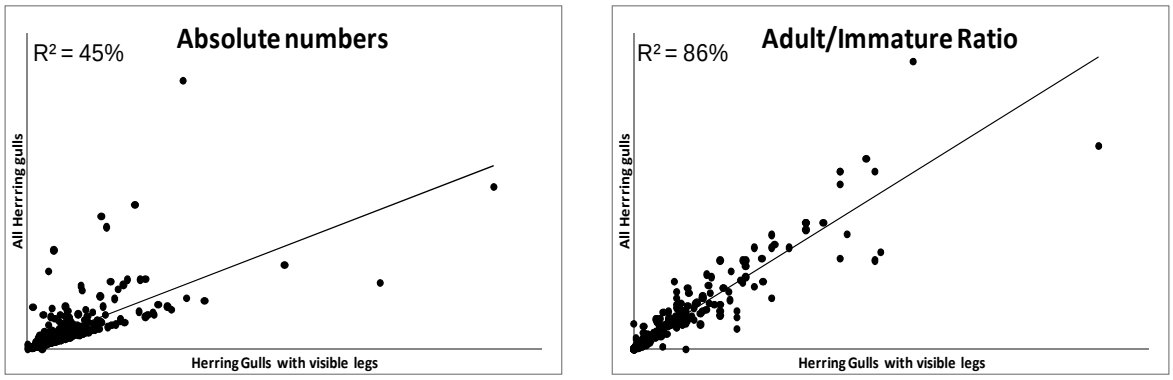


Figure 4: Average distance away from the Zeebrugge colony in relation to age of Herring Gulls *Larus argentatus*.

closer to the colony. In accordance with earlier findings of Coulson & Butterfield (1985), but in contrast to Kilpi & Saurola (1983, 1984), immature Herring Gulls of the Zeebrugge colony on average do not show the typical circular movement pattern away from the colony after the breeding season and back in winter. Only when they reached an age of 3 years a circular pattern evolves and at an age of 4 years more pronounced movements were recorded (Figure 4). Adult Herring Gulls from Zeebrugge seem to wander further south than immatures, which is in contrast to birds from Britain and Ireland (Rock, 2000; Baker, 1980). Stienen in Vanaverbeke et al, 2007 rightfully remarked that further investigations of newly ringed cohorts are necessary to confirm these regional differences (see findings below).

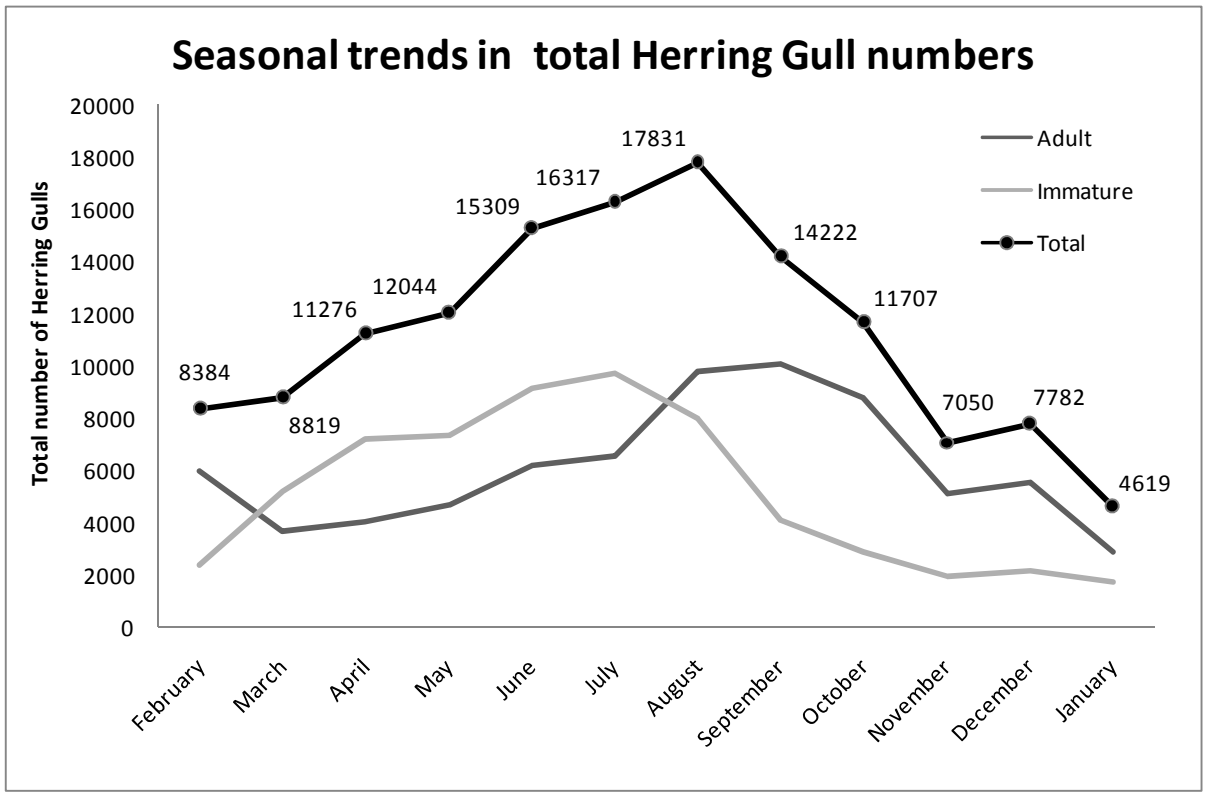
6. Spatio-temporal patterns in abundance and distribution

Herring Gull *Larus argentatus argenteus* is an abundant bird along the entire Flemish coast year-round. To investigate trends in abundance and distribution of these gulls two kinds of counts were performed over a period of one year: simultaneous counts (beach and harbours) and visible legs counts (beach only). Although the visible legs counts were primarily designed as a tool to explore skewed distribution patterns (see below), they could possibly also be used to refine the research grain of the age structure of our Herring Gull population – 2 classes (adults and immatures) for the simultaneous counts, but 5 age classes (1cy to 4cy and adults) for the visible legs counts! Therefore I examined how well the adult/immature ratio of the 'visible legs' population correlated with that of the total population (Graph 9). I found this correlation over the entire year and all beach zones to be quite high (86%), and although a further analysis suggests differences between beach zones (over all months) and months (over all beach zones), this variation ranged from high to very high (between 70% and 95%). When regressing absolute numbers (adults + immatures, not adults/immatures; Graph 10) of gulls with their legs visible (also called 'sampled' numbers further down in this report), the correlation between the 'visible legs' population and the total population proved to be very coarse at best (45%). With sometimes large parts of Herring Gulls of which the legs were hidden (birds sleeping, flying, swimming and foraging in deep water or behind/between obstacles) on any particular counting day, this comes as no surprise. I therefore conclude that the visible legs counts can be used to refine the grain of the age structure, but care has to be taken when extrapolating the results of these counts to real numbers present.



Graphs 9 and 10: Correlation between visible leg counts and total counts of Herring Gull (entire year, all beach zones).

6.1 Temporal patterns



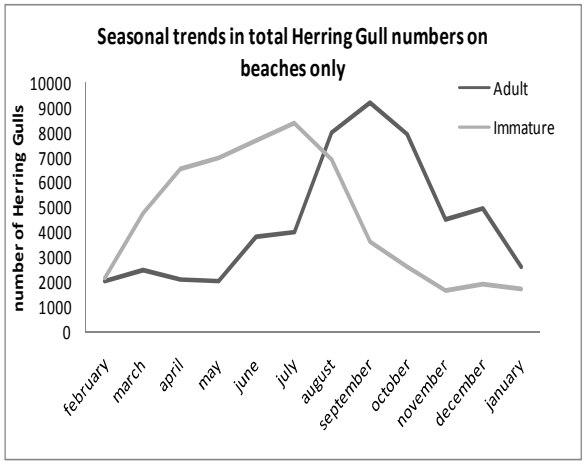
Graph 11: Total numbers of Herring Gulls present along the Flemish coast and in harbours on a monthly basis (based on simultaneous counts)

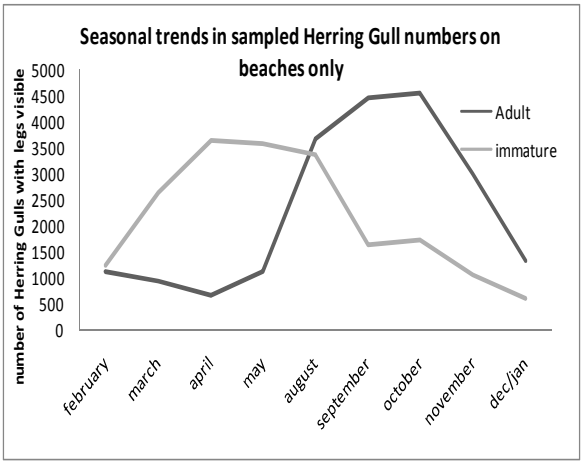
Graph 11 shows how numbers of Herring Gulls fluctuate throughout the year and that a peak is reached in August, a month later than that for all gull species taken together (Graph 2). The timing of this peak can be explained by the fact that the post-breeding dispersion of the Belgian Herring Gull population is just starting and that still half of the breeding adults and their now full-grown juveniles linger in the colony, while an overwhelming majority of the other half can certainly be found somewhere else along our coastline. On top of this some foreign adults (in August all from Zeeland) already found their way to our shores. Let us take a look at table 4 under section 7 of this chapter and I find that during the breeding season (May-July) all adults (100%) are of Belgian origin. In August 88% of the adults still are of Belgian origin and it's only from September onwards that the proportion of Belgian adults decreases to the 72% found for the entire post-breeding period (August-October). I will come back to nationalities in more detail later on (section 7). Another reason why the Herring Gull total peaks in August is that at this time both adults (upwards) and immatures (downwards) are close to their maximum numbers and this brings us to a second, more striking trend of this graph. The trendlines of Herring Gull numbers for adults and immatures separately are sinusoids with – and this is even more eye-catching – their waves running out of phase, with the pre-breeding and breeding season (February-July) being dominated by immatures and the post-breeding season and winter (August-January) by adults. In the following paragraphs I will come back to this finding. For now, it suffices to see that the sinusoids intersect somewhere in August resulting in equal (near maximum) numbers of immatures and adults and further boosting numbers to a peak total.

6.2 Spatial patterns

6.2.1 Herring Gulls at the beach

6.2.1.1 Entire beach

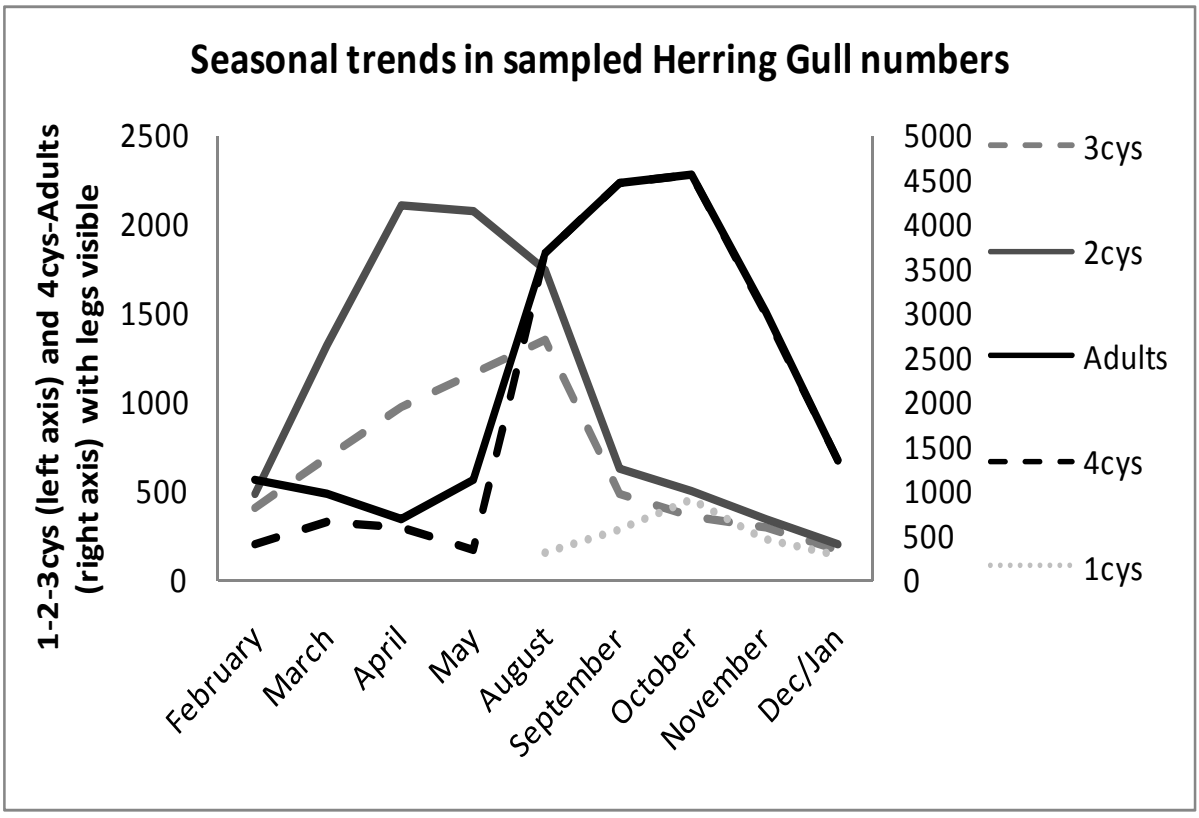




Graph 12 and 13: Seasonal trends in total numbers of Herring Gulls present on Belgian beaches based on simultaneous counts (left) and visible leg counts (right).

The same sinusoidal occurrence pattern of adult and immature Herring Gulls is found when Belgian beaches are considered separately from harbour areas (Graphs 12 and 13) and even for each of the four beach zones separately (Graphs not shown). So I find similar patterns based on two methodologies (simultaneous counts vs. visible legs counts; for details see material and methods, p.10). Based on our simultaneous counts, around 2.000-2.500 adults forage in the intertidal zone during low tide from February to May. An overwhelming majority will be Belgian Birds and, to a lesser extent, possibly non-breeders as from February/March onwards breeding adults start occupying their territories in the colonies (Stienen in Vanaverbeke et al., 2007). The fact that almost no foreign colour-rings of adults are read and relatively few of the Belgian breeding birds with colour-rings are found on our beaches during this time underpins this belief. Also I have some ring readings of adults that skipped breeding in 2008 (F.PAW, F.SAY, F.RAU), but for the most part these presumed non-breeders will more than likely be younger adults that did not come to breeding yet. As first breeding in Herring Gulls can begin between the third and eighth year of age (Vercruijsse, 1999) and no pulli were ringed between 2001 and 2005 on the Belgian breeding grounds, it's impossible to investigate this presumption for now. Rather abruptly adult numbers step up to about 4000 individuals in June and July. From August onwards adult numbers steeply increase and stay high until October, coinciding with the period of post-breeding dispersion with large numbers of foreign (especially Dutch) adults along the Belgian coast. I will come back to nationalities in section 7 of this chapter, but I will already mention that these adults are in or on their way to their 'wintering' grounds (Belgium and northern France). In November all of them have arrived there and winter for a (very) short time either here or in France. From December onwards they commence their return to the breeding grounds to arrive there from February onwards (Vercruijsse, 1999; Stienen in Vanaverbeke et al., 2007). During all that time number of adults gradually decline again to the low numbers of the first half of the year. Anyway, with adults leaving the Belgian intertidal zone to occupy their territories on the breeding grounds in Belgium or abroad and also because they prey progressively more on fish during the breeding season (Camphuysen 2008), an abundant

source of natural food is left for others to exploit. In Zeebrugge especially, the proportion of fish in the diet seems to be significantly higher than the percentages found in several foreign colonies (Stienen, 2002). Immatures tend to avoid competition with the more efficiently foraging and therefore dominant adults (Monaghan, 1980; MacLean, 1986), but are now free to fill this void ('relief of dominance'). Apparently they do so (Graph 11).



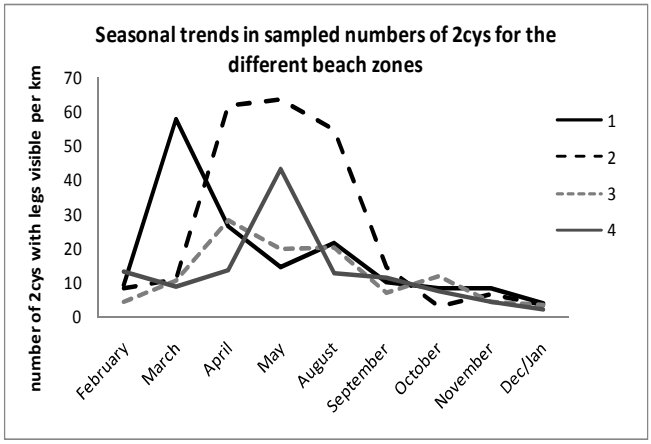
Graph 14: Seasonal trends in total numbers of the different age classes of Herring Gulls along the Belgian beaches based on visible legs counts (1cy-2cy-3cy on left axis and 4cy-adult on right axis)

During the visible legs counts immatures of the various age classes were counted allowing us to show separate trendlines for each age for a more detailed analysis (Graph 14). It is striking to observe that the sinusoidal trend seems to be primarily caused by second calendar-years and to a much lesser degree by third calendar-years. The trendline of fourth calendar-years however shadows the adult sinusoid during the first half of the year and converges with it from august onwards as in their fifth year Herring Gulls reach adulthood. Third and fourth calendar-years do not only gradually behave more like adults, they look more like them and some are inseparable from adults on plumage alone (figure 5). Golley & Elliot (1993) mention that full adult plumage is acquired more rapidly in *argenteus* than in nominate *argentatus* and thus this might on its own explain the small difference in trend between 4cys and adults during the first half of the year. This pattern where the trendlines of 2cys and 4cys mirror those of immatures and adults respectively and that of 3cys project an intermediate trend strongly indicates something more is going on than 'relief of dominance' alone. I will come back to this in the following paragraph.

Figure 5: Herring Gulls born in 2006 moulting to third-winter plumage (4cy plumage from January 2009) showing variation in adult plumage features (upper left: advanced individual, upper right: retarded individual, under: normal individual) © Davy Bosman

6.2.1.2 The different beach zones

Graph 15 shows that numbers (**expressed per km! in this paragraph**) of second calendar-years peak on beach zone 1 in March. According to my calculations roughly 60%, 30% and 10% in this zone alone are from Belgium, Zeeland and northern France respectively. In April and May they have moved up to beach zone 2 with partition of nationalities here and now – and also for beach zone 1 in March – rather similar to percentages found for all immatures during the first half of the year (50-60%: Belgian, ± 35%: Zeeland, 7%: French, 5%: British). The fact that



Graph 15: Trends in numbers per km of 2cys for the different beach zones based on visible legs counts.

percentages presented in table 4 include ringed Herring Gulls from other age classes, mostly third calendar-year Belgians, and are calculated over all beach zones, adds further proof that the immature sinusoid (Graph 14) is strongly determined by the trend in numbers of second calendar-years. In April some 2cys have reached beach zone 3 (65%: Zeeland, 35%: Belgian) and in May beach zone 4 (100%: Zeeland). The latter percentage is obtained, because all colour-ringed 2cys seen on this stretch of beach (from Bay of Heist to the Dutch border) during May were born in 2007 in Vlissingen-Oost (Zeeland). A strong indication that 2cys from Zeeland tend to move up further north than Belgian birds. The life history of Y-5M (Figure 6) reflects this tendency. During its first calendar-year it was exclusively seen in Oostende (Belgium), but in April (beach zone 3 in Blankenberge) and May (beach zone 4 in Heist) it moves up north beyond the harbour of Zeebrugge to be back in Oostende (beach zone 2) in August. It has not been seen in June and July and as there were no visible legs counts back then either it's impossible to say how numbers of 2cys evolve during these two months (see also below). This said, in August their peak numbers shifted towards beach zone 2 again (70%: Belgian, 30%: Zeeland). From September to January 2cys from Belgium and abroad have a sixty-forty partition respectively along our coastline with all beach zones more or less equally important.

Ringing data

Arnhem .6148294 Y-5M Zilvermeeuw

Age & sexe	:	pullus unknown
Ringing date	:	2-7-2007
Ringing place	:	Vlissingen-Oost (Van Cittershaven)
Ringer	:	Roland-Jan Buijs
Remarks	:	

Recoveries

Date	Recovery site
25-7-2007	Vlissingen-Oost (Van Cittershaven), Zeeland, NL
3-9-2007	Oostende (Strand), West-Vlaanderen, BELGIE
5-9-2007	Oostende (Strand), West-Vlaanderen, BELGIE
12-9-2007	Oostende (Haven), West-Vlaanderen, BELGIE
19-9-2007	Oostende (Strand), West-Vlaanderen, BELGIE
5-10-2007	Oostende (Strand), West-Vlaanderen, BELGIE
24-11-2007	Oostende (Strand), West-Vlaanderen, BELGIE
1-12-2007	Oostende (Haven), West-Vlaanderen, BELGIE
2-1-2008	Oostende (Strand), West-Vlaanderen, BELGIE
21-2-2008	Oostende (Strand), West-Vlaanderen, BELGIE
23-2-2008	Oostende (Vistrap), West-Vlaanderen, BELGIE
24-2-2008	Oostende (Strand), West-Vlaanderen, BELGIE
19-4-2008	Blankenberge (Strand), West-Vlaanderen, BELGIE
22-5-2008	Heist (Strand), West-Vlaanderen, BELGIE
18-8-2008	Oostende (Strand), West-Vlaanderen, BELGIE
23-8-2008	Oostende (Strand), West-Vlaanderen, BELGIE
28-10-2008	Oostende (Vistrap), West-Vlaanderen, BELGIE

Figure 6: Picture and life-history of colour-ringed 2cy Herring Gull Yellow-5M © Roland-Jan Buijs

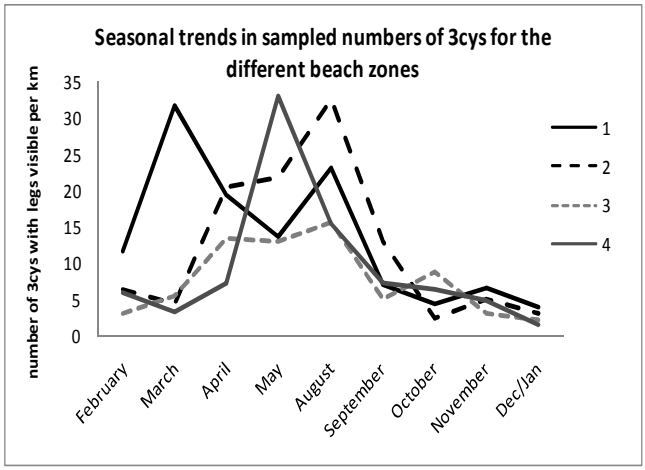
As there was no ringing effort of pulli in the colonies of Vlissingen-Oost and northern France in 2005 and 2006, and also not in Belgium in 2005, interpretation of the trends in numbers of third and fourth calendar-years is less straightforward. As in 2cys numbers of 3cys also peak on beach zone 1 in March (Graph 16), but the shift towards the north seems to advance faster and the return slower. Numbers are high in beach zone 2 in April and May, but with a larger proportion of all 3cys on beach zone 3 compared to 2cys. In May beach zone 4 is even more important than beach zone 2 and for 3cys not exclusively reserved to Dutch birds as 4 Belgian colour-ringed gulls of this age were read here during this month. In August most 3cys seem to reside on beach zone 2 and to a much lesser extent on beach zone 1. A significant proportion however still stays more to the north on beach zones 3 and 4. It would have been interesting to know how many of these birds were

from Zeeland, but once more due to a lack of ringing effort in Vlissingen-Oost in 2006 this is impossible to investigate.

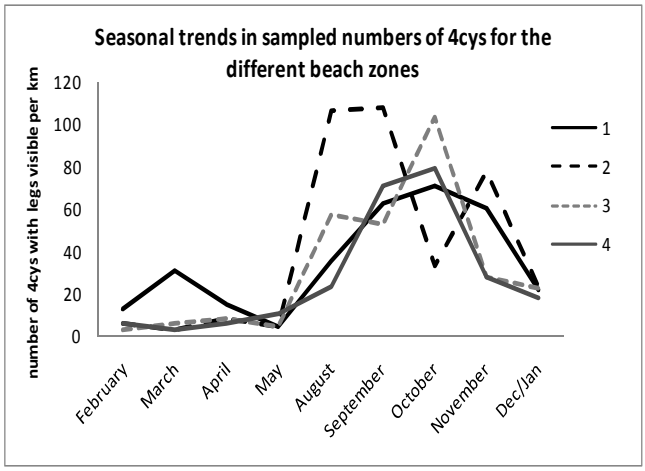
Fourth calendar-years are treated separately from adults only during the first half of the year. Their trendline mirrors that of adults, but they appear to arrive later. Their numbers peak on beach zone 1, a good month later than in adults and decline more gradually from then on (Graph 17 and 18).

After March all adults start leaving the beach to occupy their territories on their breeding grounds, but they appear to be back on beach zone 3 and 4 in May. As the proportion of fish occupies a major part in the diet of breeding adults from hatching of the chick onwards (in June) and beach zones 3 and 4 are within their foraging radius – usually 10 to 15 km (Vercruijsse, 1999) – these adults could be Belgian breeders from the colony of Zeebrugge. An alternative possibility is that young adults are involved, which didn't come to breeding yet, but prefer to reside close to the colony during the breeding season ('floaters'). How many of these birds could be 4cys that are inseparable from adults in appearance, because they have acquired full adult plumage? As there has been no ringing effort of pulli in Zeebrugge from 2001 till 2005, one can only speculate for now. I want to stress for the first, but not the last time the importance of an ongoing yearly ringing effort of pulli for a detailed (e.g. for different age classes, nationalities,…) analysis of trends in abundance and distribution of Herring Gulls.

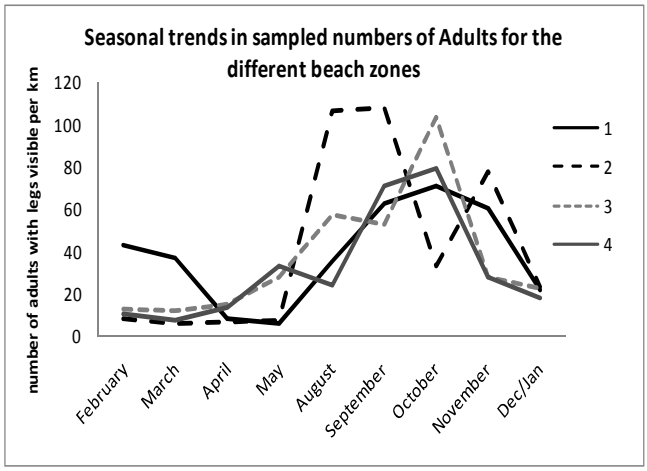
From August onwards adults take over the beach from immatures (see above) and until January beach zone 2 seems to accommodate most of the adult birds with beach zone 1 more or less equally important from November onwards (Graph 19). It is certainly noteworthy that only on these particular beach zones foreign colour-ringed adults were seen that were NOT from Zeeland, except one sighting on beach zone 3 in October. Based on the visible legs count of that month beach zone 3 also seems to hold more adults than zone 2 (Graph 18), but there was a concentration of gulls there



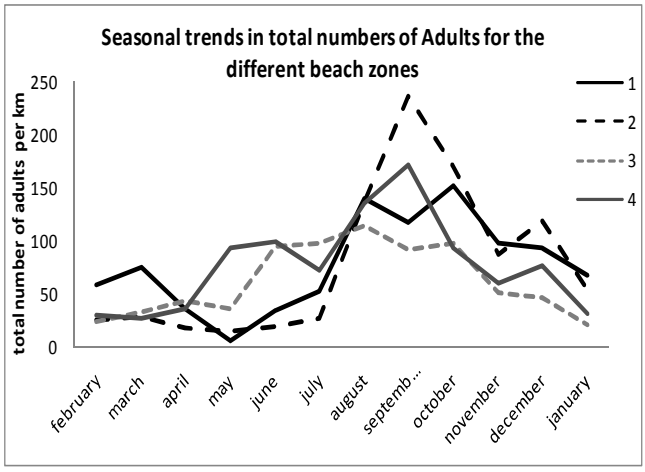
Graph 16: Trends in numbers per km of 3cys for the different beach zones based on visible legs counts.



Graph 17: Trends in numbers per km of 4cys for different beach zones based on visible legs counts.

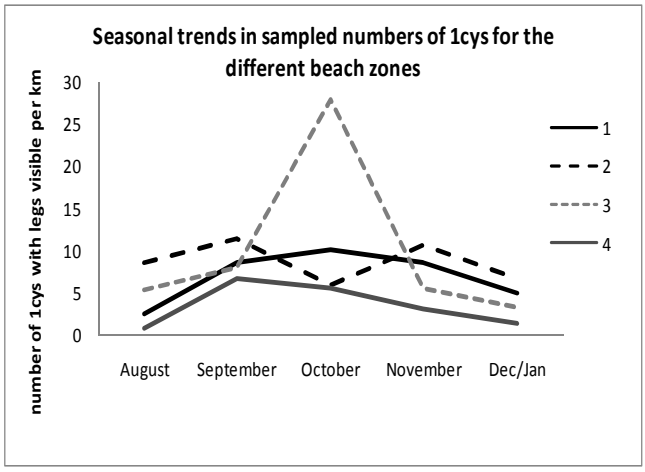


Graph 18: Trends in numbers per km of adults for different beach zones based on visible legs counts.



Graph 19: Trends in total numbers of adults per km for different beach zones based on the simultaneous counts.

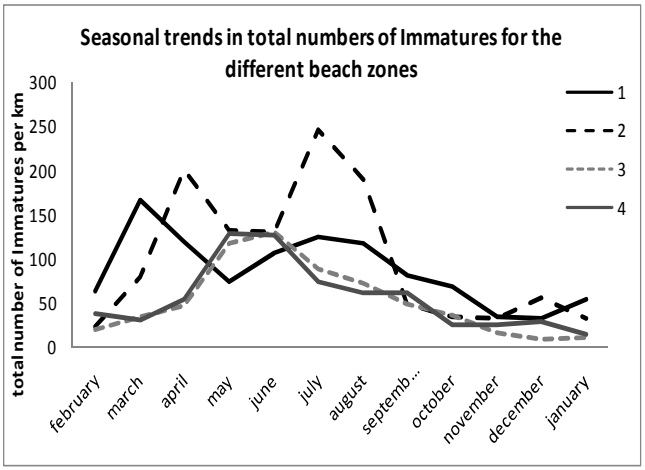
due to a mild beaching of *Ensis* ssp. on that particular day. Furthermore on the day of the visible legs count of beach zone 2 an angler was present on the far end of almost every breakwater preventing gulls to forage there. Therefore I believe that under normal circumstances beach zone 2 accommodates most adults during the post-breeding period and that graph 19 correctly projects this trend. Not surprisingly beach zone 3 (the stretch between Zeebrugge and Blankenberge) turns out to be a Belgian stronghold. In August and September, respectively 95% and 90% of the adults were Belgian and from October to January all of them were. These adults originated from the colony of Zeebrugge and started their post-breeding dispersion (August-September) or stayed close to the breeding grounds even outside the breeding season.



Graph 20: Trends in numbers of 1cys per km for different beach zones based on visible legs counts.

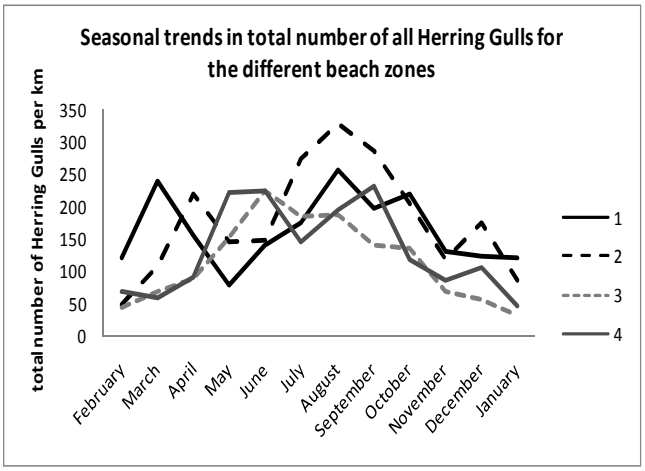
From the end of July onwards, juveniles start leaving the colony of Zeebrugge and explicitly seem to prefer the coastline south (beach zone 1-3) of the colony over the one to the north (beach zone 4) in accordance with what Vercruijsse (1999) found for the Herring Gulls of Schouwen (Zeeland). The peak in October on beach zone 3 is of course caused by the above-mentioned concentration of gulls there and then. Above I already insinuated that something more than 'relief of dominance' might be behind the abundant presence of immatures along our coastline during the first half of the year. Vercruijsse (1999) mentions that 2cys can be found on their 'wintering' grounds in all months of the year, but that there are two processes at work by which reduce the mean distance away from the natal colony from May till September. First of all 2cys exhibit the tendency to forage more in natural habitats – as opposed to refuse tips – during this period. It is this process I have dubbed 'relief of dominance' (see above). Immatures fill the void left behind when adults desert the beach to occupy territories on the breeding grounds and therefore wander almost by accident closer to their natal grounds. A second process implies that a proportion of 2cys actively makes a return movement that brings them closer to their colonies of birth. As Herring Gulls grow older, these processes intensify. With every transition to a higher age class their foraging skills improve (MacLean, 1986) and they feed more and more in natural habitats as their growing experience allows them to better resist competition with (older) conspecifics. Vercruijsse (1999) also mentions that with growing older a higher proportion of immatures returns earlier to the vicinity of the breeding grounds and stays there longer. Probably this has to do with a change in the hormone cycle whereby older immatures get in the mood for breeding earlier (Van Waeyenberge et al., 2002). Above I have demonstrated for 2cys (Graph

15) that they indeed shift to the north, with Dutch birds (Vlissingen-Oost) moving beyond the outer harbour of Zeebrugge to beach zone 4 and possibly even further and with Belgian 2cys only going up to beach zone 3. The majority of 2cys are back on beach zone 2 in August. I also showed that 3cys (Graph 16) advanced a lot quicker northwards than 2cys and more than probably arrived earlier in the vicinity of their breeding grounds. Vercruijsse (1999) mentions that subadults and also still younger Herring Gulls relatively often 'overshoot' their breeding grounds during the summer months. Indeed, I already sighted some Belgian ringed 3cys to the north of their natal grounds on beach zone 4 in May (see above). In August many 3cys are back on beach zone 2, but a good deal of them is still found to the north indicating a longer stay of these birds in the vicinity of their natal colony. In other words with each transition to a higher age class immatures spent more time close to their natal grounds and stayed for a shorter time on their 'wintering' grounds. This of course reduces the chance that in the latter area the rings of older immatures are read. This might explain why Stienen (Vanaverbeke et al., 2007) found in his analysis of ringed (as pulli) cohorts 1999 and 2006 that older immatures dispersed over a shorter distance after the breeding season than younger immatures (Figure 4). Adults certainly also spent little time on the 'wintering' grounds (Vercruijsse, 1999), but foraging along the coastline – as opposed to refuse tips and/or inland for immatures – where more rings are more easily read might have improved the chance their rings were actually read. Anyway, I believe their more pronounced circular pattern – away from the colony after the breeding season and back in winter – than immatures to be a biological reality as a far bigger proportion of them (probably all, except non-breeders) participated in the active return movement to the colony each year. That a circular pattern started to evolve when Herring Gulls reached an age of 3 years also seems logical, as 4cys not only behave more like adults (Graph 17 and 18), but look more like them also (Figure 5). Stienen (Vanaverbeke et al, 2007) indeed rightfully remarked that further investigations of newly ringed cohorts are necessary!



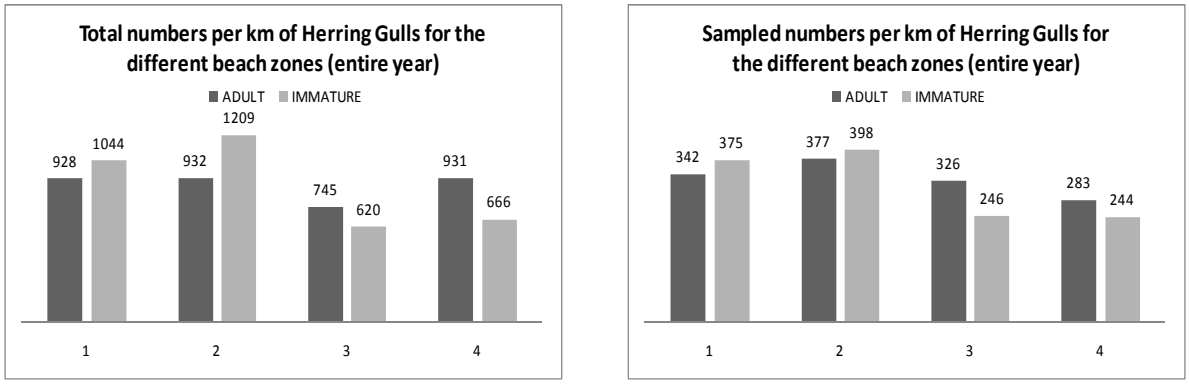
Graph 21: Trends in total numbers of immatures for different beach zones based on the simultaneous counts.

Graph 21 for immatures based on the simultaneous counts confirms what I have found above based on the visible legs counts. Immatures peak on beach zone 1 in March. Luckily the simultaneous count of March was done before the visible leg count of the same month, which coincided with a massive beaching of *Ensis* ssp. causing a feeding frenzy with large number of gulls. So graph 21 confirms numbers of immatures peak there in March anyway. In April most immatures have moved up to beach zone 2. In May-June equal numbers are found on beach zone 2, 3 and 4. In august counts of



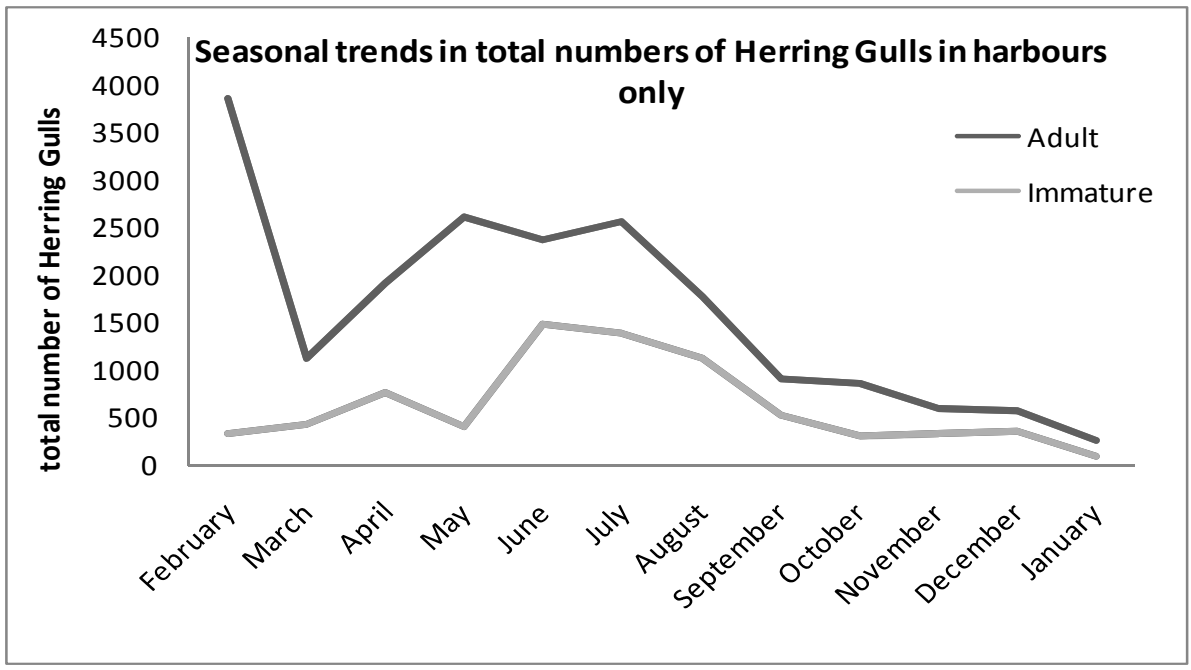
Graph 22: Trends in total numbers of all Herring Gulss for different beach zones based on the simultaneous counts.

immatures once again peak on beach zone 2. For most of the second half of the year beach zone 1 seems to accommodate most immatures. Van Waeyenberge et al. (2002) similarly found that the presence of immatures in the colony peak in may (2cys) and June (3cys) after a first peak in March and that in July (2cys) and August (3cys) all immatures have left.
When all age classes are taken together (Graph 22), trends for the different beach zones mirror those of immatures for the first half of the year and those of adults in the second half of the year in concordance with the sinusoidal occurrence pattern described above. Although I have found that the sinusoidal pattern for adults and immatures separately holds for all different beach zones (see above), counts compiled over the entire year (Graph 23 and 24) show that beach zones 1 and 2 are most important for immatures, while the beach zones 3 and 4 adjacent to the outer harbour of Zeebrugge not surprisingly are adult dominated (based on both counts).



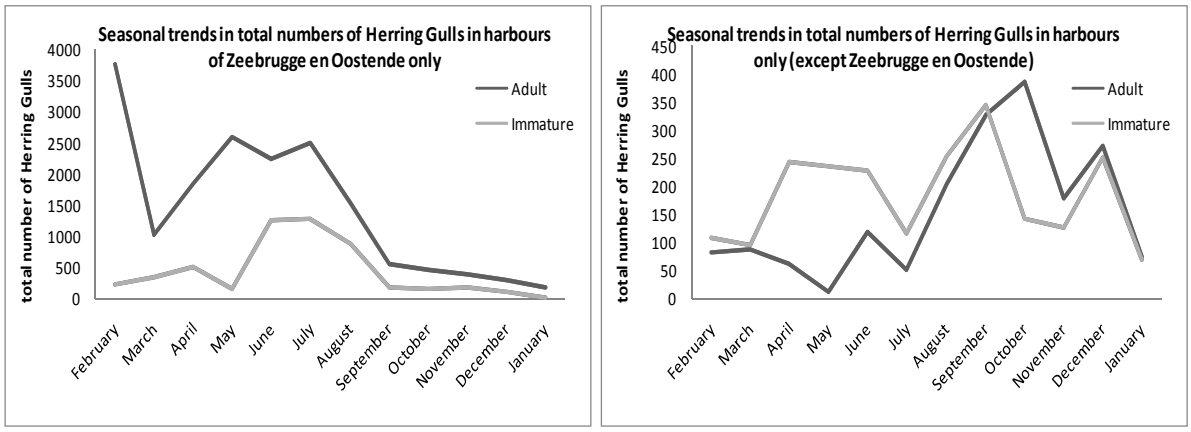
Graph 23 and 24: Adult/immature ratio (numbers per km) of Herring Gulls compiled over the entire year for the different beach zones based on simultaneous counts (left) and visible leg counts (right)

6.2.2 Herring Gulls and harbours



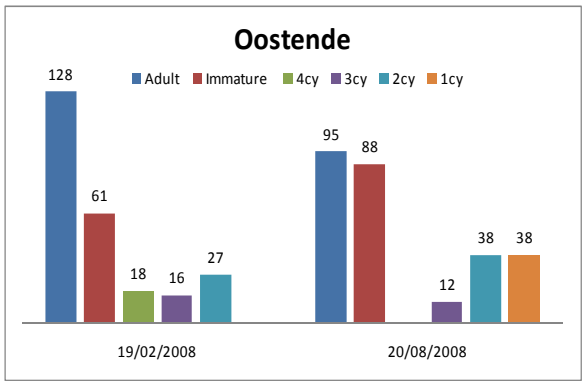
Graph 25: Trend in total numbers of Herring Gulls present in all Belgian harbours counted on a monthly basis (based on simultaneous counts).

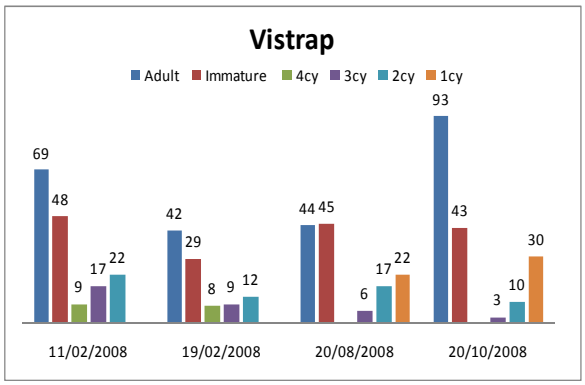
Graph 25 shows us that for all Belgian harbours together no sinusoidal pattern is found for the trendlines of immatures and adults separately. Adults seem to have the upper hand year-round, but when I take a look at the trendlines in graph 26 based on counts in the harbours of Oostende and Zeebrugge alone, I come across an almost exact copy of the first graph. Not coincidently, in harbours where Herring Gulls breed adults are always in the majority. It is the outer harbour of Zeebrugge in particular that has a dominant effect on the shape of the trendlines of the first graph. The peak in immature numbers during the summer months is caused by the reproductive effort of the almost 2,000 breeding pairs in the colony of Zeebrugge. I have no good explanation why 2,650 adults were already present here in February. Were these adults possibly new potential breeders prospecting the colony of Zeebrugge? Whatever the reason might have been, low numbers were counted the next month in (due to?) stormy weather conditions. When I exclude these harbours from my analysis, the remaining harbours do exhibit a sinusoidal trend, although heavily distorted (Graph27). When one knows these places (Nieuwpoort, Blankenberge and Zwin) are predominantly used as high tide roosts and the simultaneous counts were always performed during low tide, then the match is close enough. So it is not the 'harbour' population that does not follow the sinusoidal trend and sets itself apart as a population with its own dynamics, but in fact the breeding population.



Graph 26 and 27: Trends in total numbers of Herring Gulls on a monthly basis for Oostende and Zeebrugge only (left) and for all other harbours (right) based on simultaneous counts.

Visible legs counts were normally only performed on the beaches, but time allowing the harbour of Oostende was sometimes counted during high tide (Graph 28). Again an adult-immature ratio was usually found in favour of adults (contra Engledow et al., 2001), although in August it was close to fifty-fifty and on the Vistrap alone (Graph 29) there were marginally more immatures present during this month. Many of these immatures are juveniles that have left the colonies of Oostende. In October the majority of the young Herring Gulls at the Vistrap are first calendar-years on the lookout for easy food (fishing harbour and market, human waste, chip stalls,…). In February the different age classes of immatures seem to be represented in more or less equal numbers.

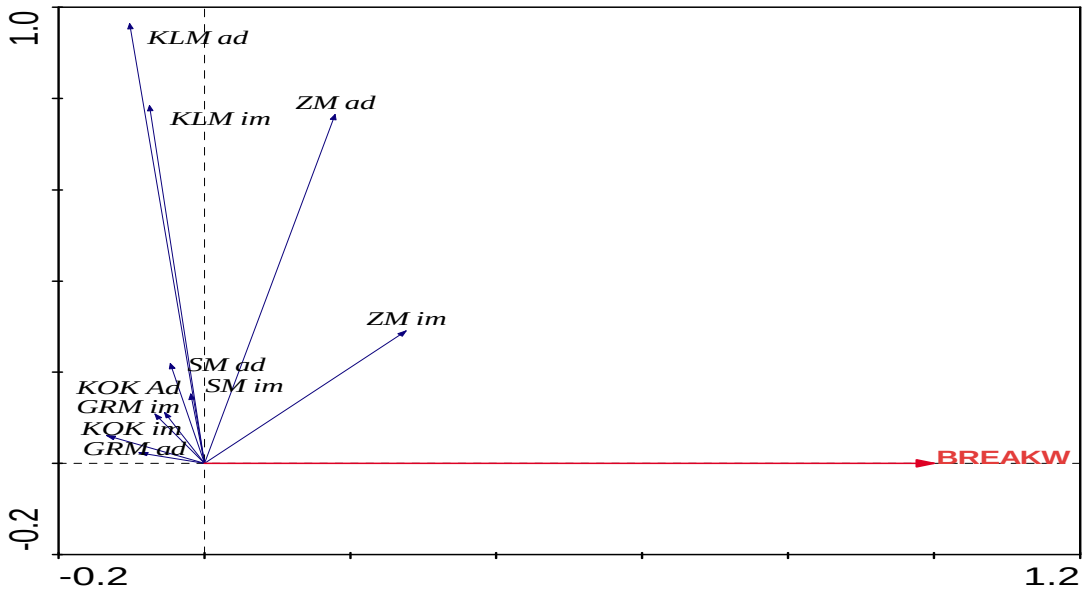




Graph 28 and 29: Trends in sampled numbers of Herring Gulls (with legs visible) for the harbour of Oostende: entire harbour (left) and Vistrap only (right) based on visible legs counts.

6.2.3 Herring Gulls and breakwaters

From previous studies (Spanoghe, 1999; Engledow et al., 2001; Speybroeck et al., 2005) we know that breakwaters along the Flemish coast-line are important feeding areas for Herring Gulls. In fact anybody with any experience in gull watching in Flanders will soon have learned that nine out of ten an assembly of large gulls on a breakwater consists entirely out of Herring Gulls, while other gull species seldom make use of the hard substrates, usually for resting and infrequently for foraging. This does not necessarily imply that of all Herring Gulls present along the coast, the majority of them will be found on breakwaters (see below). High numbers of Herring Gulls counted on beach zone 1 (broad sandy beaches with few breakwaters) indicate that hard substrates are not a strict necessity for this species. Nonetheless when breakwaters are present, up to 90% of the Herring Gulls present make us of them (Engledow et al., 2001) and so I tried to capture the importance of these structures for Herring Gulls in our simultaneous count dataset using Canoco for Windows 4.5.

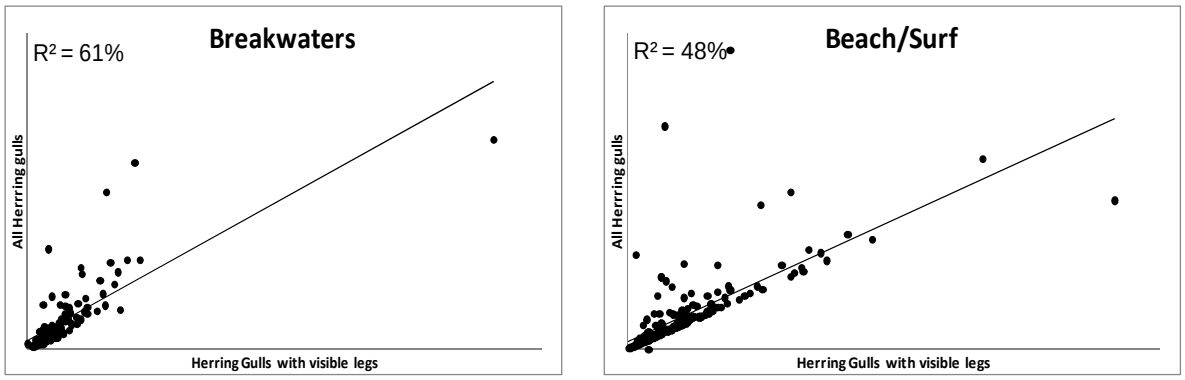


Graph 30: Species-environment biplot from RDA.

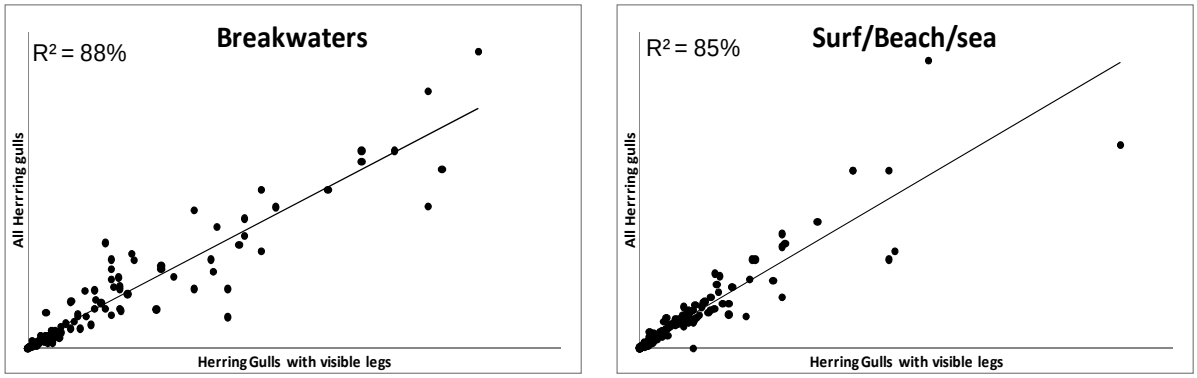
Graph 30 has ‘mixed contents’: the first (horizontal) ordination axis is constrained, representing the variation in gull abundances explainable by the environmental variable BREAKW (= breakwaters), while the second (vertical) ordination axis is already unconstrained, representing the residual variation that is not explained by the BREAKW variable. Graph 30 shows us that the only gull species which numbers are positively related to the number of breakwaters found along the Flemish coast is the Herring Gull (= ZM) and more so for immatures (up to 7%) than adults (up to 3%). Although the first axis only explains approximately 2,5% of the variability in species data for the 5 common gull species taken together (GRM = Great Black-backed gull, KLM = Lesser Black-backed gull, KOK = Black-headed Gull and SM = Common Gull), it is nevertheless significant (499 permutations, $p < 0,05$). These low percentages can be accounted for by linking a very rough measure for the importance of breakwaters to a dataset in which almost 70% of the variability in the species data is explained by a concentration of large numbers of breeding Herring and especially Lesser Black-backed Gulls and their pulli in the outer harbour of Zeebrugge (zero breakwaters) during the breeding period. Also keep in mind that only a minority of all Herring Gulls present along the coastline are foraging on breakwaters at the same time.

Figure 7: Herring Gulls foraging and resting on and near a breakwater © Pieter Vantieghem

During the visible legs counts I recorded for a total of 29515 Herring Gulls whether they were associated with a breakwater or not. From these only 9062 (30%) were counted on or near breakwaters. Note however that absolute numbers of Herring Gulls with their legs visible are used and that these correlate very roughly (45%) with real numbers present (Graph 10) and that I find a better correlation for breakwaters than beach/surf(/sea), 61% and 48% respectively (Graph 31 and 32). Therefore the proportion of Herring Gulls foraging on breakwaters over the year might be less than 30%. Contra Engledow et al. (2001) who say than more than 50 % of the coastal population make use of hard substrates. In this case I observed no difference between adults and immatures (again 30% for both respectively) and what adult/immature ratio is concerned, the ratio of Herring Gulls with their legs visible correlates highly (86%) with that of all Herring Gulls present (Graph 9), and this more or less similarly for breakwaters than beach/surf(/sea), 88% and 85% respectively (Graph 33 and 34). For all that I conclude that the difference found between adults and immatures during the multivariate analysis presents an artefact due to a larger (more than double) concentration of adults than immatures in the outer harbour of Zeebrugge during the breeding period.

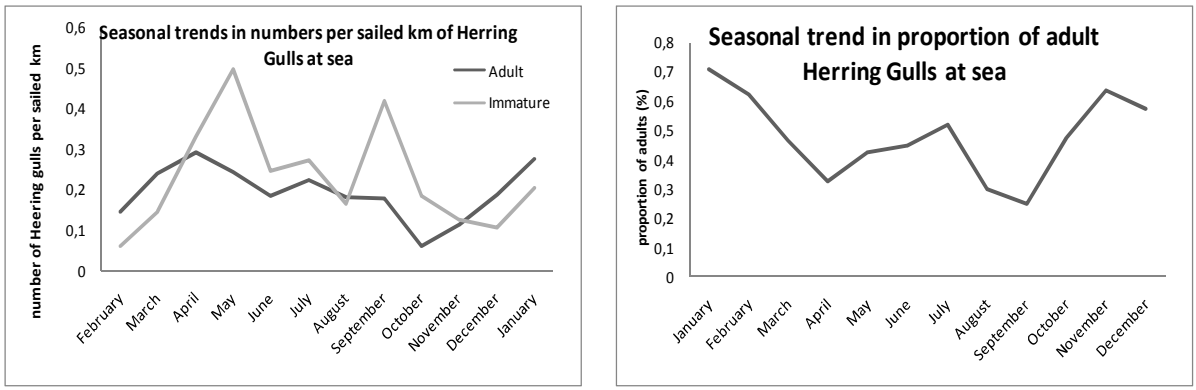


Gaph 31 and 32: correlation between absolute numbers of Herring Gulls with or without legs visible.



Graph 33 and 34: correlation between ad/imm ratio of Herring Gulls with or without legs visible.

6.2.4 Herring Gulls and the sea



Graph 35 and 36: Trends in total numbers per sailed km of Herring Gulls at sea on a monthly basis for adults and immatures separately (left) and proportion (%) of adults (right) based on ship-based counts conducted by INBO.

At sea there seems to be no such thing as a sinusoidal trend (Graph 35) indicating that we are dealing with a population that has its own dynamics. Trends in abundance and distribution are here predominantly driven by associations with fisheries. 40%-50% of all Herring Gulls at sea are counted while scavenging behind fishing vessels, especially trawlers (Stienen, WAKO-eindrapport; Camphuysen, 2008). Adult densities keep relatively constant throughout the year except for a dip in September, while immature densities fluctuate strongly year-round. Spanoghe (1999) found few similarities and relations in trends between the coastal population and the one at sea. However it cannot be totally independent and there must be at least some interaction with the population along the coast. During the breeding season the percentage of fish in the diet of breeding adults increases considerably and this is possibly reflected in the rising proportion of adults out at sea from May till July (Graph 36)? The spikes in April and

August in the density trendline of immatures (Graph 35) could possibly also be explained in connection with coastal population dynamics. The peak in April coincides with rising numbers of immatures along our coastline shifting north (see above) and could reflect immatures foraging at banks close to the coast while moving up that coast (cfr. Graph 21)? In August large flocks of juveniles (mixed flocks of Herring and Lesser Black-backed gulls) can be seen scavenging behind fishing vessels close to coast (pers. obs.) accounting for at least part of the peak in immature numbers then. The dip in September in adult densities may be explained by the fact that large numbers of them are counted in the intertidal zone. Do they prefer to forage there during the post-breeding period? Do they prefer to forage at sea again during their return movement to the breeding grounds from December onwards (Graph 35) as they outnumber immatures there until February, when they start occupying territories in their respective colonies?

7. Herring Gulls and colour-rings

This section could not have been written without the willing cooperation of the European ringers whose colour-ringed Herring Gulls were seen during the course of this research. I wish to thank **Roland-Jan Buijs, Kees Camphuysen, Morten Helberg, Richard Thompson, Jean-Pierre Leys, Bird Ringing Centre Moscow, Mike Marsh, Kjeld Tommy Pedersen and Nele Markones** for sending us their ringing efforts and supplying us with the life-histories of the sighted Herring Gulls. The presented results are only preliminary, because among other reasons my calculations should be made over several subsequent years and the assumptions (see material and methods, p.12) in reality do not hold. For example a rare, but ringed long distance disperser in a Herring Gull colony with a low ringing effort will boost the percentage to a high level, while in reality only one bird is here (violation of the first assumption). Zeeland is a fine example of how 'regionalities' can play a role. Considerably more birds seen along our coast originated from Vlissingen-Oost than from Moerdijk and when I split up the ringing effort of Zeeland for these two regions the percentages found were different from the pooled Zeeland population. So what about regions or even countries where there is no ringing effort (violation of assumption 2)? Nevertheless I got interpretable results. For good measure I did however pool the results of the ring readings and the simultaneous count over four periods/seasons. Only for clarifying trends single months were picked out. I defined the pre-breeding period from February-April, the breeding season from May-July, the post-breeding period from August-October and the winter season from November-January.

Figure 8: Dutch Colour-ringed 2cy Herring Gull present in the harbour of Oostende February 9th 2008. © Davy Bosman

7.1 Herring Gulls and their

nationalities

PRE-BREEDING				%			%
ADULT	13570	11670	BELGIAN	86			
		1357	VLISS	10	1357	ZEELAND	10
		543	GERMAN	4			
IMMATURE	14909	7753	BELGIAN	52			
		5069	VLISS	34	5815	ZEELAND	39
		745	MOERD	5			
		1193	FRENCH	8			
		149	BRITISH	1			
		1	HOLLAND	NVS			
TOTAL	28479	19423	BELGIAN	68			
	28479	7172	ZEELAND	25			
	28479	1193	FRENCH	4			
	28479	543	GERMAN	2			
	28479	149	BRITISH	1			
		1	HOLLAND	NVS			

BREEDING				%			%
ADULT	17401	17401	BELGIAN	100			
IMMATURE	26269	2212	PULLI		14962	BELGIAN	57
	24057	12750	BELGIAN	53			
		6977	VLISS	29	8660	ZEELAND	36
		1684	MOERD	7			
		481	SUSSEX	2	1443	BRITISH	6
		962	SUFFOLK	4			
		1203	FRENCH	5			
		1	HOLLAND	NVS			
TOTAL	43670	32363	BELGIAN	76			
		8660	ZEELAND	19			
		1443	BRITISH	3			
		1203	FRENCH	2			
		1	HOLLAND	NVS			

POST-BREEDING				%			%
ADULT	28716	20388	BELGIAN	71			
		3159	VLISS	11	3590	ZEELAND	12,5
		431	MOERD	1,5			
		3733	HOLLAND	13			
		861	WADDEN	3			
		144	BRITISH	0,5			
IMMATURE	15044	8425	BELGIAN	56			
		2557	VLISS	17	3610	ZEELAND	24
		1053	MOERD	7			
		375	FRENCH	2,5			
		2407	HOLLAND	16			
		226	BRITISH	1,5			
		1	DANISH	0			
TOTAL	43760	28813	BELGIAN	65			
		7200	ZEELAND	16			
		6140	HOLLAND	14			
		861	WADDEN	2			
		375	FRENCH	1			
		370	BRITISH	1			
		1	DANISH	0			

WINTER				%			%
ADULT	13512	10269	BELGIAN	76			
		1892	VLISS	14	2297	ZEELAND	17
		405	MOERD	3			
		946	WADDEN	7			
		3	HOLLAND	NVS			
IMMATURE	5939	2970	BELGIAN	50			
		594	VLISS	10	891	ZEELAND	15
		296	MOERD	5			
		119	FRENCH	2			
		30	SCANDIN	0,5			
		148	BRITISH	2,5			
		1366	HOLLAND	23			
		416	RUSSIAN	7			
TOTAL	19451	13239	BELGIAN	68			
		3188	ZEELAND	16,5			
		1366	HOLLAND	7			
		946	WADDEN	5			
		119	FRENCH	0,5			
		148	BRITISH	0,5			
		446	NORTH	2,5			

Table 4: Partition of nationalities of Herring Gulls for adults and immatures together and separately for the four different seasons based on ring readings by volunteers from February 2008 till January 2009 ZEELAND= VLISS(ingen-Oost)+MOER(dijk), NVS= Norman Van Swelm (no calculations possible)

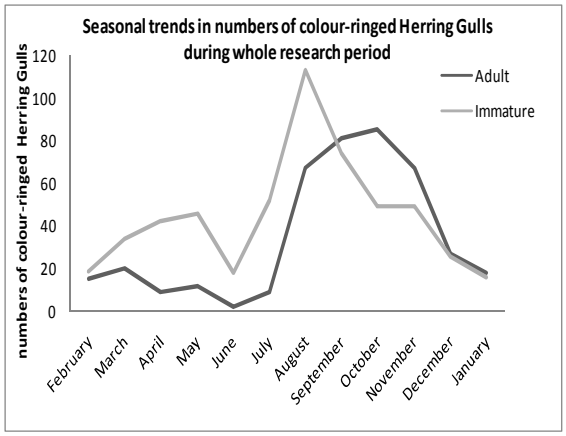
7.1.1 Adults

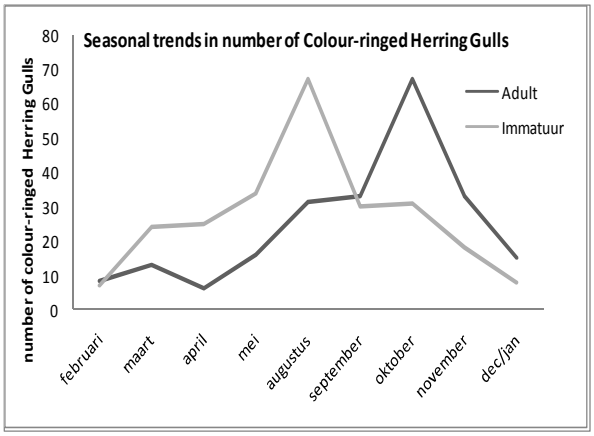
During the breeding season (May-July) all adults are of Belgian origin as no foreign colour-ringed Herring Gulls were seen during this period. It is possible that among the non-breeders on the beach some foreign birds were present, but that they were missed due to a low reading effort in June and July (e.g. no visible legs counts). What I do know is that at least a part of the breeding adults in the colony of Zeebrugge are of foreign origin. Stienen et al. (2002) mentions that the Delta area (Zeeland) probably was an important source of the initial growth of the Herring Gull breeding population in Zeebrugge. Let us however consider these birds as naturalized Belgians and conclude that during the breeding season of 2008 all adults present along our coastline had Belgian nationality. After the breeding season a period of post-breeding dispersion (August-October) begins, with foreigners – mostly Dutch birds (28,5%) – staying here or passing through on the way to their 'wintering' grounds. The proportion of Belgian birds falls back to 71%. During the first month of the winter season (November-January) all adults are present on their 'wintering' grounds, but from December onwards they already start the return movement to their breeding grounds (Vercruijsse, 1999). Paul D'hoore (pers. comm.) reports that on the seventh of December 2008 in less than 2 hours time ± 500 adults in flocks of ten flew north-east over the dunes in Blankenberge. In the pre-breeding season (February-April) the proportion of Belgian birds stepped up to 86% as most adults are now in the vicinity of their breeding grounds and even start occupying territories in their colonies. Noteworthy is the presence of a German adult from Kiel close to the border with Denmark. After correction for ringing effort I find that more or less 4% of the adults in winter come from a zone where *argentatus* and *argenteus* intergrade. Extra care must therefore be taken when one tries to identify an unringed *argentatus* in winter, particularly because Helberg (pers. comm.) comments that most Norwegian Herring Gulls stay close to their breeding grounds year-round. No colour-ringed adults from northern France have been seen as there has been no ringing effort of adults there and pulli have only been ringed from 2007 onwards. However, I believe that French adults do reach our shores.

7.1.2 Immatures

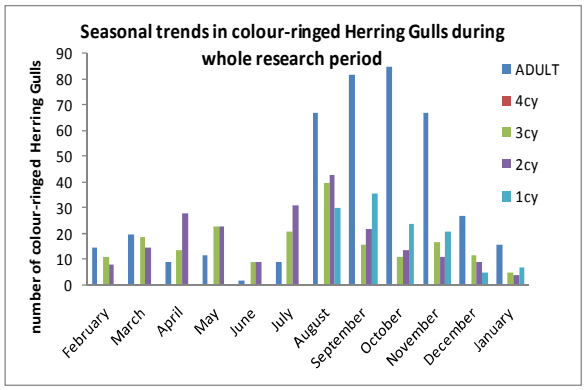
The proportion of Belgian Herring Gulls among immatures remains more or less constant throughout the year (between 50-60%) and in all seasons a greater diversification of nationalities is found than in adults. This seems to support the notion that more immatures wander further away from the breeding grounds. The percentages of immatures of Zeeland roughly reflect the northwards return movement to the natal grounds and back again of these birds (see above). During the pre-breeding season 39% of the immatures are from Zeeland. These individuals are moving up the coast and in the breeding season some of them must reside in the vicinity of their natal colony as their percentage drops to 36% here. During the course of the post-breeding season many of them travel to their 'wintering' grounds where depending on their age they stay a shorter or longer time and their percentage drops to 24%. Many of these immatures must reside in northern France in the winter season as percentages of birds from Zeeland further decrease along our coast to a low of 15%. It is during this period that most Dutch immatures here seem to originate from Holland, north of Zeeland. Every or almost every season immatures are sighted from northern France, Zeeland, Holland and Britain indicating the importance of immature dispersion for the exchange of individuals between these populations in the southern part of the North Sea and their metapopulation dynamics. Surprisingly two first calendar-years from Russia were sighted in November, one in Blankenberge and one in Oostende. Together with the sighting of a third calendar-year from Norway, I calculated that 7,5% of the immatures must be *argentatus* in winter.

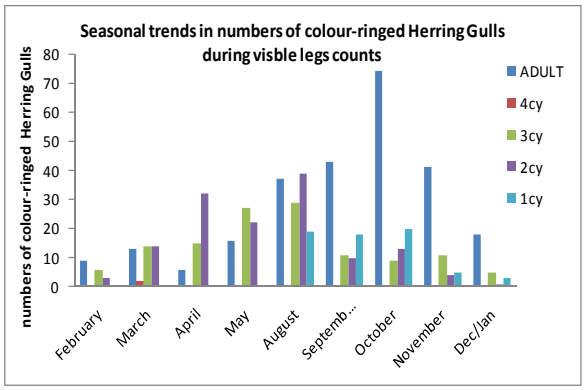
7.2 Skewed distribution patterns





Graph 37 and 38: Trends in numbers of colour-ringed Herring Gulls based on reading effort of all volunteers during whole research period (left) and of Davy Bosman during visible legs counts only (right).

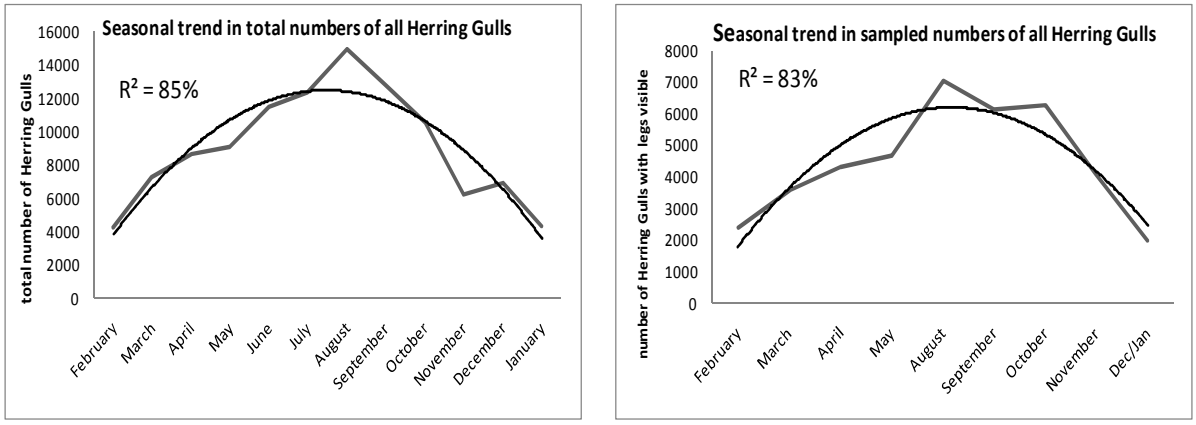




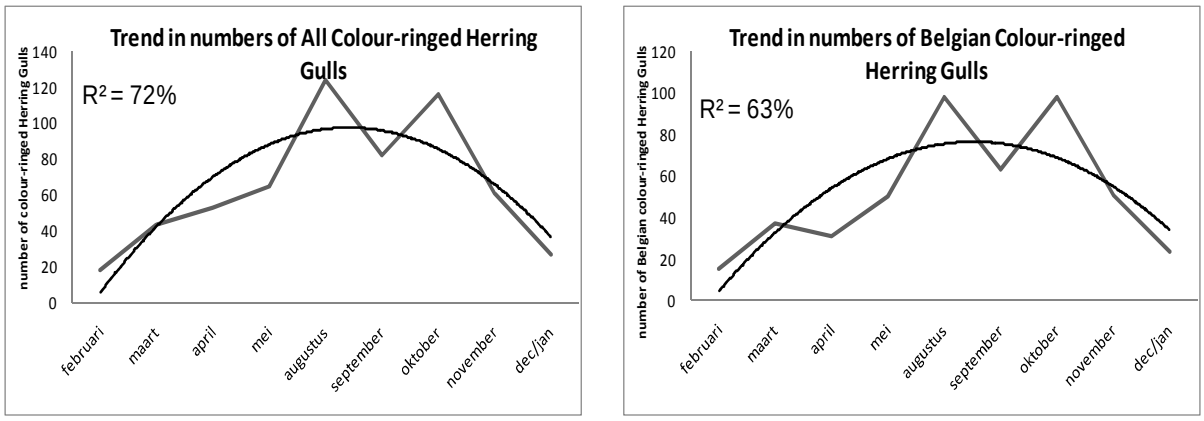
Graph 39 and 40: numbers of colour-ringed Herring Gulls (age classes separately) based on reading effort of all volunteers during research period (left) and of Davy Bosman during visible legs counts (right)

In Graph 37 I find that the adult trendline of colour-ringed Herring gulls closely resembles the trendline that was found for the entire adult population (Graph 11). The immature trendline however seems to be heavily distorted with upward and downward spikes. First of all the relatively low numbers of colour-ringed immatures seen during the first half of the year, when immatures along our coastline are abundant, are caused by a lack of ringing effort of pulli in the (for our coastline) important colonies of Vlissingen-Oost (Zeeland) and northern France in 2005 and 2006, and also in Belgium in 2005. An other colony from Zeeland (Moerdijk) has known a more consistent ringing effort since 2003, but seems to be less important as only 21% of the colour-ringed birds from Zeeland seen during the entire research year originate from there. The rock bottom low in June and July is caused by a low reading effort during these months on top of a lack of ringing effort in the previous years. In August high numbers of ringed second and third calendar-years present along our coast together with juveniles leaving the colony (Graph 39) explains the peak in readings of ringed gulls for this month. The trendline more gradually declines in the following months compared to the trendline of all immatures (Graph 11) as it takes a while for the (ringed) juveniles to disperse. It's only from December onwards that they stop being the most abundant immature age class of ringed birds along our coastline (Graph 39). I see the same thing happening for the immature trendline in Graph 38 based on the visible legs counts. Here however the adult trendline is

also distorted with a (too) pronounced peak in October due to concentration of ringed and unringed gulls on beach zone 3 (see above). It was on the basis of this finding I decided to use the ring reading effort of all volunteers in conjunction with the simultaneous counts (not the visible legs counts) to calculate the partition of nationalities.

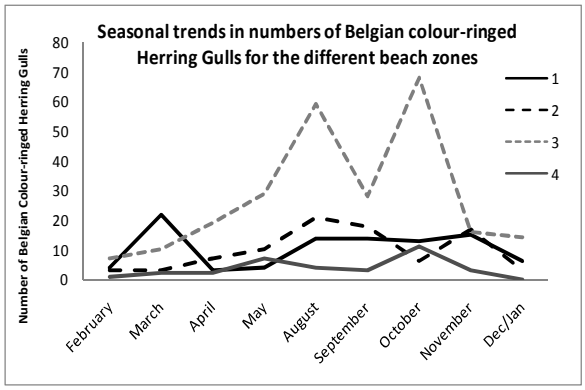


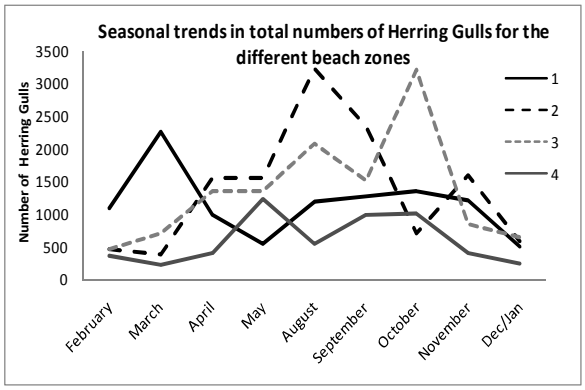
Graph 41 and 42: Trends in numbers of all Herring Gulls of the entire population based on the simultaneous counts (left) and in sampled numbers of all Herring Gulls of the 'visible legs' population based on visible legs counts (right) for beaches only.



Graph 43 and 44: Trends in total numbers of all colour-ringed Herring Gulls (left) and of Belgian colour-ringed Herring Gulls only (right) based on visible legs counts

Graph 41 based on the simultaneous counts projects more than likely the most realistic trend in total numbers of Herring Gulls on our beaches and by extension of the entire population (minus the breeding population) along our coast (see above), because within the framework of these counts all beaches were counted at the same time (see material and methods, p.10). When I try to fit a polynomial on this graph next, I find a perfect symmetrical parabola (85% fit). Graph 42 is based on the visible legs counts (gulls with their legs visible only) with counts in June and July lacking and the last visible legs counts spread over December and January (for further details see material and methods, p.10). Nevertheless when I again try to fit a polynomial, I find a rather symmetrical parabola (83% fit) and thus still a good approximation of reality!! However when I try to extrapolate a trend in Herring gull numbers based on absolute numbers of all (incl. foreign) colour-ringed birds seen during the visible legs counts and subsequently try to fit a polynomial (Graph 43), the resulting trend starts to deviate from reality. The parabola is slightly skewed and the fit decreases to 72% due to spikes in August and October respectively. Using absolute numbers of Belgian Colour-ringed birds only (Graph 44) seems to add an extra spike in March further lowering the fit to 63%.





Graph 45 and 46: Trends for the different beach zones separately in total numbers of Belgian colour-ringed Herring gulls (left) and sampled numbers of Herring Gulls (right) based on visible legs counts.

When I split up Graph 42 and 44 for the different beach zones (Graph 45 and 46), I was able to identify why these three spikes occur. The peaks in March and October are caused by beachings of *Ensis* ssp. and subsequent concentration of foraging gulls on beach zone 1 and 3 respectively. Above I have demonstrated that immatures peak on beach zone 1 in March anyway, but that adults in October under normal circumstances are most abundant on beach zone 2 and the spike in this month is therefore a deviation of the normal trend. I have also found that beach zone 3 (the stretch between Zeebrugge en Blankenberge) is a Belgian stronghold with 95% of the adults having Belgian nationality and at the beginning of the post-breeding dispersion only few foreign adults (12%) have found their way to our coastline (see above). Due to a lack of ringing effort of pulli in previous years numbers of ringed immatures are relatively low. Consequently most rings are read on beach zone 3 in August (Graph 44), while in reality the total number of Herring Gulls peaks on beach zone 2 (Graph 45). When I do the same exercise for Graph 42 with foreign birds included (Graph not shown), I find that the peak in Marsh is actually there, but that it is obscured by a rising number of foreign (mainly Dutch) colour-ringed immatures on beach zone 2. The spikes are thus mainly caused by concentrations of Belgian colour-ringed Herring Gulls, which of course can be expected along the Belgian coastline. It does however demonstrate that trends found on the basis of ring readings are not necessarily a projection of how trends in reality take their course.

Great care has to be taken when extrapolating trends based on analysis of ring readings and a yearly ringing effort of pulli is necessary in all relevant colonies to avoid skewed trendlines. Otherwise you might come to wrong conclusions, although I have to say that adults seem less sensitive than immatures. This is probably due to the fact that once pulli become adults, they stay adults and when you ring a cohort of adults (besides pulli), you might capture a more or less 'normal' age distribution in one single effort. Therefore adults are more than likely less sensitive for anomalies in their trendline based on ring readings. Also one has to know the dynamics of the population under analysis to asses in how far peaks in ring readings project a real trend or represent deviations of the usual situation due to a concentration of gulls (e.g. as a result of feeding opportunities).

LESSER BLACK-BACKED GULL *LARUS FUSCUS*

1. Introduction

Lesser Black-backed Gulls *Larus fuscus graellsii* migrate over greater distances and spend more time at sea than Herring Gulls. The small spatial scale (relative to these distances) and the experimental design of our research did not allow us to get the same quantity/quality of data as for Herring Gulls. However, I found some interesting trends in their abundance and distribution. Ring readings were linked to the results of the simultaneous and visible legs counts to calculate partition of nationalities, but my findings are presented with the necessary reservations. Our counts along the coast will again be compared to counts made by the Research Institute of Nature and Forest (INBO) on the Belgian Continental Shelf (from 1992 onwards). Furthermore an extensive paragraph on how to identify the different age classes of Lesser Black-backed Gull has been written by Peter Adriaens. In addition an overview is given of its status as a coastal breeding bird in Flanders and on feeding ecology and migration patterns necessary to interpret the results.

2. Taxonomy and identification by Peter Adriaens

In Lesser Black-backed Gull, three subspecies are recognized: *L. f. graellsii, L. f. intermedius* and *L. f. fuscus*. Birds breeding in The Netherlands and, to some extent, Belgium cannot easily be assigned to subspecies (probably due to interbreeding) and are sometimes referred to as “Dutch intergrades”. The descriptions below refer to the subspecies *graellsii* unless otherwise stated. At all ages, many birds of this subspecies have a rather pear-shaped head, a moderately thin bill, rather long primary projection and fairly short legs. The upperparts are never uniformly pale to medium grey.

2.1 General impression

In first cycle the plumage is usually (much) darker and more contrasting than in Herring Gull. Second-cycle birds are even more contrasting, as the rather uniformly dark upperparts and upperwings contrast with whitish head and underparts. From third cycle on, the upperparts and upperwings are dark blackish-grey and the legs yellowish.

2.2 Identification

First cycle

The inner primaries are a reliable character: they are entirely blackish on the outer webs, and dull brown to blackish on the inner. They are therefore much darker than in Herring Gull, and also darker than in the other species treated here. The upper tail shows a contrasting pattern of a (very) broad, solid blackish tail band against a white rump. Another useful feature in flight (compared to Herring Gull) is that the greater coverts are almost as dark as the secondaries, thus creating two dark bars on the arm. At rest, the juvenile primaries are more blackish than in Herring Gull, the tertials have almost blackish centres and thinner, less extensive pale

edges, and the outer greater coverts are uniformly dark (often almost blackish). Unlike some Herring Gulls (particularly pale *argentatus)*, the primaries never show extensive white fringes. Juvenile scapulars are darker brown than in Herring Gull, with more contrasting whitish fringes. Newly moulted ('first-basic') scapulars often show a slightly thicker anchor pattern than in Herring. Towards the end of the first cycle, some birds acquire some uniformly dark grey scapulars and wingcoverts. Note also moult stage; some birds have already moulted some wingcoverts (especially median coverts) in early autumn, which is not usually seen in Herring Gull. In spring, some birds (mainly of the races *intermedius* and *fuscus*) show a variable number of moulted, fully-grown tailfeathers (which can be told from juvenile feathers by their prominent white tips), secondaries (with very broad white tips) and primaries (blacker and more rounded than juvenile feathers), with little or no active moult – suggesting that these feathers were replaced during winter. Such an extensive first-cycle moult is very unlike the other large gull species, which only start replacing these feathers from April – May.

⇨ Individual variation (first cycle)

- The inner primaries may have slightly paler inner webs than usual (dull greyish), but show little variation otherwise. A pattern as pale as in Herring Gull (pale inner and outer webs, with dark subterminal spot) seems very rare (only one bird in 10 years of gull observation; this bird is shown in plate 2).
- The upper tail pattern ranges from showing a moderately thin (but solid) blackish band to being all black. Birds with a rather thin band may recall Yellow-legged Gull, but usually have stronger dark barring on the bases of the outer tailfeathers.
- The tertials vary from dark brown to blackish. They can be similar to Herring Gull.
- The greater coverts vary from all-barred to all-dark. They are usually darker than in Herring Gull, but there is overlap.
- The pattern of newly moulted scapulars is really variable, but the feathers are usually darker than in Herring Gull.
- Head and underparts range from heavily streaked dark brown to completely whitish and nearly unmarked (the latter pattern is normally only seen towards the end of this cycle, and is quite unlike Herring Gulls of this age).
- The underwing is usually (very) dark brown, but may be pale in a few birds and can become nearly white towards the end of the cycle.
- The legs are usually pink, but may already turn yellow near the end of this cycle in a few birds.
- Until late winter, the bill usually remains predominantly dark, but it often becomes paler from then on and may be largely pale in late spring. In a few birds, it is already yellowish.

Note that some juvenile birds can be really difficult to tell from dark juvenile Herring Gull – until the inner primaries are seen.

⇨ Geographical variation (first cycle)

Juvenile birds with very pale underwing are more likely to belong to the race *fuscus*, but there is overlap in this character. Spring birds that have already replaced more than a few tailfeathers, secondaries and/or primaries during winter are likely either *intermedius* or *fuscus*. Further supporting characters of these two races are smaller size compared to *graellsii*, slimmer built with longer wings, thinner bill, more rounded head, whiter head and underparts, and more uniformly dark upperparts and wingcoverts, but there is large overlap in all of these characters. Separating *fuscus* from *intermedius* is extremely tricky and is not recommended.

Second cycle

The plumage is usually very contrasting, with rather uniformly dark upperparts against whitish head and underparts. The upperparts usually have a darker ground colour than the other species, except for Great Black-backed Gull. A few birds, however, may look slightly paler and can be similar to 2nd cycle Yellow-legged Gull, especially in early autumn when a few of the latter species have not acquired any grey (adult-like) scapulars yet. Such Lesser Black-backed Gulls can be told by their thicker, more prominent dark bars and anchors on the upperparts and their more uniformly dark inner primaries. Note also size, shape and later primary moult of such birds.

⇨ Individual variation (second cycle)

The dark ground colour of the upperparts (especially mantle and scapulars) is a fairly consistent character, but otherwise plumage patterns and moult are really variable at this age.

- The inner primaries are usually quite uniformly dark brown to blackish, but may have paler brown inner webs.
- The upper tail varies from all-dark to all-white (!) – the latter particularly in spring (as tail can be fully moulted in winter).
- The upper wingcoverts and tertials may look immature (brown and barred) or may be completely moulted during winter. In spring, birds with advanced moult look quite similar to adults, but can be aged by any remaining second-generation primaries.
- Some birds moult a variable number of secondaries and primaries during winter, after which they suspend for migration. They may therefore turn up in spring with two generations of secondaries and/or primaries.
- Bill varies from all-dark to very adult-like.
- Leg colour varies from pink to yellow.
- Iris colour varies from dark to pale.

⇨ Geographical variation (second cycle)

At this age, moult sequence and colour of the upperparts are too variable to warrant correct racial identification – though birds with very blackish upperparts will not be pure *graellsii*.

Third cycle

Rather easily told from the other species (except Great Black-backed Gull) by the dark slaty-grey to black(ish) upperparts and upperwings. The legs are usually yellowish. Winter head and neck markings are often more extensive than in Yellow-legged Gulls of similar age. In autumn and winter, some birds retain a dark bill (as in some 3rd-cycle Yellow-legged Gulls).
For differences from Great Black-backed Gull, see that species.

⇨ Individual variation (third cycle)

- The upper wingcoverts and tertials can be fully adult-like, or can be all immature (brown) exceptionally. In the latter case, the bird is similar to 2nd-cycle, but differs in its adult-like inner primaries (and sometimes the presence of a white mirror on P10 already). Advanced birds differ from adults particularly in the retention of some brown markings on the underwing, at least on the underside of the primary coverts.
- Bill varies from all-dark to adult-like.
- Leg colour ranges from pink to yellow.

- Moult, again, is variable. Some birds arrest the primary moult before autumn migration, finishing in the winter quarters.

⇨ Geographical variation (third cycle)
At this age, moult sequence and colour of the upperparts are too variable to warrant correct racial identification. Note that Dutch and German 'intergrades' can show the whole range of upperpart shade, from slaty-grey to pure black (e.g. Noeske, 2008).

Fourth cycle

Rather easily told from the other species (except Great Black-backed Gull) by the dark slaty-grey to black(ish) upperparts and upperwings. The legs are usually yellowish. Winter head and neck markings are often more extensive than in Yellow-legged Gulls of similar age. For differences from Great Black-backed Gull, see that species.

⇨ Individual variation (fourth cycle)
At this age, birds are normally very similar to adults, but some can be told by their larger amount of black in the primaries (e.g. all-dark outer webs of P7-8 reach up to the primary coverts), some black markings on the primary coverts, paler yellow or (rarely) even pinkish legs, and/or more extensive head and neck streaking.

⇨ Geographical variation (fourth cycle)
At this age, moult sequence and colour of the upperparts are too variable to warrant correct racial identification. Note that Dutch and German 'intergrades' can show the whole range of upperpart shade, from slaty-grey to pure black (see e.g. Noeske 2008).

Adult cycle

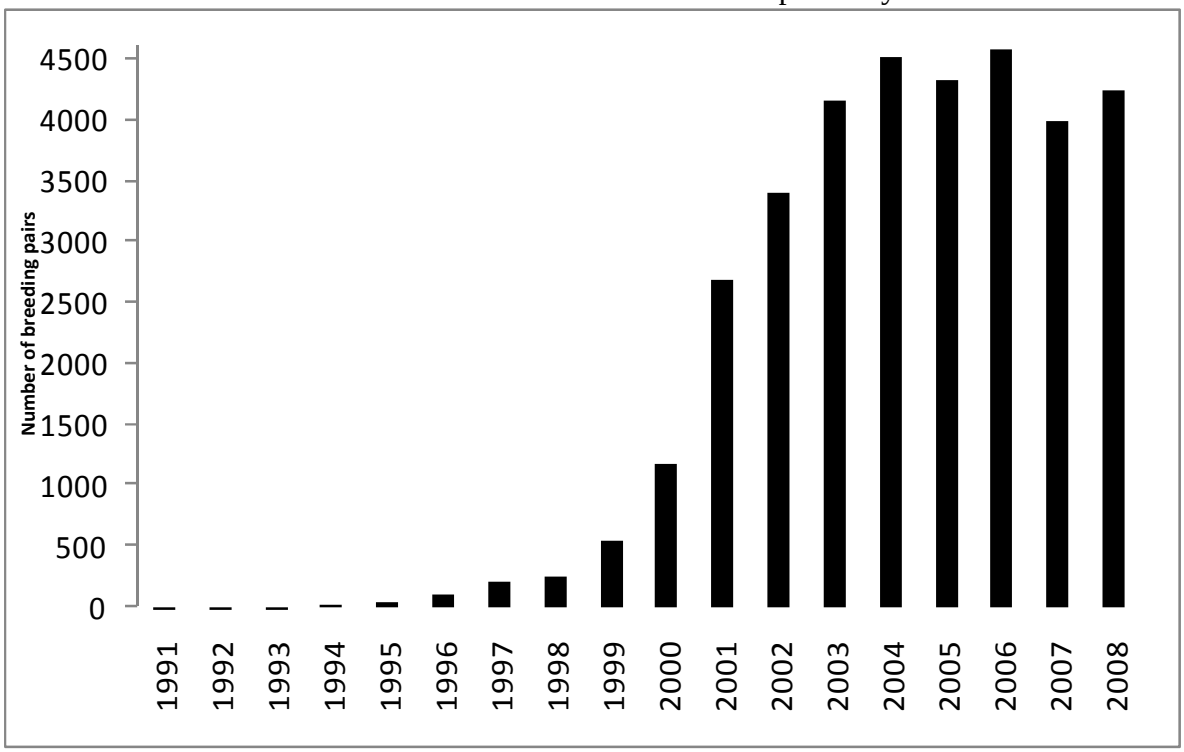
Rather easily told from the other species (except Great Black-backed Gull) by the dark slaty-grey to black(ish) upperparts and upperwings. The legs are yellow. Winter head and neck markings are often more extensive than in Yellow-legged Gulls of similar age. For differences from Great Black-backed Gull, see that species.

⇨ Individual variation (adult cycle)
- The shade of the upperparts ranges from slaty-grey to pure black (in intergrades; see e.g. Noeske 2008); in pure *graellsii* it is never black though.
- Especially some dark intergrades (with blackish upperparts) can be very white-headed in winter and may recall the subspecies *fuscus*.
- There is normally a large amount of black on the outer primaries, at least down to P5, which usually shows a complete black subterminal band. However, black on P5 can exceptionally be lacking completely (perhaps in old adults only?).

⇨ Geographical variation (adult cycle)
Birds with black upperparts and late or arrested primary moult are likely to be *intermedius* or *fuscus*, but racial identification is seriously hampered by the occurrence of numerous intergrades in Western Europe, which can show the whole range of upperpart shade, from slaty-grey to pure black (see e.g. Noeske 2008). Separating individual, out-of-range *fuscus* from *intermedius* is generally not possible.

3. Status as a coastal breeding bird in Flanders

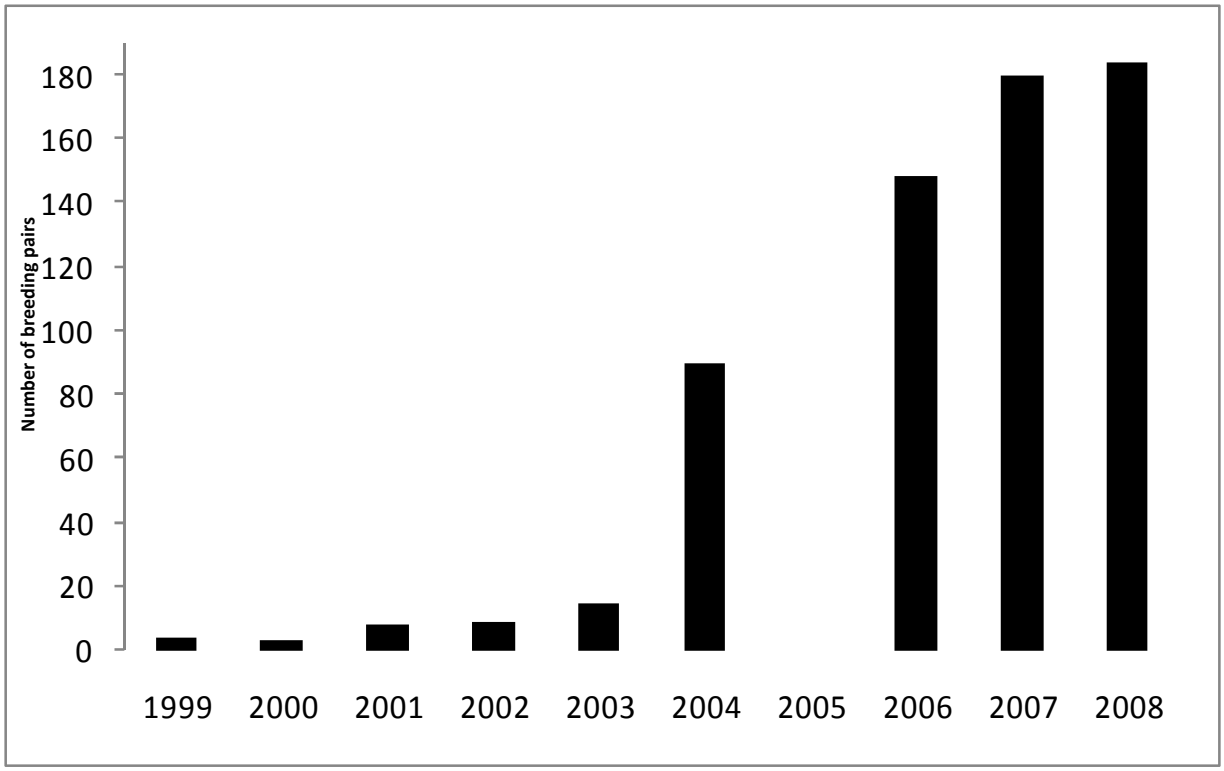
The colonisation of the Flemish coast, in fact the first breeding record of Lesser Black-backed Gull in the whole of Belgium, started in the Zwin nature reserve with only one pair in 1985, but here the number of pairs never exceeded the total of 40 and for some years now this colony has been abandoned. The colony at the inner harbour of Zeebrugge, where in 2001 125 pairs of Lesser Black-backed Gulls were still breeding, is now decimated. A strong increase in the breeding population was found at newly created land in the outer harbour of Zeebrugge (from 1991 onwards) where a peak of 4573 breeding pairs was counted in 2005 (Graph 47). This exponential increase in number of breeding pairs seems to be primarily the result of the occupation of new nesting habitat by immigrants from foreign countries (see below) in addition to a high reproductive output as a consequence of a good food situation in Zeebrugge (Stienen et al., 2002). However, ongoing industrial development in the harbour of Zeebrugge results in the loss of large areas of nesting habitat. Therefore numbers of breeding pairs of Lesser Black-backed Gulls in the outer harbour stabilized at around 4000 pairs since 2003 (Graph 47), due to concentration of pairs in smaller and smaller areas suitable for breeding and a heightened interspecific competition (see and Stienen et al., 2007). The lower numbers in 2007 (and possibly even earlier) were caused by predation and disturbance by foxes, which found their way to the outer harbour of Zeebrugge. In past years the recent range expansion of foxes was most likely also responsible for the steep decline and the disappearance of the colonies in the inner harbour and the Zwin nature reserve respectively.



Graph 47: Number of breeding pairs of Lesser Black-backed Gull *Larus fuscus* in the outer harbour of Zeebrugge.

In 1999, the first roof-nesting Lesser Black-backed Gulls for Belgium were recorded at Oostende (François, 2002), followed by a moderate increase in the next years. From 2004 onwards numbers of roof-nesting pairs boosted and in 2008 184 pairs were estimated (Graph

48). In 2005, 2 pairs of Lesser Black-backed Gulls were found breeding on roofs in the other harbour of Zeebrugge and in 2008 already 37 pairs were counted.



Graph 48: Number of roof-nesting pairs of Lesser Black-backed Gull *Larus fuscus* in Oostende.

4. Feeding ecology

Lesser Black-backed Gulls chiefly feed at the open sea and generally avoid the nearshore area where Herring Gulls predominate (Garthe et al., 1999). They make foraging trips of up to 200 km away from the coast. A big proportion of their diet consists of marine fish (Camphuysen, 2008). Although Lesser Black-backed Gulls do actively fish on small clupeids and swimming crabs by shallow plunge diving, marine fishes are also obtained as discards while scavenging in the wake of fishing vessels (Camphuysen, 1995).

5. Migration

Lesser Black-backed gulls can be considered true migratory birds with the breeding and wintering grounds clearly separated from each other. The first adults return to the breeding grounds already in December, but numbers stay low until March. From April till July adults are abundantly present in or near the breeding grounds and the core of their distribution lies in the colony of Zeebrugge. From August onwards they start the migration back to the

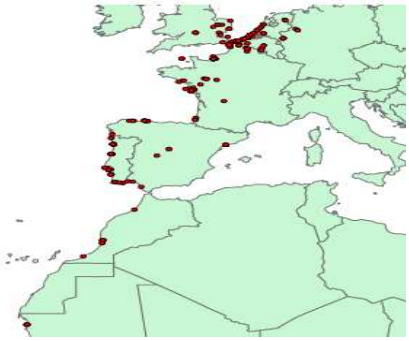
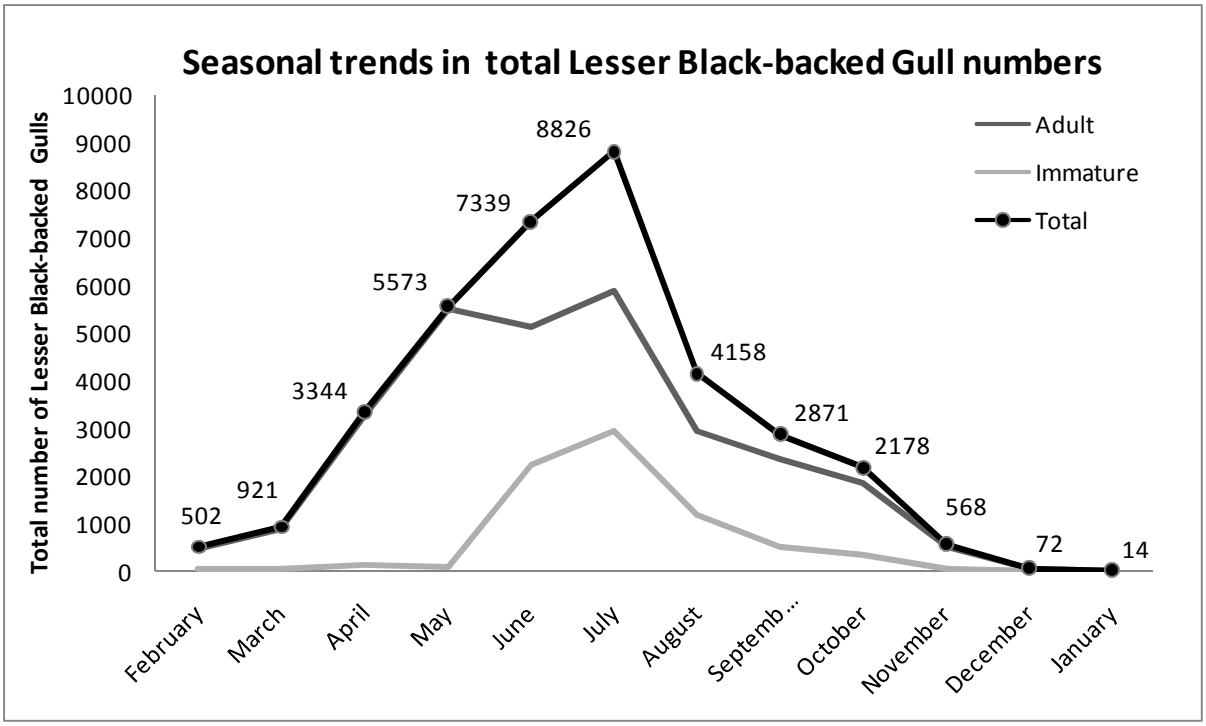


Figure 9: Sightings of Lesser Black-backed Gulls *Larus graellsii* ringed as chicks in Zeebrugge.

wintering grounds and in October hardly any adults and their young are still present in the colony. In the post-breeding season Lesser Black-backed gulls mainly head southwards to the coast of Southwest Europe and Northwest Africa in accordance with the main wintering grounds of the western population of this species (*Larus fuscus graellsii/intermedius*) breeding from Iceland to the United Kingdom and from France to Southern Scandinavia (Cramp & Simmons, 1983). Most Belgian breeders are reported from the Vendée (France), fishing harbours in Portugal and the south-coast of Spain and to a lesser extent further to the south from wetlands on the western coast of Morocco (Rabat, Agadir) and even the National Parc Banc d'Arguin in Mauritania. One bird was reported from Senegal (5600 km) at the southern-most border of the wintering range of the species. There are few records of Lesser Black-backed gulls in their second and third calendar-year south of the Somme (France). The spread to the east (Germany), the west (England) and the north (Netherlands) becomes obvious from the second calendar-year onwards (Van Waeyenberge et al., 2002).

6. Spatio-temporal patterns in abundance and distribution

6.1 Temporal patterns



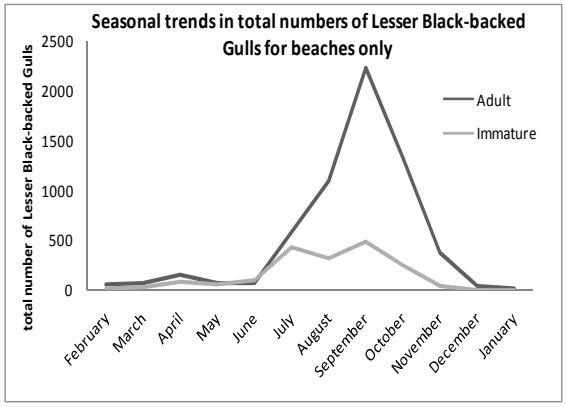
Graph 49: Trends in total numbers of Lesser Black-backed Gulls present along the flemish coast on a monthly basis (based on simultaneous counts).

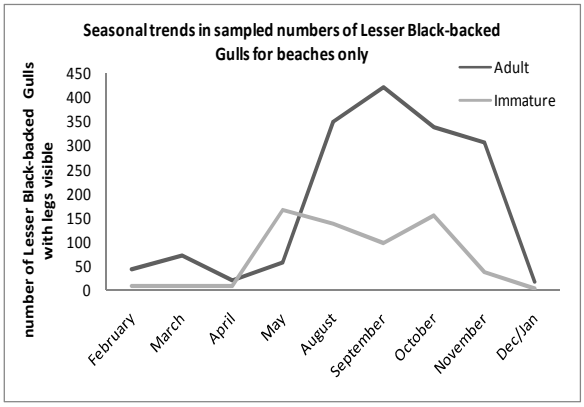
Total numbers of Lesser Black-backed Gulls peak in July, not surprisingly the heart of the breeding season (Graph 49). Adult Lesser Black-backed gulls start arriving at the breeding grounds from April onwards. In May all breeding pairs are present in the colony and they stay there until at least July to raise their young creating a plateau in the adult trendline. Near the end of this period the young are fully grown and about to fledge and it is these juveniles together with their parents that boost total numbers to a peak in July. The steep rise in numbers of adults in April is contrasted to a more gradual decline in numbers from August till the end of October. Juveniles gradually leaving the colony during the same period are

accompanied by their parents on their maiden trip to the wintering grounds and this explains the existence of this trend. By winter nearly all Lesser Black-backed Gulls have left our coast.

6.2 Spatial patterns

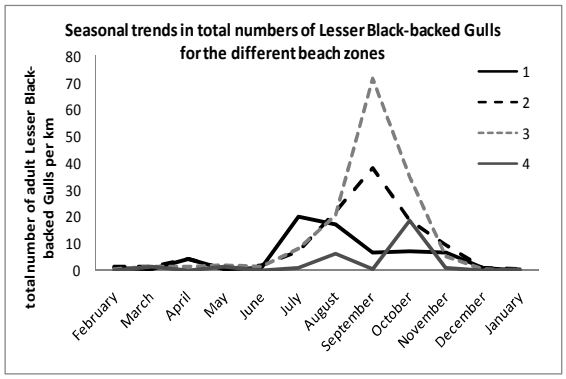
6.2.1 Lesser Black-backed Gulls and the beach

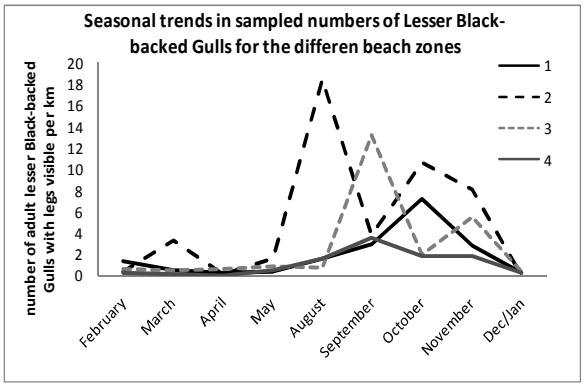




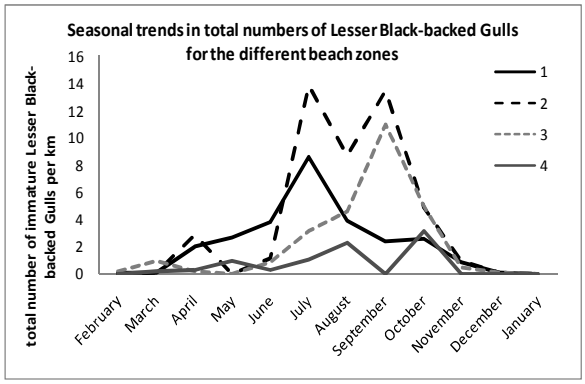
Graph 50 and 51: Trends in numbers of Lesser Black-backed Gulls present on Belgian beaches on a monthly basis based on simultaneous counts (left) and visible leg counts (right).

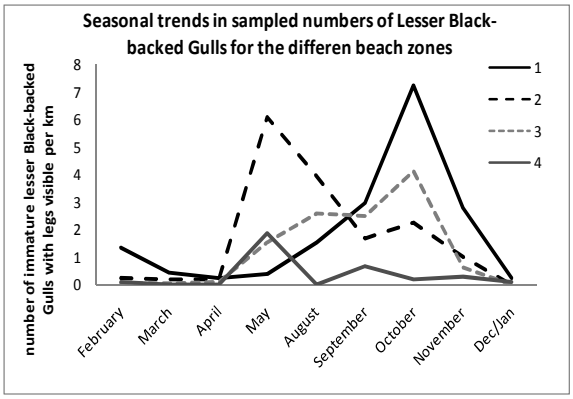
The steep rise in numbers of adults in April is completely lost on the beach (Graph 50 and 51) and it is only from August onwards that numbers considerably go up there. An interesting anecdote in this respect might explain why this trend is lacking. On April 20th 2008 during the visible legs count of beach zone 5 I spotted only one Lesser Black-backed gull resting on the beach for only a short while. Meanwhile flocks of tens of Lesser Black-backed gulls were flying over the surf and probably also further at sea. 1932 Lesser Black-backed gulls passed the Fonteintjes (Blankenberge) that morning (Paul D'hoore, pers. comm.). The birds flying in the surf were likely Belgian breeders arriving in Zeebrugge and flying straight into the colony from out of the sea. Probably the first wave of breeders arrives even earlier as on the 22nd of March 2009 the same scenario took place again at the Fonteintjes (Blankenberge). Probably most, if not all adults do not want to waste time resting on the beach and driven by their boosting breeding condition (hormones) want as quickly as possible to start to occupy their territories in the colony. Birds flying directly north further at sea during this month might be on their way to their colonies at higher latitudes. Most subadult birds do not return to their natal grounds in the breeding season, but when they do, they arrive later than adults. Van Waeyenberge et al. (2002) mention that only from April and chiefly May second and third calendar-years are seen in the colony. This is reflected on the beach where in May subadults (75%) even outnumber adults (25%). 14% are fourth, 33% are third and 29% are second calendar-years. The return trip to the wintering grounds is more gradual (see above) and this time does include pit stops on the beach. The peak in Graph 50 in September is exaggerated and caused by an osprey *Pandion haliaetus* hunting in and around the outer harbour of Zeebrugge during the simultaneous count of that month, scaring and driving away the Lesser Black-backed Gulls that under normal circumstances would have resided there, but now were found on the beach between Blankenberge and Oostende (beach zone 3). In the course of November the last Lesser Black-backed gulls are leaving our beaches until only a handful are left in January.





Graph 52 and 53: Trends in numbers per km of adult Lesser Black-backed Gulls for the different beach zones versus time (month) based on simultaneous counts (left) and visible legs counts (right).



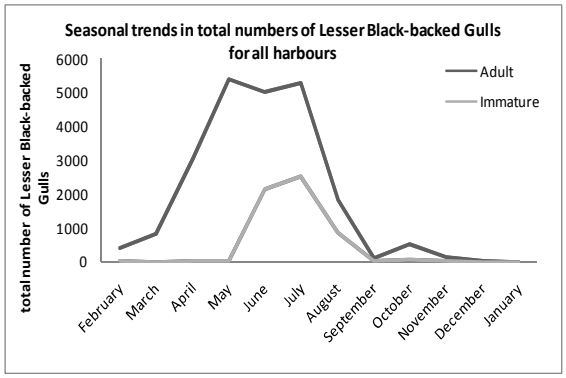


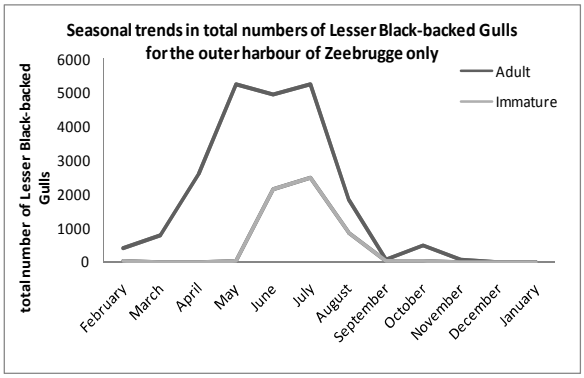
Graph 54 and 55: Trends in numbers per km of immature Lesser Black-backed Gulls for the different beach zones versus time (month) based on simultaneous counts (left) and visible legs counts (right).

When Lesser Black-backed gulls come to the beach, they are resting or preening their plumage and are almost never seen foraging. Spending most of their time in the colony or at sea during their stay at the breeding grounds, they are less accustomed to human presence and more shy than Herring Gulls and their numbers more prone to human disturbance. Beach zone 2 seems to be very popular in this respect (Graph 52 to 55) and Lesser Black-backed Gulls can be found here resting in parties of ten(s) on the beach hidden between the breakwaters. They are almost never present on the breakwaters themselves as this is Herring Gull territory (see above) and if you do spot the odd individual there, nine out of ten it is resting, not foraging. Other popular places to come to land are the broad beaches of beach zone 1, the 'esplanade' of Oostende (again beach zone 2) and the large sandbank adjacent to the western arm of the outer harbour of Zeebrugge (beach zone 3). The narrow and crowded (with people) beaches of beach zone 4 are largely ignored by Lesser Black-backed Gulls.

Figure 10: Norwegian Colour-ringed 1cy Lesser Black-backed Gull present on a breakwater in beach zone 3 on August 17th 2008. © Davy Bosman

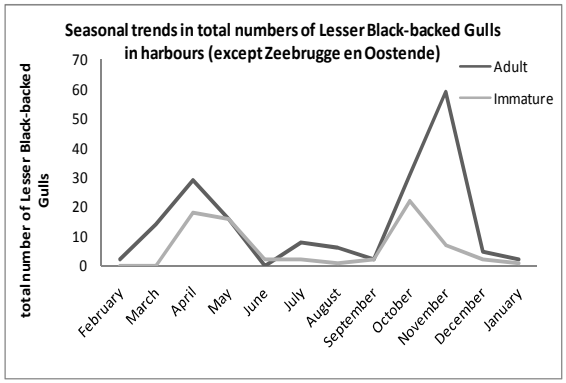
6.2.2 Lesser Black-backed Gulls and harbours

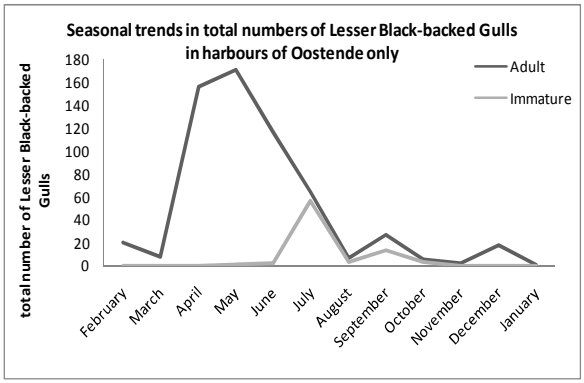




Graph 56 and 57: Trend in total numbers of Lesser Black-backed Gulls present in all Belgian harbours (left) and for the outer harbour of Zeebrugge only (right) counted on a monthly basis (based on simultaneous counts).

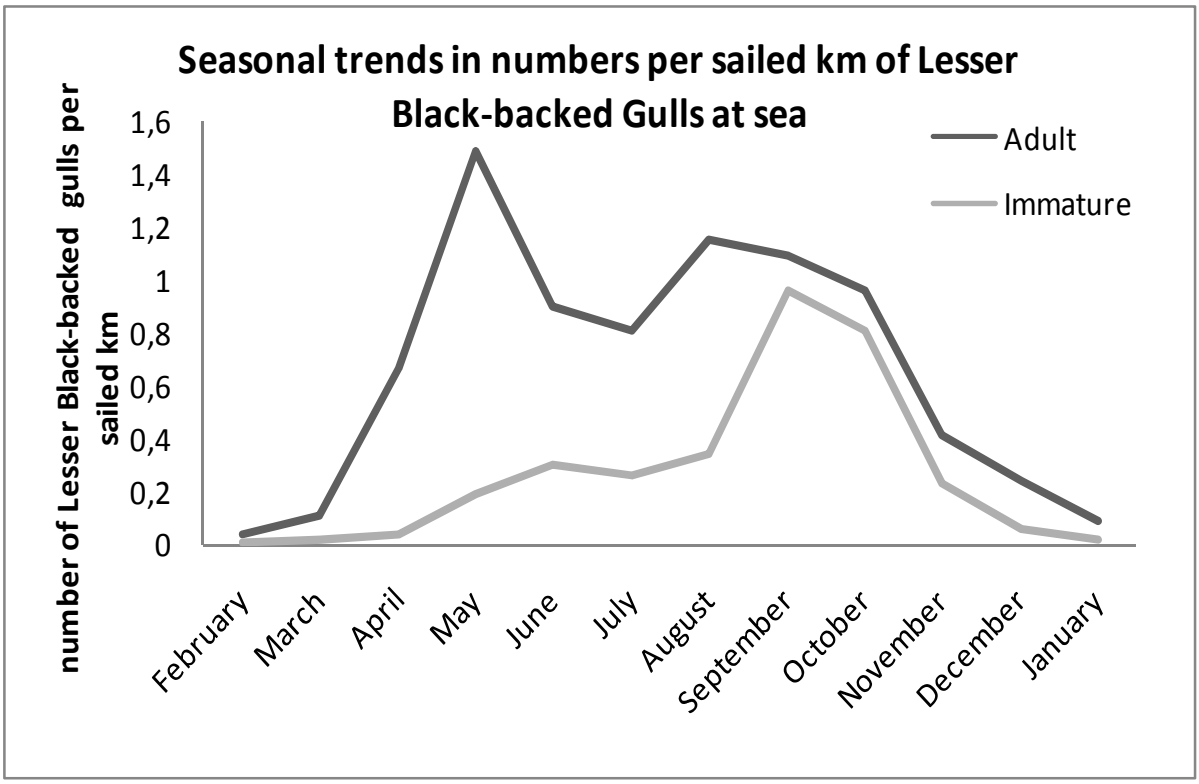
How numbers of Lesser Black-backed gulls fluctuate in the outer harbour of Zeebrugge does not only have a dominant effect on how trends evolve for the entire 'harbour' population (Graph 56 and 57), but apparently also has an overriding effect on the trends of the entire coastal population (cfr. Graph 49). The only noticeable difference is the lack of gradually declining tails in the trendlines of adults and immatures during the second half of the year. Apparently the breeding population leaves the colony rather abruptly after the breeding season. The same trend is found for the harbour of Oostende, but slightly distorted, because the roof-nesting population here is less studied (for now) and is more difficult to monitor (Graph 59). When I only consider 'harbours' that host no breeding populations and are mainly used as high tide roosts I find a more or less similar dynamic in numbers as on the beach, especially when you account for the fact that – within the design of this research – they were counted during low tide (Graph 58).





Graph 58 and 59: Trend in total numbers of Lesser Black-backed Gulls present in the harbours of Blankenberge/Nieuwpoort and the Zwin nature reserve (left) and for the harbour of Oostende (right) only counted on a monthly basis (based on simultaneous counts).

6.2.3 Lesser Black-backed Gulls and the sea



Graph 60: Trends in numbers per sailed km of Lesser Black-backed Gulls at sea on a monthly basis based on ship-based counts conducted by INBO (from 1992 onwards).

A Lesser Black-backed Gull is still more of a seabird than for example a Herring Gull is (see above). Therefore I believe graph 60 to present how trends in their numbers really fluctuate year-round along our coast (including the Belgian Continental Shelf). In April migration reaches its peak (with birds flying directly north at sea and branching off at the latitudes of their breeding grounds?; see above). The 'plateau' during the breeding season is defined by the adult trend in the Belgian breeding population (cfr. Graph 57), indicating that mainly Belgian breeders are found foraging on the Belgian Continental Shelf in May and June. The more gradual return trip to the wintering grounds with more stopovers is also found on the beach (see above), but numbers of adults and immatures (probably for the most part 1cys) seem to lie less far apart than suggested by the simultaneous and visible legs counts.

7. Lesser Black-backed Gulls and colour-rings

Due to the behaviour of this species with a lot of time spent out at sea, the catch of ring readings is a lot less than for Herring Gulls. Nevertheless I use them to calculate the partition of nationalities for the different seasons separately. Needless to say I present my results with even more restriction than Herring Gulls. I wish to thank **Roland-Jan Buijs, Kees Camphuysen, Morten Helberg, Volker Dierschke, Kjeld Tommy Pedersen and Sönke Martens** for sending us their ringing efforts and supplying us with the life-histories of the sighted Lesser Black-backed Gulls.

In the pre-breeding period (February-April) only Belgian colour-ringed adults were reported either from Oostende or from Zeebrugge in accordance with the situation described above that only Belgian breeders branch off at the latitudes of their respective colonies.
Also in the breeding season (May-July) all adults are probably Belgian breeders as most foreign birds must be on their breeding grounds abroad. However an adult with a ring from Holland (Netherlands) was sighted in May on the beach in Zeebrugge (pers. obs.), but this could have been a naturalized Belgian breeder as such birds with foreign rings are found breeding in the colony of Zeebrugge (Stienen et al., 2002). Because the project was recognized, but the ring was not read, we will never know and it could still have been a bird on its way to the north. Therefore I find that 98% of the adults have Belgian nationalities in the breeding season. For immatures the situation is a little bit different with subadults arriving late on the breeding grounds. Based on ring readings 83% of these are Belgians and 17% are foreigners (8% from Zeeland and 9% from Amrum or surrounding area).
Not surprisingly most colour-ringed birds were reported during the post-breeding season (August-October) when Lesser Black-backed Gulls make stopovers on the beach. If you look at graph 57 in particular you notice that the trendlines of immatures and adults run parallel to each other during this period. Strikingly enough this is reflected in a parallel partition of nationalities. For adults and immatures respectively I found that 67%-68% are from Belgium, 8%-10% from Zeeland, 17% (Texel) -16% (fifty-fifty Amrum-Helgoland) from isles more to the north and 4%-4% from Denmark. 2% of the adults and 1% of the immatures originate from Norway during the post-breeding period.
In winter only a handful of Lesser Black-backed gulls were seen here with a ditto amount of ring readings. Anyway, in this season a minority has Belgian nationality (21%). 3% are from Norway. The greater majority are from the Netherlands (73%). Maybe it is safer to assume that in winter, partition of nationalities fluctuates strongly from year to year and maybe also from month to month within the season?

YELLOW-LEGGED GULL *LARUS MICHAHELLIS*

1. Taxonomy and identification by Peter Adriaens

Yellow-legged *Gull Larus michahellis* has two or three subspecies (*L. m. michahellis, L. m. atlantis* and, according to some authors, *L. m. lusitanius*), though only one seems to occur in Belgium (*michahellis*). At all ages, many birds of this species have a rather angular head with flat crown, broad neck, long primary projection, rather long legs with prominent tibia, and a strong bill with distinct gonydeal angle.

1.1 General impression

In first cycle, the plumage is contrasting, as head and underparts (especially belly) have a white ground colour, while the wings look almost blackish-brown. Newly moulted scapulars often stand out as distinctly paler than the wingcoverts and tertials. In second cycle, many birds show a mixture of grey and dark (blackish-) brown feathers on the upperparts and upperwings, while head and underparts remain rather white. From third cycle on, the upperparts and upperwings become predominantly medium grey (adult-like) and the legs yellow.

1.2 Identification

First cycle

The inner primaries show a fairly constant pattern of uniformly dark outer webs and relatively pale inner webs. The upper tail is often quite typical: it is very white, with a solid, contrasting, black subterminal band that is quite thin, especially on the outer tailfeathers. In typical birds, there are no additional thin dark tail bars (unlike the previous two species) and the bases of the outer tailfeathers are often unmarked. The greater coverts are darker than in Herring Gull and may form an additional dark wing bar above the dark secondary bar (as in Lesser Black-backed Gull). The underwing is mostly brown, but the greater underwing coverts may be mostly pale and may form a diagonal, pale bar.

At rest, the blackish-brown tertials (almost as dark as the wingtips) attract attention. The pale edges to these feathers are often more restricted than in Herring Gull. The outer greater coverts are often uniformly blackish-brown as well. Juvenile birds show a whitish head that is separated from the whitish belly by a band of breast streaking. There is usually a dark 'mask' around the eye. Newly moulted scapulars are typically very pale, with only thin dark anchors – thus paler and more delicately marked than in Lesser Black-backed Gull – and they contrast with the dark wingcoverts. During the first cycle, many birds already replace a variable amount of wingcoverts and tertials. New feathers are fresher and paler than juvenile ones, and show a dark anchor pattern. The bill usually remains all-black throughout the first cycle, and contrasts with the white head.

Moult, wear and state of the plumage can be important, additional characters when trying to distinguish between Yellow-legged Gull, Herring Gull and Lesser Black-backed Gull. Yellow-legged Gulls have an earlier breeding cycle and are about a month ahead of the other two species. Free flying juvenile birds can be seen in late June already, at a time when juvenile Herring and Lesser Black-backed Gulls are still in the breeding colony and not fully-grown. During July already, they start moulting their scapulars (about a month earlier than in

most birds of the other two species) and in early autumn their wingcoverts may show significant wear. Any moulted wingcoverts or tertials before April are a good indication that the bird is not a (first-cycle) Herring Gull. Note also size and shape.

⇨ Individual variation (first cycle)

- The inner primaries may rarely be all-dark. At the paler end of the variation, there may be a pale spot in the dark outer web, but completely pale outer webs (as pale as the inner webs) are very rare.
- The upper tail can show many additional dark bars (even on the bases of the outer tailfeathers), but the basic pattern of a solid, blackish band contrasting against the white ground colour is normally maintained. Also, the blackish subterminal band does not normally become as extremely broad as in some Lesser Black-backed Gulls.
- The underwing ranges from all dark brown to largely pale (the latter especially towards the end of the first cycle). The underwing can be very similar to Caspian Gull in a few birds!
- The greater coverts vary from all-barred to all-dark.
- In some birds, the bill base becomes pinkish (especially towards the end of the first cycle), and the pink colour can be extensive in a few.
- Moult is variable; some birds moult most or even all wingcoverts and tertials during their first cycle (a few even replace some tailfeathers during winter), while a few others moult none before May. In particular, birds that breed in Belgium or the Netherlands can be on a similar moult schedule as the local Herring and Lesser Black-backed Gulls.

Second cycle

Most birds have acquired at least a few grey, adult-like scapulars at this age. These feathers are clearly paler than in Lesser Black-backed Gull, but slightly darker than in *argenteus* Herring Gulls. Often, many wingcoverts and tertials are uniformly grey as well. Further (average) differences from 2nd-cycle Herring Gull are darker inner primaries, more contrasting tail pattern, tertials with blacker, more solid centers (like thumbprints), darker outer greater coverts, somewhat more rounded and blacker centers to the lesser coverts, a whiter head that contrasts with both a dark 'eye-mask' and rather dark bill, and whiter belly. A few birds in (early) autumn have not acquired any adult-like scapulars yet, and such birds may be difficult to tell from Lesser Black-backed Gull, but show on average thinner dark anchors on the upperparts, slightly paler inner primaries, and subtly different size and shape. During complete moult, Yellow-legged Gull has about one more new primary than the other two species, as it is about one month ahead in moult schedule. For instance, a bird that has completed its primary moult (10 new primaries) when all other 2nd-cycle gulls present are still growing P9, could well turn out to be a Yellow-legged Gull.

⇨ Individual variation (second cycle)

- The inner primaries range from rather pale, dull brown or grey to all-dark. There is normally no white mirror on P10 (only one bird in 10 years of gull observation).
- Bill ranges from dark to pale; towards the end of the cycle, it often turns rather bright yellow, with a reddish gonys spot.
- Legs vary from pink to yellow.
- Winter streaking on head and underparts can be more extensive than usual in some birds.

- Moult is variable; a few birds (e.g. those breeding in Western Europe) may be on the same moult schedule as the previous two species.

Third cycle

The upperparts and upperwings are largely medium grey (similar in shade to Common Gull *Larus canus*), the legs are yellowish and the head is often rather white (any head streaking being concentrated around the eye). The tail is mostly white too and the outer primaries show a large amount of black (though there is a lot of overlap with 3rd-cycle Herring Gull). Some birds retain a few dark markings in the wingcoverts and/or tertials, the pattern of which is then more or less similar to that of second-cycle birds and therefore slightly blacker and more solid than in Herring Gull. Black markings on the secondaries may also be a bit darker and better defined than in 3rd-cycle Herring Gull, but this is not easily judged in the field. The iris is still dark in many birds of this age, while bill colour may already be advanced (adult-like), with reddish gonys spot bleeding onto the upper mandible. Differs from pale *graellsii* in paler grey upperparts (contrasting well with the black primaries), slightly longer legs, heavier bill, squarer head with flatter crown, broader neck, and whiter head and neck throughout autumn/winter. Note also moult stage.

⇨ Individual variation (third cycle)
- The number of white mirrors on the outer primaries varies from 0 to 2.
- Leg colour ranges from pinkish (uncommon) to bright yellow.
- Iris colour ranges from dark to yellow.
- The tail may show a complete, thin blackish subterminal band or – at the other extreme – may be all-white.
- The bill ranges from all-dark (which seems to occur more regularly than in 3rd-cycle Herring Gull) to completely adult-like.

Fourth cycle

The plumage and bare parts are generally similar to adult, but with some black markings on the primary coverts, a slightly larger amount of black on the outer primaries, and sometimes blackish bill markings. Differs from yellow-legged *argentatus* in the larger, more solid amount of black on the outer primaries (shorter grey tongues on P7-10, smaller white primary tips and smaller white mirror[s]), slightly brighter bill colour with reddish gonys spot bleeding onto upper mandible, more angular head shape and slightly heavier bill. In autumn and early winter, head streaking can also be useful, as it is often restricted to the area around the eye. Moult stage is often slightly more advanced, and plumage wear a bit more excessive; in spring, for instance, the white tertial crescent may have become clearly thinner than in the previous two species, due to wear. Differs from pale *graellsii* in paler grey upperparts (contrasting well with the black primaries), slightly longer legs, heavier bill, squarer head with flatter crown, broader neck, and whiter head and neck throughout autumn/winter. Note also moult stage.

⇨ Individual variation (fourth cycle)
- There is usually only one mirror (on P10), but some birds already show two.
- Leg colour ranges from pinkish-yellow to bright yellow.
- Iris colour ranges from dark to yellow.
- Bill varies from dull greenish with a black subterminal band to completely adult-like.

Adult cycle

The upperparts are medium grey (as in Common Gull), legs yellow and the head remains rather white throughout autumn and winter. Differs from yellow-legged *argentatus* in the larger, more solid amount of black on the outer primaries (shorter grey tongues on P7-10, thicker black band on P5, smaller white primary tips and smaller white mirror[s]), slightly brighter bill colour with reddish gonys spot bleeding onto upper mandible, more angular head shape and slightly heavier bill. In autumn and early winter, head streaking can also be useful, as it is often restricted to the area around the eye. Moult stage is often slightly more advanced, and plumage wear a bit more excessive; in spring, for instance, the white tertial crescent may have become clearly thinner than in the previous two species, due to wear. Differs from pale *graellsii* in paler grey upperparts (contrasting well with the black primaries), slightly longer legs, heavier bill, squarer head with flatter crown, broader neck, and whiter head and neck throughout autumn/winter. Note also moult stage.

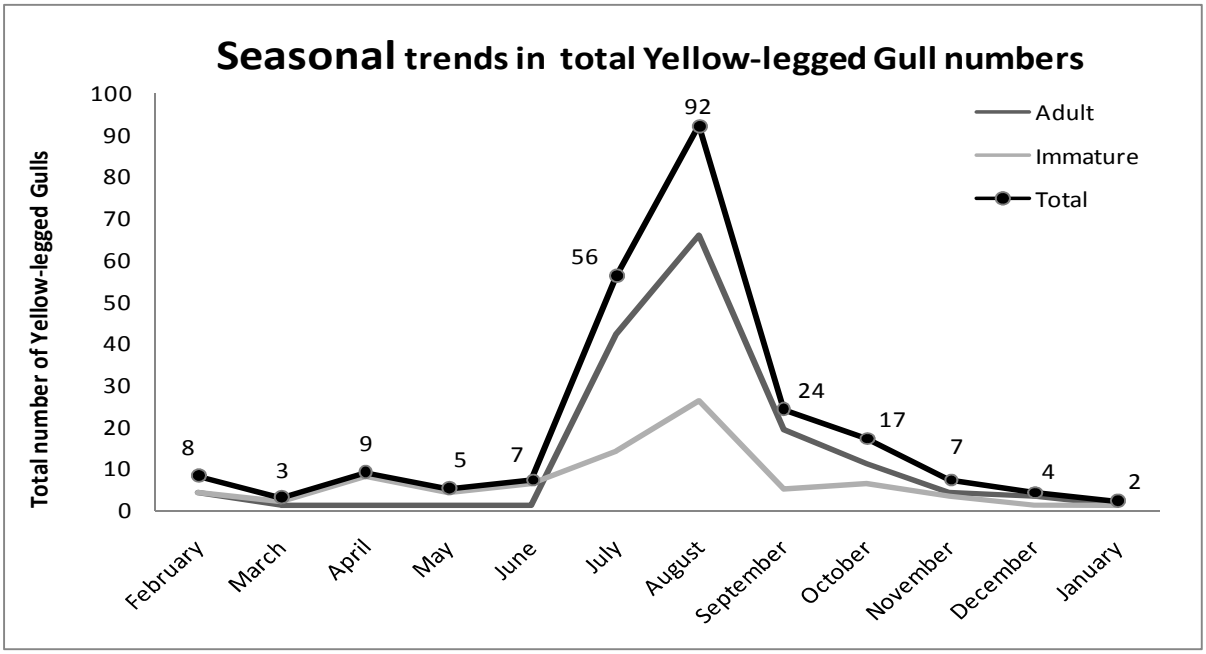
⇨ Individual variation (adult cycle)

- The white mirror on P10 is typically separated from the white apical spot by a complete, black subterminal band, but some birds lack this black division completely (showing an all-white mirror + tip instead).
- The white mirror on P9 may be completely absent or, at the other extreme, may cover both webs.
- The grey tongue on the inner web of P10 usually covers less than 50% of the length of the feather, but it can be longer in a very few birds (Jonsson, 1998)
- The black band on P5 is usually complete and fairly thick, but may be thin and interrupted in a few birds, and may perhaps even be lacking completely in a few exceptions.
- Iris colour ranges from dark to yellow. It is usually slightly darker than in adult Herring Gull, but there is overlap.
- The orbital ring is often bright red – brighter than in many Herring Gulls – but it may be duller or paler.
-

2. Status as a coastal breeding bird in Flanders

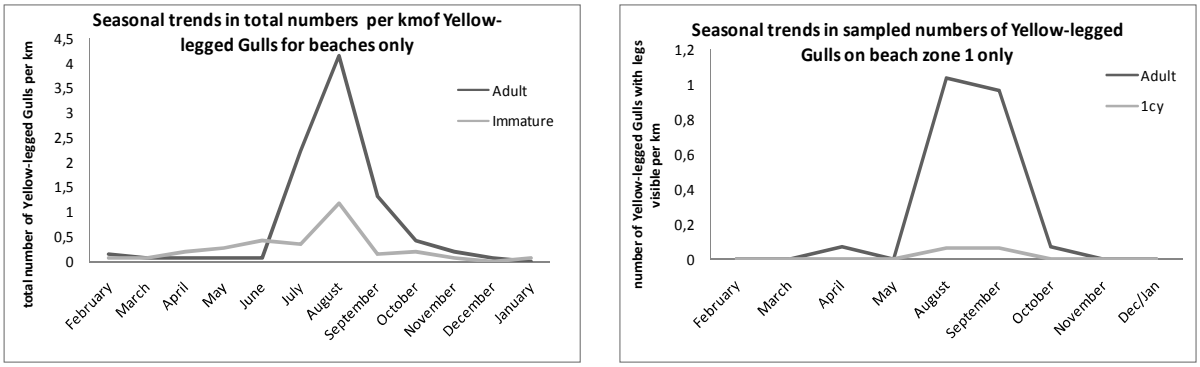
In 2002 the first instance of pure breeding pairs along the North Sea was recorded in the outer harbour of Zeebrugge where 2 pure pairs together produced 3 fledglings. This fitted well in the ongoing northward expansion of the breeding range of this species. In the last two decades some Yellow-Legged Gulls had established themselves along the North Sea coast, but these birds had until then only formed mixed pairs with either Lesser Black-backed Gull or Herring Gull. In the vicinity of the pure breeding pairs, also two individuals were found interbreeding (Vercruijsse et al., 2002). In the following years (except for 2007) always one pure pair bred (Eric Stienen, pers. comm.). In 2009 again 2 pure pairs were recorded.

3. Spatio-temporal patterns in abundance and distribution



Graph 59: Trends in absolute numbers of Yellow-legged Gulls present along the Flemish coast on a monthly basis (based on simultaneous counts)

Yellow-legged Gulls are scarce visitors to our shores from July until September that demonstrate a clear late-summer peak in August, with much lower numbers in the rest of the year. Adults seem to arrive earlier than juveniles and already show relatively high numbers in July (Graph 59). Most of these gulls are counted on the beach and in fact only 4 adults and 4 immatures have been counted in the harbours scattered in time all over the year. Based on the simultaneous and the visible legs counts beach zone 1 (Graph 60 and 61) seems to harbour most Yellow-legged gulls in summer and trends found here are almost an exact copy of graph 59, while on the other beach zones much lower numbers are counted and trends are very erratic. This hints at a northern French origin of these birds, but as no colour-ringed individuals were sighted I can only guess. In Fact one colour-ringed juvenile from Germany was seen in September on beach zone 3 in a large party of Lesser Black-backed Gulls (Osprey, see above), but I refuse to believe this to be representative and probably most Yellow-legged Gulls originate from a colony in northern France without colour-ringing effort and arrive on Beach zone 1 after a northwards post-breeding dispersal.



Graph 60 and 61: Trends numbers per km of Yellow-legged Gulls present on beach zone 1 versus time (month) based on simultaneous counts (left) and visible leg counts (right).

GREAT BLACK-BACKED GULL *LARUS MARINUS*

1. Taxonomy and identification by Peter Adriaens

Great Black-backed Gull *Larus marinus* is a monotypic species. This is the biggest and heaviest of the five large gull species. It is often almost a head larger than Lesser Black-backed Gull and *argenteus* Herring Gull, though a few unusually small birds also exist. Bill shape is usually typical: thick, heavy, with a prominent gonydeal angle and, importantly, a strongly curved upper mandible (the culmen curves down for almost 90° at the tip, making the bill appear rather blunt). Further characters are a large, angular head with flat crown, broad neck, bulky body, and prominent tertial step.

1.1 General impression

The first-cycle plumage looks contrasting and fairly similar to Yellow-legged Gull, but with generally blunter bill and shorter rear end (shorter primary projection). Second-cycle birds again look very contrasting; some acquire a variable amount of uniformly blackish scapulars and/or wingcoverts. From third cycle on, the blackish upperparts easily separate from all species except Lesser Black-backed Gull.

1.2 Identification

First cycle

Characterized by a rather whitish head and neck, heavy, dark bill, and very white greater coverts, often with no more than three, widely-spaced, dark bars on each feather. The black tailband is often (very) thin and the inner primaries are dull brown to dark brown, often with a pale spot near the tip of each feather. The underwing is usually dark brown and strongly marked. Most birds can be readily identified by size and shape alone, but a few large *argentatus* Herring Gulls and a few large Yellow-legged Gulls can be deceivingly similar in this respect. *Argentatus* can be told by paler inner primaries, slightly browner tailband, browner and denser bars on the greater coverts, paler bill base and less strongly curved culmen. Yellow-legged Gull often shows a more advanced state of moult and wear; most 1st-cycle Great Black-backed Gulls retain some juvenile scapulars well into October (which many Yellow-legged Gulls have lost in September already), and some retain them even until spring. A few birds may replace a few wingcoverts during autumn – winter of the first cycle, but this replacement is usually less extensive than in Yellow-legged Gull. The juvenile wingcoverts quite often look fresher and less abraded compared to Yellow-legged Gull (from autumn on). The tertials often have wider white edges in 1st-cycle Great Black-backed Gull, and the primaries may show thin, pale edges. The dark bars on the greater coverts are more widely-spaced, leaving the impression of very white feathers. Note also the slightly shorter primary projection and more strongly curved culmen.

⇨ Individual variation (first cycle)
- Bill may show a dull pinkish base.
- The outer greater coverts may be uniformly dark.
- The tertials vary from rather barred to showing large, all-dark centres.

- The inner primaries range from pale, dull brown to very dark brown. There is normally not such a prominent pale 'window' on the inner primaries as in Herring Gull.

Second cycle

The upperparts and wingcoverts show rather black barring on a white background, and some birds acquire some uniformly black feathers here as well. Head and underparts are largely whitish, while the bill remains quite dark. The blackish tailband is still thin, the inner primaries are dark brown or slaty-grey, and there may be a small, white mirror on P10. Birds that have not acquired any uniformly blackish feathers on upperparts or upperwings differ from Herring Gull by darker inner primaries, more contrastingly checkered, black-and-white plumage, and blunter bill shape. From (retarded) Yellow-legged Gull by blunter bill, wider white tertial edges (especially on lowest tertial), whitish primary edges, and white mirror on P10 (when present). From Lesser Black-backed Gull by size and shape, thinner tailband, wider white tertial edges (especially on lowest tertial), whitish primary edges, and white mirror on P10 (when present).

⇨ Individual variation (second cycle)
- Bill varies from all dark to bright pink with dark tip.
- The inner primaries can be paler than usual and may form a pale panel.

Third cycle

As birds of this age acquire many blackish feathers on upperparts and wingcoverts, they can only be confused with Lesser Black-backed Gull but note larger size, stouter and blunter bill, shorter primary projection, generally larger white primary tips, larger amount of brown on wingcoverts (and sometimes scapulars too), larger white mirror on P10 (and sometimes also one on P9), slightly thinner black band on P5, darker iris on average, and lack of yellow tinge in legs. Some birds also show long, pale tongues on P8-9 already.

⇨ Individual variation (third cycle)

Some birds lack the prominent white tips to the outer primaries and may look very similar to 2nd-cycle birds at rest. They can be aged by their adult-like inner primaries (blackish, with well demarcated, broad white tips) and sometimes adult-like bill colour (yellow, with reddish gonys spot), though with some black near the tip.

Fourth cycle

Variable and not very well-known. The slow ageing process in this species make accurate ageing difficult. Some retarded birds look similar to (advanced) third-cycle birds and are probably not safely aged. Others look like adults, but with thick black markings near bill tip, a few dark markings on tailfeathers, black marks on outer primary coverts, thick black subterminal band on P10, and/or brown tinge on some wingcoverts. However, such immature features can apparently also be found in some young adults. Rather easily told from *graellsii* Lesser Black-backed Gull by blacker upperparts, size and shape, lack of yellow tinge in legs, whiter head throughout autumn – winter, generally darker iris, and larger white primary tips. From darker Lesser Black-backed Gulls by same features except colour of upperparts, but

often also by larger white mirrors, thinner or incomplete black band on P5, prominent white tongue-tips to P6-7, and longer pale tongues on P8-9.

Adult cycle

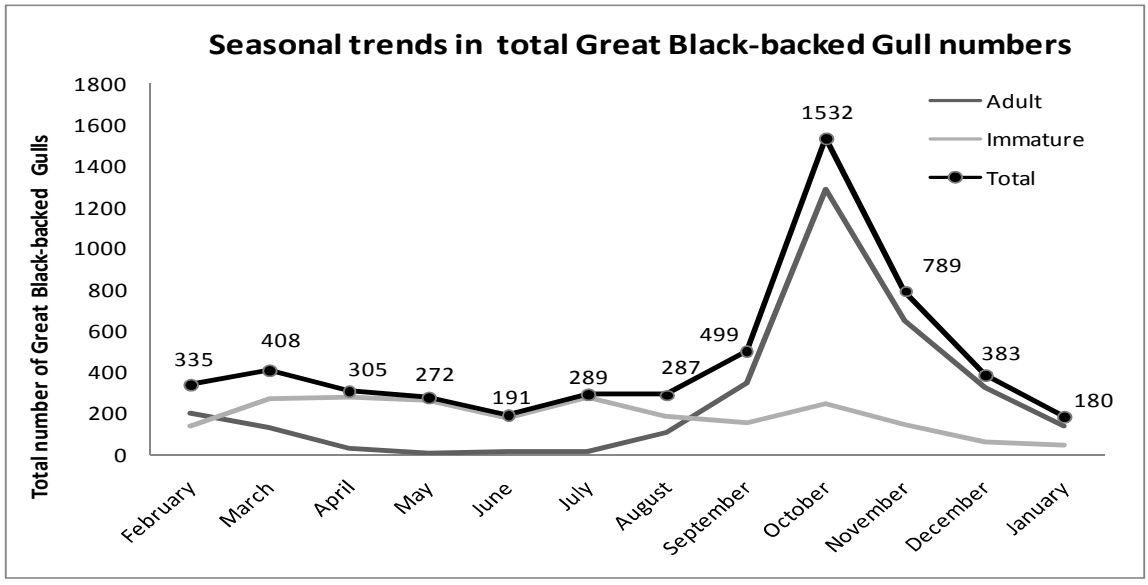
Characterized by blackish upperparts, white head throughout autumn – winter, significant amount of white in wingtips, and quite often dark iris. Rather easily told from *graellsii* Lesser Black-backed Gull by blacker upperparts, size and shape, lack of yellow tinge in legs, whiter head throughout autumn – winter, quite often darker iris, and larger white primary tips. From darker Lesser Black-backed Gulls by same features except colour of upperparts, but also by larger white mirrors, smaller amount of black on P5, prominent white tongue-tips to P6-7(-8), and longer pale tongues on P8-10.

⇨ Individual variation (adult cycle)
- Legs may have a yellowish tinge in a few birds.
- Iris ranges from all-dark to yellow.
- A few birds show three white mirrors, on P8-10.

2. Status as a coastal breeding bird

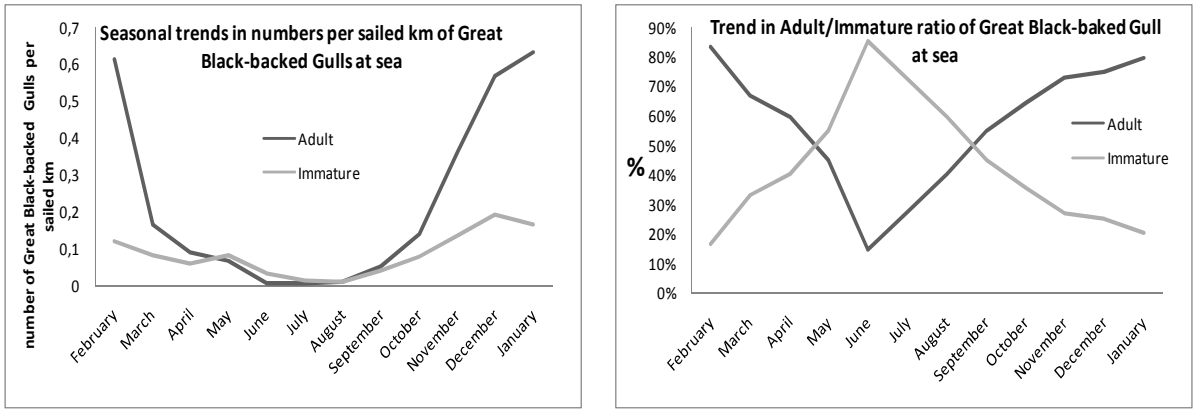
In 2004, a Great Black-backed Gull nested in the outer harbour of Zeebrugge. It concerned a single female that produced a 3-egg clutch. As she had no partner and had to leave the nest unattended whilst foraging, the eggs were predated about a week after the completion of the clutch. About two weeks later she made a second attempt but again the nest was predated after the first egg was laid. This was the first time that breeding has occurred in Belgium, although it has been claimed that there was already a successful breeding attempt in 2002 (Vercruijsse et al., 2001)

3. Spatio-temporal patterns in abundance and distribution



Graph 62: Trends in total numbers of Great Black-backed Gulls present along the Flemish coast on a monthly basis (based on simultaneous counts).

Trends in numbers of Great Black-backed Gulls exhibit a sinusoidal pattern (just like Herring Gulls) with the adult and immature trendlines running out of phase, although the pattern is obscured by a major peak in October (Graph 62). The same trends are found for the harbours and beaches separately (Graphs not shown) and in both areas more or less equal numbers are counted except for October. Thus Great Black-backed gulls do not seem to prefer one area over the other (contra Spanoghe, 1999), but they do give preference to wide beaches while roosting on the shore, like the ones found on the west coast. Indeed, beach zone 1 is the only zone that mirrors the trend found for the whole coast (Graph not shown). Trends found in other beach zones range from distorted (2) to erratic (3,4 and 5). The October peak coincides with the arrival of most birds on the wintering grounds in the southern part of the North Sea (Cramps & Simmons, 1985). Counts in the past also revealed peaks around this time (Spanoghe, 1999; Spanoghe et al., 2002). However, Great Black-backed Gulls seldom forage on the shore as they prefer to feed at sea (discards, birds, fish). Therefore I believe that Graph 63 projects the real trends in numbers of Great Black-backed Gulls with peaks lacking. From March to June adults are on their breeding grounds, but numbers gradually increase from July through November (Graph 63) when the core of the age distribution shifts from immatures in summer to adults in winter (Graph 64).



Graph 63 and 64: Trends in numbers per sailed km (left) and in adult/immature ratio (%) of Great Black-backed Gulls (right) at sea versus time (month) based on ship-based counts conducted by INBO.

Figure 11: Norwegian Colour-ringed 2cy Great Black-backed Gull present on the beach in beach zone 1 on June 18th 2008 © Pieter Vantieghem

CASPIAN GULL *LARUS CACHINNANS*

1. Taxonomy and identification by Peter Adriaens

Caspian Gull is considered monotypic by most authors, though there is some regional variation in the former, with birds from the Middle East looking slightly different from more western populations. Caspian Gull was only recognized as a full species in the late 1990s (Yésou, 2002) as identification characters of this species have only recently become established (Klein & Gruber, 1997); and the full scope of variation may still not be clear. In other words, we are all still learning about this taxon. In general, this is an attractive, elegant gull species that can often be pretty distinctive. Many birds are characterized by a long, relatively thin and parallel-sided bill with only a weak gonydeal angle, a long, sloping forehead, long neck, long legs (especially tibia), fairly slim body and elongated rear end (due to long primary projection). Shape may even recall a giant Slender-billed Gull *Larus genei* at times. With experience, the long neck may be obvious even in flight. Some (presumably female) birds are less distinctive, being smaller, with rounded head and short legs, but still show a thin, parallel-sided bill without a strong gonydeal angle.

1.1 General impression

In first cycle, many birds are distinctive due to their predominantly whitish head and underparts contrasting with sharp, dark streaking on the lower hindneck, and their dark wingcoverts with a few pale wingbars. In flight, the pale underwing is a useful character. In second cycle, the upperparts are partly grey (subtly paler than Yellow-legged Gull), with blackish bases to the tertials and rather pale bill and legs. Again, the underwing is rather pale.
From third cycle on, the upperparts and upperwings become predominantly medium grey (adult-like) and the legs pale yellowish. The iris remains rather dark, and stands out in the very white head. Even in adult birds, there is often a blackish ring near the bill tip.

1.2 Identification

First cycle

In fresh juvenile birds, head and underparts may be rather brown, but from early autumn on, these parts become (very) whitish and attract attention. The whitish head is abruptly demarcated from sharp, dark streaking on the lower hindneck. The tertials show solid, blackish-brown centres and prominent whitish tips. Pale edges along the centres are confined to the distal part of the feather and do not reach the greater coverts. The pattern recalls that of juvenile Common Gull. The greater and median coverts typically have uniformly dark bases and wide, pale tips creating two pale wingbars. Newly moulted scapulars have a very pale grey ground colour and only thin dark markings (dark shaft streak only, or very thin dark anchors). Legs are often a pale, almost whitish-pink, and bill often has a dark pinkish base. In flight, the underwing pattern is often quite different from the other species: the axillaries and the larger underwing coverts are typically pale, and only poorly marked. The inner primaries show dark outer webs contrasting with (very) pale grey inner webs, creating a so-called ‘venetian blind’ pattern that is somewhat more contrasting than in Yellow-legged Gull. The upper tail shows a black-and-white pattern as in Yellow-legged and Lesser Black-backed Gull,

but the black tail band is wider than in the former species and there are a few additional, narrow dark bars towards the base of each feather.
Many birds moult some wingcoverts and/or tertials during their first cycle, unlike the vast majority of Herring Gulls. Note also size and shape.

⇨ Individual variation (first cycle)
- In a few birds, the tertials may show a little bit of dark barring near the tips. In some, the pale edges are more prominent than usual and reach the greater coverts.
- The greater coverts range from largely dark to (rarely) entirely barred. In the latter case, however, the barring is thinner and more irregular than in first-cycle Herring Gull.
- The underwing ranges from largely whitish to entirely brown. However, even in birds with brown underwing, the axillaries show thinner barring than in Herring Gull, or have the brown barring more restricted to the tips of the feathers.

Second cycle

At the start of the second cycle, the upperparts may show a mixture of many dark brown anchor-like markings, but from early autumn on, at least a few uniformly grey scapulars are acquired. The grey feathers are typically slightly paler than in 2nd-cycle Yellow-legged Gulls. The tertials show fairly solid, blackish-brown bases ('thumbprints') and most of the greater coverts show a uniformly (dark) brown base. As in 2nd-cycle Yellow-legged Gull, the lesser coverts show fairly large and rounded dark centres. Sharp neck streaking is retained, and contrast with the whitish head and underparts. In flight, the underwing is again a useful feature; it is often very whitish at this age. The inner primaries are variable, but often show darker outer webs than in 2nd-cycle Herring Gull. The outermost primary regularly shows a white mirror already (in about 60%). The white tail shows a solid and broad black band with a few additional, thin dark bars towards the base of most tailfeathers. Bill is largely pale (e.g. pinkish or greenish) with a broad black subterminal band, and the iris is dark. Legs remain rather pinkish or greyish. Differs from 2nd-cycle Yellow-legged Gull in different shape, paler underwing, slightly paler upperparts, paler bill and legs, more barring on upper tail, lack of dark eye-mask, and sometimes white mirror on P10. Differs from 2nd-cycle Herring Gull in different shape, whiter head and underparts, sharper streaking on hindneck, darker tertial centres (nearly as blackish as the wingtip), paler underwing, often darker outer webs to inner primaries, more black-and-white tail pattern, and sometimes slightly different leg colour. Note also moult stage (slightly more advanced than in Herring Gull).

⇨ Individual variation (second cycle)
- In a few birds, the tertial centres are browner than usual (more like Herring Gull).
- Greater coverts range from mostly dark to all-grey. They can also be irregularly barred throughout, or may show barred inner and uniformly dark outer feathers.
- A few birds lack neck streaking.
- The underwing varies from largely whitish to rather brown. In the latter case, the axillaries usually still look plainer and paler than in Herring Gull.
- The inner primaries vary from pale grey (including the outer webs) to dull grey-brown with dark brown outer webs.
- Bill varies from all-dark to quite adult-like (the latter especially towards the end of the cycle).

Third cycle

The upperparts and upperwings have become largely medium grey. Legs may become pale yellowish towards the end of the cycle. Head is predominantly white and sharp neck streaking may be retained. Many birds show already two white mirrors on the outer primaries. The iris remains dark. Differs from 3rd-cycle Yellow-legged Gull in often longer pale tongues on the outer primaries (best judged on the underwing), duller colour of bill and legs, and different shape. If there is a grey tongue on P9 or P10 that covers 50% or more of the feather length, or if there are prominent white tongue-tips on P7-8(-9), the bird is much more likely to be a Caspian Gull than Yellow-legged Gull. Differs from 3rd-cycle Herring Gull in different shape, whiter head in autumn – mid-winter, blacker tertial centres (if present), darker iris, lack of bright pink colour in legs, and combination of longer grey tongues on outer primaries with thicker black marks on P5-6 (though there is some overlap in all of these characters; it is advisable to use them all in combination).

⇨ Individual variation (third cycle)

- The number of white mirrors on the outer primaries varies from 1 to 2.
- A few birds show a larger amount of black in the outer primaries than usual, overlapping with some 3rd-cycle Herring Gulls in this respect.
- A few birds show a rather large amount of brown in the wingcoverts and secondaries, making them similar to 2nd-cycle birds. They can still be aged by their adult-like inner primaries and slightly thinner tail band, on average.

Fourth cycle

Basically similar to adult, but often with blackish marks on primary coverts, a larger amount of black on the outer webs of the outer primaries, duller leg and bill colour, and thick black band near bill tip. Even though there is quite a large amount of black on the outer webs of the primaries, the grey tongues of the inner webs are rather similar to adult, which means that, on P9-10, they cover 50% or more of the feather length – unlike 4th-cycle Yellow-legged Gull. There are also usually two white mirrors, as opposed to one in (typical) 4th-cycle Yellow-legged (but there is overlap). The white tongue-tips on P7-8(-9) are often quite prominent. Other differences are shape, darker iris on average, and duller leg and bill colour. Often, at rest, the white primary tips look larger too. Differs from 4th-cycle Herring Gull in shape, white head throughout autumn and early winter, sharp neck streaking when present, darker iris on average, lack of bright pink colour in legs, and *combination* of longer grey tongues on outer primaries with thicker black marks on P5-6 (though there is some overlap in all of these characters; it is advisable to use them all in combination). The grey tongue of P10 averages also wider and more rectangular than in Herring Gull, but again there is overlap. Note also moult stage, which is often slightly more advanced.

⇨ Individual variation (fourth cycle)

- Some birds show no black markings on the primary coverts nor extensive black in the outer primaries, and can probably not be told from adults.
- In some birds, the grey tongue of P10 is shorter than usual (< 50% of the length of the feather).
- There may be only one white mirror (on P10), as opposed to two.
- Iris ranges from very dark to yellow.

Adult cycle

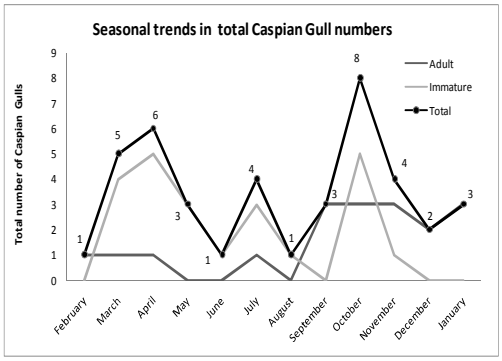
Characterized by medium grey upperparts (slightly darker than *argenteus* Herring Gull), pale yellowish or greenish legs, dull yellowish or greenish bill with rather small, orange or reddish gonys spot, dark iris, white head, and fairly typical primary pattern with long, pale tongues on all of the outer primaries and, usually, a thick, complete black band on P5. Many birds in winter show a slight amount of black near the gonys. Differs from Yellow-legged Gull in shape, darker iris on average (though there is overlap), duller colour of bill and legs, longer tongues on P9-10 (>50% of the length of the feather), and more prominent white tongue-tips on P7-8(-9). The long, wide tongue of P10 is often visible even at rest, on the underside of the far wingtip. The two white mirrors average larger than in Yellow-legged, but there is some overlap. Differs from adult Herring Gull in shape, white head throughout autumn and early winter, sharp neck streaking when present, darker iris on average, lack of bright pink colour in legs (though many eastern Baltic Herring Gulls are hardly different in this respect), and *combination* of longer grey tongues on outer primaries with thicker black marks on P5-6 (though there is some overlap in all of these characters; it is advisable to use them all in combination). The grey tongue of P10 averages also wider and more rectangular than in Herring Gull, but again there is overlap. Note also moult stage, which is often slightly more advanced.

⇨ <u>Individual variation (adult cycle)</u>

- In a few birds, the grey tongue of P10 is shorter than usual (about 50% of the length of the feather, but still wide and rectangular).
- The black band on P5 is usually thick and complete (covering both webs), but it can be broken at the shaft in as many as 10% according to Jonsson (1998). A few birds show only a black spot on the outer web (as in many Herring Gulls), and, exceptionally, black markings may be lacking altogether on P5.
- The iris is typically all-dark or yellow with many dark spots (creating a dark impression from any distance), but can be pale yellow in quite a few birds. Estimates in literature vary; according to Jonsson (1998), about 25% of adults show a pale iris, but Liebers and Dierschke (1997) stated that a pale iris is shown by as many as 50% in Ukraine.
- Leg colour ranges from dull greyish-pink to deep yellow (the latter mostly in a few breeding birds).
- The reddish gonys spot can become brighter during the breeding season, and may then bleed onto the upper mandible (as in Yellow-legged Gull).

2. Spatio-temporal patterns in abundance and distribution

Trends in numbers of Caspian Gulls *Larus cachinnans* are very erratic and no pattern can be recognized in accordance with its status of being a very scarce and irregular visitor to our coastline. The only real trend is seen in the absence of adults in May and June as probably most, if not all of them are present on their breeding grounds.



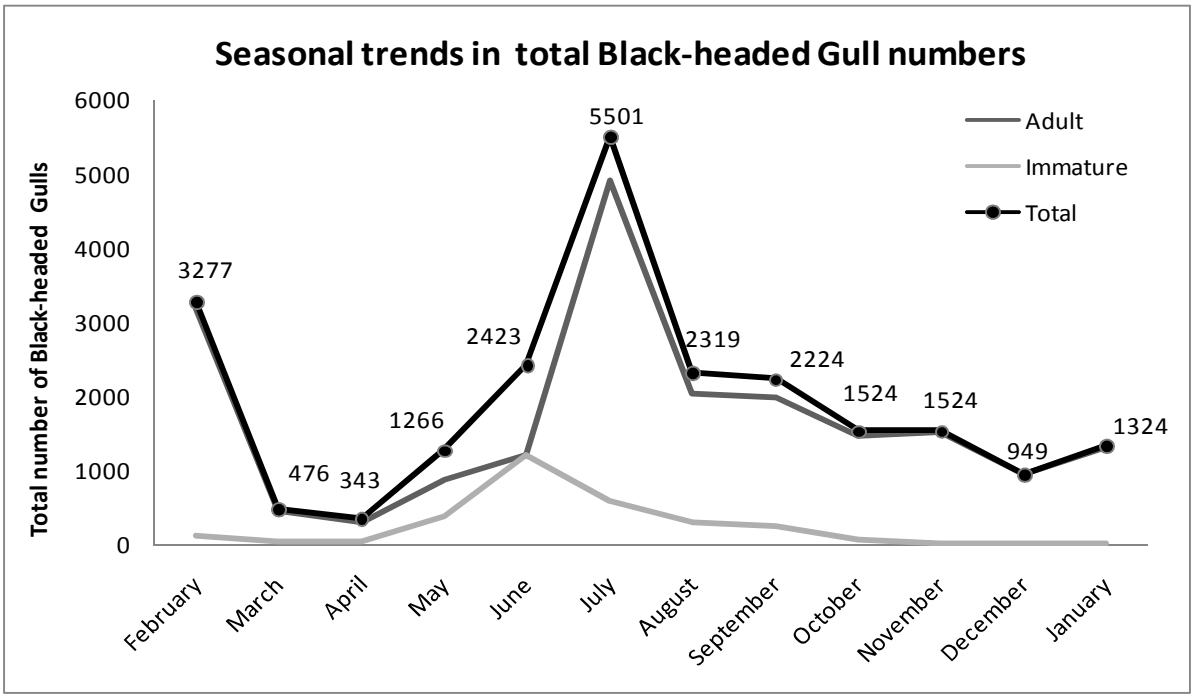
Graph 65: Trends in total numbers of Caspian Gulls versus time (month) along our coast. →

SMALL- TO MEDIUM-SIZED GULLS

1. Introduction

Although Black-headed Gull *Larus ridibundus*, Mediterranean Gull *Larus melanocephalus* and Common Gull *Larus canus* are species in their own right with separate population dynamics, I will treat them here under one header, because their trends in numbers show some similarities.

2. Black-headed Gull *Larus ridibundus*

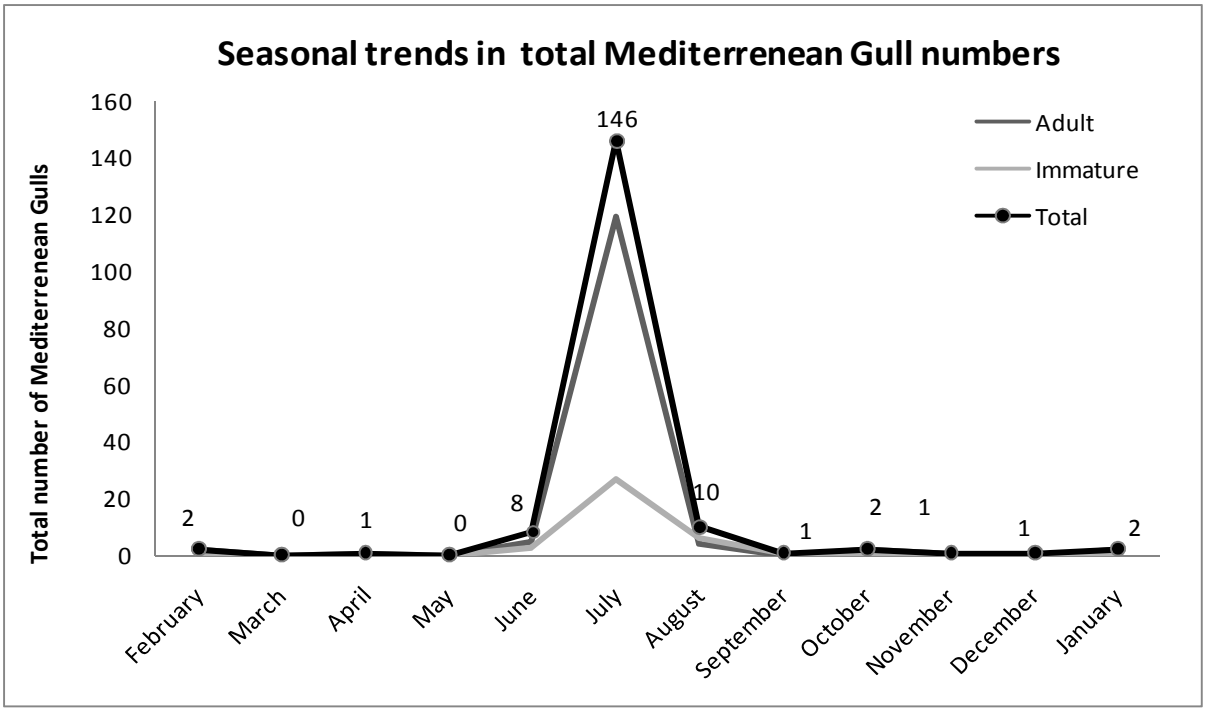


Graph 66: Trends in total numbers of Black-headed Gulls present along the Flemish coast on a monthly basis (based on simultaneous counts).

Adults always outnumber immatures along the coast, especially outside the summer months when they constitute more than 98% of all Black-headed Gulls present in agreement with

what Spanoghe (1999) found. Noticeably the trend in total numbers is marked by a winter and a summer peak. Further analysis showed that the background story behind both peaks completely differs between the two. The summer peak occurs on all beach zones (graphs not shown), but with absolute numbers decreasing from the Dutch to the French border. More than likely we captured a snapshot of a big southward movement of adult and to a much lesser extent immature (juvenile) Black-headed Gulls. Also noteworthy is the finding that juveniles seem to lag behind on the adults as most of them are counted on the east coast with their numbers abruptly dropping to a handful scattered here and there south of the harbour of Blankenberge. The winter peak only occurs on beach zone 1 and 2 and probably reflects a preference of Black-headed Gulls to forage in these areas, rather than a migratory movement. These beach zones are characterized by a broad intertidal zone and at low tide and three quarters up the beach from the surf a lot of pools can be found over a long area, left behind by the retreating sea. Is it in these pools that Black-headed gulls prefer to forage, maybe avoiding competition with Herring Gulls that predominate in or near the surf when foraging on the beach? The same phenomenon can be seen at the broad stretch of beach in Zeebrugge adjacent to the western arm of the outer harbour of Zeebrugge. The trend at sea is the same as that found for the harbour of Oostende. Not surprisingly most Black-headed Gulls are counted when the ship leaves the harbour of Oostende from where it leaves, after which none are seen (Eric Stienen, pers. comm..).

3. Mediterranean Gull *Larus melanocephalus*

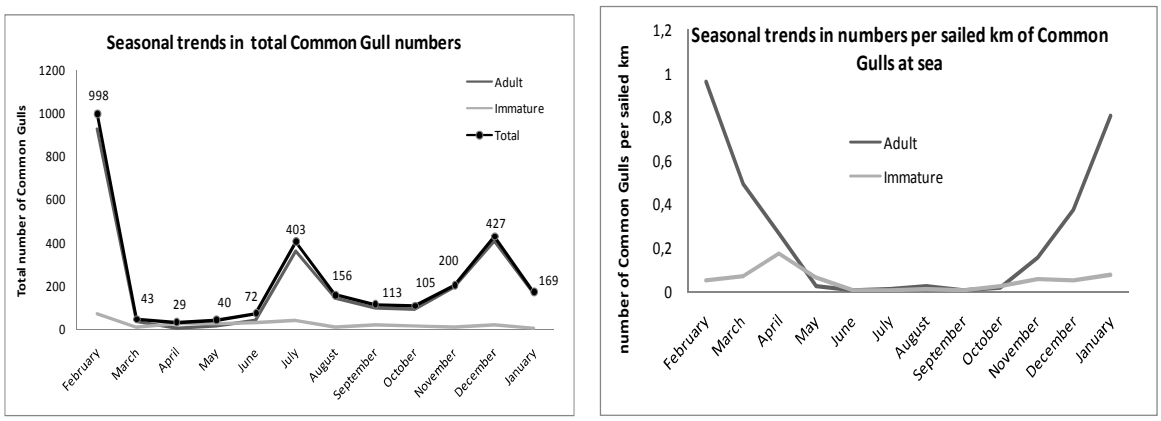


Graph 67: Trends in total numbers of Mediterranean Gulls present along the Flemish coast on a monthly basis (based on simultaneous counts).

Mediterranean Gulls can be seen along our coastline in every month of the year. Usually and especially in the winter months, only singles are seen. During spring migration groups of

adults can be found roosting on the beach (pers. obs.). Every year at least a few pairs still breed on the 'Sternenschiereiland' in the outer harbour of Zeebrugge. In July (Graph 67) we apparently caught the return migration of adult and to a lesser extent juvenile Mediterranean Gulls in analogy with my findings for Black-headed Gulls (see above). Most individuals (88) were counted on beach zone 1 with numbers abruptly dropping to singles here and there south of the outer harbour of Zeebrugge. Two colour-rings were read (white 3H64 and white 3T60). Therefore I believe that these Mediterranean Gulls are birds that had followed the river 'Schelde' all the way to our coast from their colonies in the province Antwerp (Zandvlietsluis, Verrebroekse plassen) and were now migrating along our coastline southwards on the way to their wintering grounds in the north of France (Pas-de-Calais). Maybe the Black-headed Gulls also were travelling to the same area?

4. Common Gull *Larus canus*



Graph 68 and 69: Trends in total numbers of Common Gulls present along the Flemish coast (left) and in numbers per sailed km at sea (right) on a monthly basis (based on simultaneous and ship-based counts respectively).

Common Gulls forage on the beach, in the surf or at sea and from August till February over 90% of the birds are adults. In March the proportion of immatures starts to gradually increase to 80% in April in accordance with the findings of Spanoghe (1999). Afterwards percentages of young birds decline to around 50% in May/June and back to 10% from July onwards. I have to report that 3cys are counted as adults as they cannot be aged quickly enough. Total numbers clearly display a winter peak along the coast (Graph 68) and at sea (Graph 69). Common Gulls, when foraging on the shore, seem to prefer beach zone 1 and the majority of them are found there in the above-mentioned pools. Trends on beach zone 2 and 3 also display a winter peak, but absolute numbers are much lower. The peak in July is mainly caused by a significant rise in numbers on beach zone 5 and the outer harbour of Zeebrugge and lower numbers elsewhere. Probably these birds flew in the wake of the migrating Black-headed and Mediterranean Gulls.

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