Space utilization in Larids in the Coastal Plain of Picardy (France)

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Space utilization by sympatric larids was studied during an annual cycle in the Somme estuary and throughout the coastal plain of Picardy, the western littoral of France. As in many West European estuaries, Laridae population in the Somme estuary comprises five main species: Black-headed Gull, Common Gull, Lesser Black-backed Gull, Herring Gull, and Great Black-backed Gull. Lesser and Great Black-backed Gulls mainly frequent the delta beyond the estuary and the sedimentary littoral. The other three species feed mainly on the mudflats in the estuary but also make incursions inland. Compared with other European countries, the almost exclusive use of the Picardy littoral by Lesser Black-backed Gull, Yellow-legged Herring Gull, and Great Black-backed Gull is one of the most original aspects of the use of these environments by larids. Another difference is the relatively limited use of resources of human origin within rubbish tips (except for Herring Gull) and in agglomerations compared with other regions.

Mots clés : Laridés, alimentation, Plaine Maritime Picarde.

Keywords: Larids, feeding, Coastal Plain of Picardy

Introduction

The diversity of a water bird's habitat determines largely the specific richness of communities (TAMISIER et PRADEL, 1992). In the case of Laridae, due to the opportunism of certain species, these ecosystems can be aquatic or terrestrial, including man-made habitats (towns, rubbish tips, etc) and the airspace above them. Each habitat can support several species of birds at the same time, but for each of them, it can only satisfy a part of their requirements. The completion of a species annual cycle is also determined by the availability of and the accessibility to different habitats which are necessary to satisfy its demands.

Precise data on the use of different habitats by Laridae in a specific region are rare. For the whole annual cycle of particular species we only have STRANN et VADER's work (1992) for Common Gull *Larus canus* (present from April to October), Lesser Black-backed Gull *L. fuscus* (present from May to September), Herring Gull *L. argentatus* and Great Black-backed Gull *L. marinus* (all year round) and that of ISENMANN (1977) for Black-headed Gull *L. ridibundus* (all year round). Other papers dealing with all or several Laridae only cover a limited period of the year: breeding (HUNT et HUNT, 1973; ISENMANN, 1979), post-nuptial period (HUNT et HUNT, 1973; DUBOIS, 1982), summer and winter with, respectively, three and five species (MUDGE et FERNS, 1982) or over-wintering (CHAPMAN et PARKER, 1985). A more limited study deals with Black-headed Gull from April to July (HONZA, 1993).

Study area and methods

The use of space the sympatric Laridae, Black-headed Gull, Common Gull, Lesser Black-backed Gull, Herring Gull, Yellow-legged Herring Gull, *L. cachinnans*, and Great Black-backed Gull, was studied in Somme Bay (50.14 N/1.33 E) and throughout the coastal plain of Picardy, the western littoral of France (Figure 1).



Figure 1: The Picardy coast

The Somme estuary consists in fact on two interlocking estuaries: the former is the River Somme, the most important in terms of size and flow (on average 40 cubic metres per second ; ELKAÏM *& al*., 1992), and latter much smaller the River Maye. Together they cover about 75 square kilometres, with three particular features:

- the marine area, composed essentially of sand and occupying all the delta beyond the estuary ;
- the estuary, or mudflats, composed of fine and rough sands, partially silt (less than five per cent) which is regressing but still well developed adjacent to the Somme and Maye Rivers ;
- the area consisting mainly of salt marshes.

The Bay of Authie, north of the Somme estuary, looks like this latter but, due to its small size, the marine influence here is stronger.

The shore between these two estuaries is sandy, just like the one in the South of Somme estuary, except for a rocky, calcareous portion of about eight kilometres along the Normandy border. This rocky shore consists of natural mussel beds while a zone of mussel farming exists to the north of Somme Bay.

The coastal plain of Picardy consists mainly of dunes along the northern coast (the Marquenterre dunes cover between 2500 and 3800 hectares according to various estimates ; LEFÈVRE & *al.*, 1981), which are little used by the Laridae because of the forests, and a bar of shingle in the south which provides some resting places at high tide. The two largest habitat types of the Picardy coastal plain, both in terms of size and use by the Laridae, are the moist zones and particularly on the agricultural land where food (chiefly lumbricids and arthropods) is available in abundance. The latter can be subdivided into cultivated land for food, fields of fodder and pasture land which, in Marquenterre, covered, respectively, 6,100, 1,550 and 5,500 hectares at the beginning of the 1970s (COLLADO, 1973). However 20 years later, cultivated land has grown at the expense of the other two which themselves have slightly encroached on the margins of the moist zones. At the periphery of the zone, two rubbish tips are also attractive for Laridae.

In 1992, at least once a month, we proceed to a census of Laridae on each tip. The same day, we counted the birds returning from inland at the end of the day at Saint-Valery-sur-Somme. Since 1977, most of the Laridae have been spotted in this area. Birds arrive in the Somme Bay via "Cap Hornu" in small numbers or by a northern route to the west of Le Crotoy, where they escaped our detection, in much greater numbers. These censuses, linked to those taken in Somme Bay (at least three counts per month or once every ten days) and in various sites on the coastal plain of Picardy, allow us to determine the use of the four major habitat categories (littoral, marshes, agricultural land, and rubbish tips) by the Laridae.

Two species, the Lesser and Great Black-backed Gulls, are almost exclusively found along the coast and have never numbered more than 2,000. For them, we have separated the shore into two categories - the estuary and the sandy shores beyond the estuary - based on the censuses carried out between September 1983 and August 1984.

Results

Functional units

A map (figure 2) presents the different habitats of the Picardy coast (use by larids is synthesized in a table) : sandhills and pebblehills (disaffected by larids for feeding), cultivated areas as fields but also pastures (used chiefly by Black-headed and Common Gulls but also by Herring Gull), marshes (used only almost by Black-headed Gull) shore with cockles *Cerastoderma edule* and mussels *Mytilus edulis* beds (used by the five main sympatric larids, the Yellow-legged Gull and minor other species) and rubbish tips (used chiefly by Herring Gull). This map presents also Black-headed and Herring Gull colonies, major (80 to 90 % of movements) and minor fly-roads, major (in bay of Somme, see table 1) and minor irregular (few hundreds birds in bay of Authie) night-roosting.

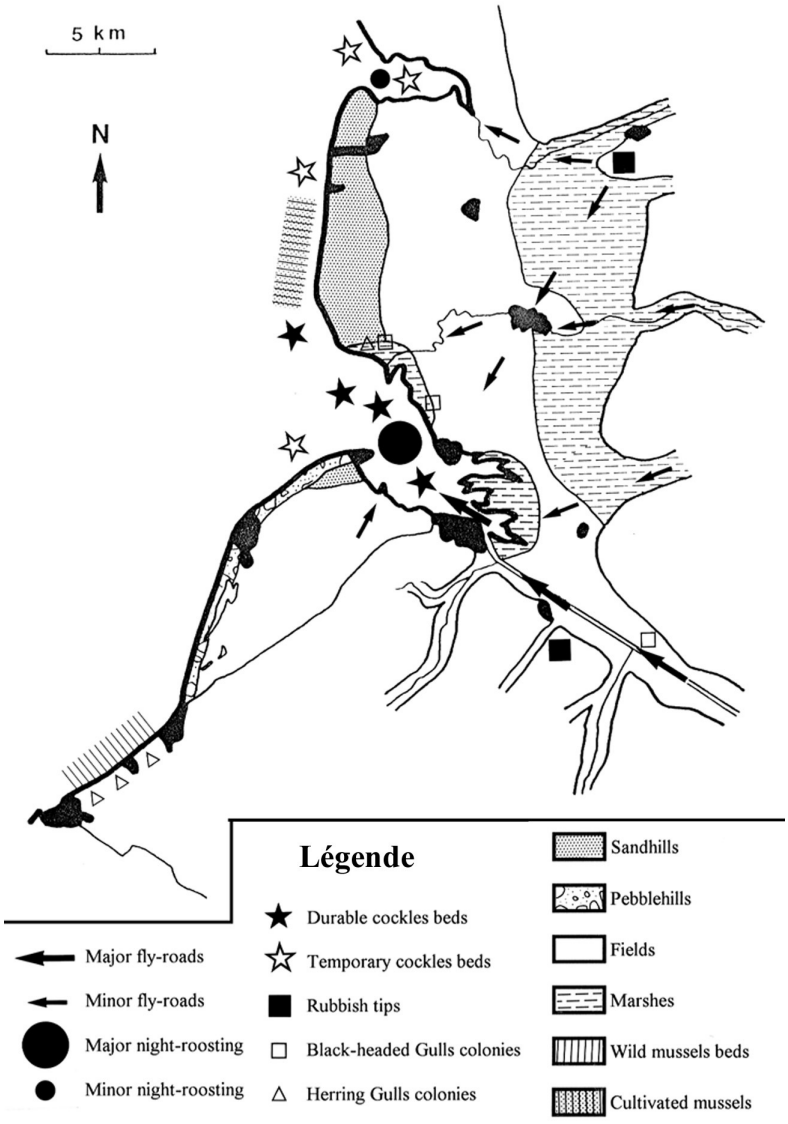


Figure 2 : Habitats of the Picardy'coast and space utilization by larids

Table I : Counts of Larids during roost-movements at Saint-Valery-sur-Somme (after SUEUR, 1996)

Dates	*Larus ridibundus*	*Larus canus*	*Larus argentatus*
29/01/92	6365	955	2260
12/02/92	8048	1317	2218
11/03/92	13245	1810	1345
01/04/92	9180	-	1265
29/04/92	5115	-	870
02/05/92	1055	16	318
17/06/92	350	-	200
30/07/92	430	50	300
30/08/92	400	20	735
20/09/92	1040	4	400
27/09/92	2500	75	250
29/09/92	5570	220	1610
19/10/92	6233	368	752
26/11/92	10600	4500	3430
22/12/92	13150	1840	2250
19/01/93	8790	3110	1620
18/02/93	13780	3600	1840
22/03/93	1950	3925	930
16/04/93	500	90	520

Species

Black-headed Gull *Larus ridibundus* (figure 3).

Black-headed Gulls usually feed in cultivated areas from September to April (75.1 to 97 % of the birds). This period corresponds to the period when preys living in the surface of the soil are easiest to reach or have been brought to the surface by agricultural work.

This bird only uses marshes as an important feeding ground in May (63.7%) and June (80.6%), when fields are inaccessible to Black-headed Gull because of the tall vegetation and when invertebrate fauna of marshes is more abundant.

Later, Black-headed Gull favours the shore, mainly mudflats of Somme Bay, in July and August (about 94% of the birds), when potential prey such as crustaceans amphipods, *Corophium volutator* and *C. arenarium*, and annelids, *Nereis diversicolor* (SUEUR, 1993a) are the most abundant (SUEUR *& al*., 1989 ; SCHOTTLER *& al*., 1991). This is also the period when birds, potential victims of kleptoparasites affecting the Black-headed Gull, such as Bar-tailed Godwit *Limosa lapponica*, Redshank *Tringa totanus* and Curlew Sandpiper *Calidris ferruginea* (SUEUR, 1993b), are at the height of their postnuptial migrations (SUEUR et COMMECY, 1990).

Rubbish tips were completely abandoned in May and June when colonies are, at six to fifteen kilometres, a significant distance away. The tips are less frequented from February to April (1.6% to 4.9% of birds) and from July to December (0.9 to 4.5%) but more so in January (16.2%), heart of winter, when food sources in other environments, and also at the tips, are minimal.

Black-headed Gulls feed so rarely in the region's towns, except during cold periods, that our data provides insufficient evidence to draw conclusions.

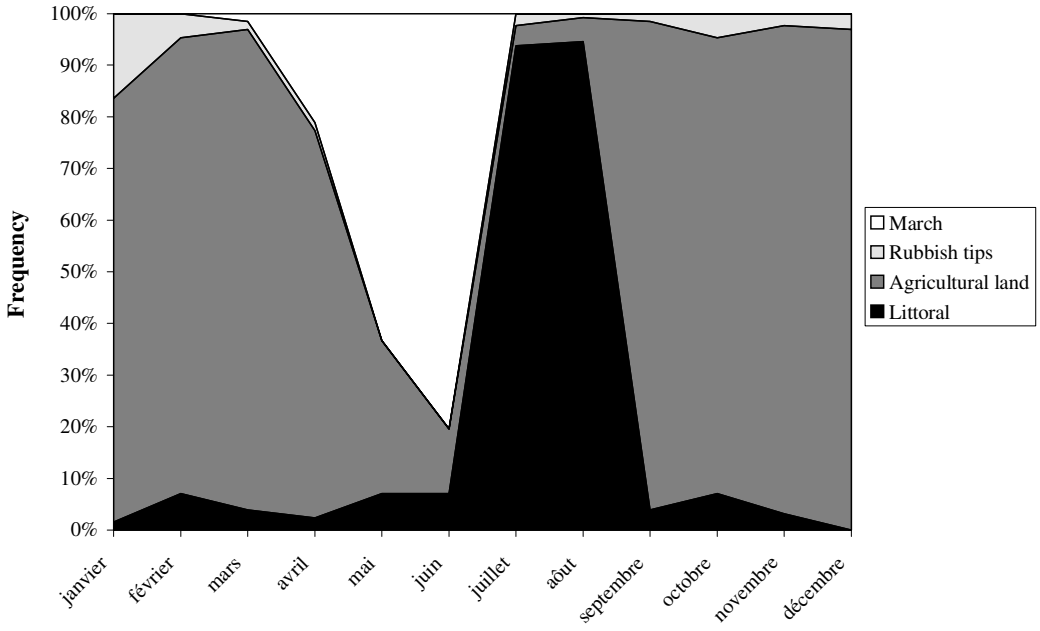


Figure 3: Variations in the use of different feeding grounds by Black-headed Gull *Larus ridibundus* during its annual cycle (n = 83 281 birds).

Common Gull *Larus canus* (figure 4)

Common Gulls feed essentially on the shore, particularly in Somme Bay, from May to October (61 to 100% of birds), when potential prey are at their maximum (SUEUR & *al.*, 1989).

The rest of the year, from November to April, it mainly frequents cultivated areas (56.5 to 88.7%) when prey there becomes more accessible because of agricultural work.

Compared with Black-headed Gull, it never feeds significantly in marshes. It rarely frequents tips to feed (0 to 0.8%) although there is clearly use, as with the Black-headed Gull, in the heart of winter in January (3.4%). In Belgium, it feeds more readily in such a man-made environment (SCHMITZ et DEGROS, 1988).

Common Gulls feed so rarely in the region's towns, except during cold periods, that our data provide insufficient evidence to draw conclusions.

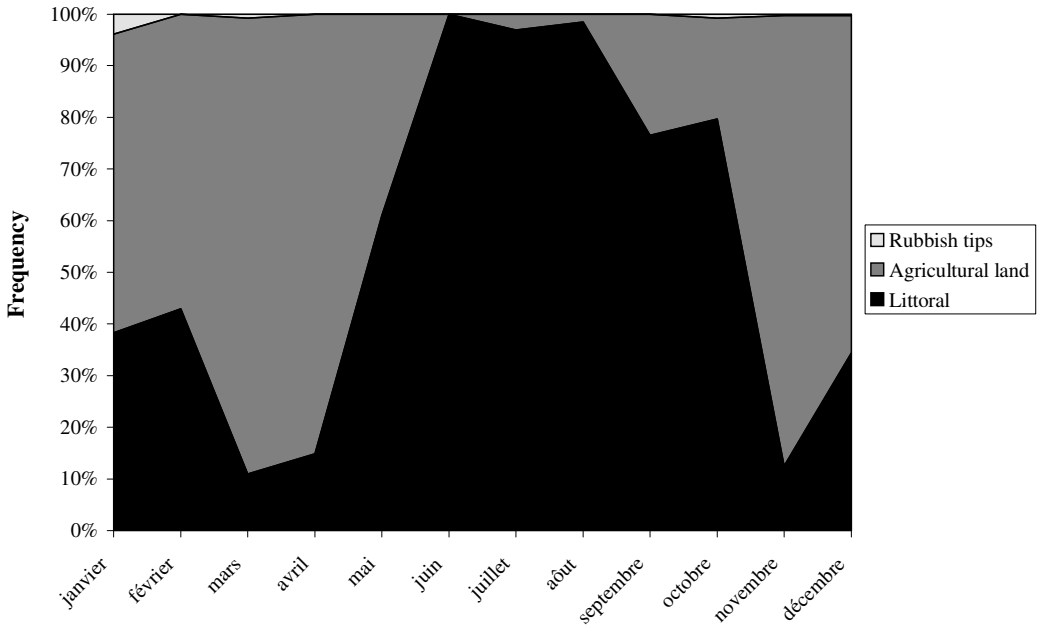


Figure 4: Variations in the use of different feeding grounds by Common Gull *Larus canus* during its annual cycle (n = 11 175 birds).

Lesser Black-backed Gull *Larus fuscus* (figure 5)

Most Lesser Black-backed Gulls alight in the outer delta of the Somme estuary where they feed at low tide. This zone is almost exclusively composed of sandy sediments brought by the sea. Few individuals frequent the mudflats.

Numbers on the shore, compared with those in the estuary, are negligible in winter (December to February) and in July. They tend to be in higher numbers during migrations: 40 to 48% in April, 42 to 46% in September, 35 to 44% in October and 6 to 50% in November.

Lesser Black-backed Gull only occasionally visits rubbish tips and there are always less than ten individuals present simultaneously.

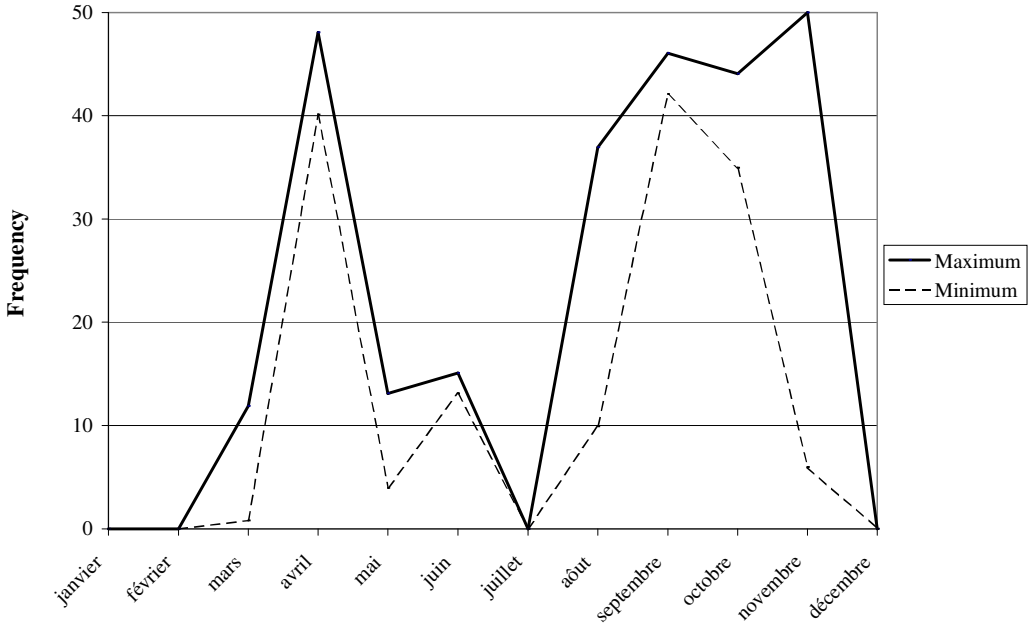


Figure 5 : The proportion of Lesser Black-backed Gulls *Larus fuscus* occuring on the shore outside the estuary during an annual cycle (maximum and minimum ; n = 4 988 birds).

Herring Gull *Larus argentatus* (figure 6).

Of the three species making frequent incursions inland, the Herring Gull remains the longest time on the shore, which is its most important feeding ground in February (70.5% of birds), April to September (54 to 90.9%) and in November and December (about 39%).

Tips play an important role in birds' feeding habits almost throughout the annual cycle (21 to 53.5% of birds except in June when the percentage drops to 9.1%). This role, however, is probably underestimated since tips' surroundings have not been observed throughout the day and have only been the object of snap-shot censuses, when, for instance, a flux of birds exists. Just like Black-headed Gulls, Herring Gull abandon the tips in May and June, since colonies, at 15 and 19 kilometres distance, are far away. The poor quality of food obtained at tips, which fail to meet the birds' requirements at this time, also helps to explain the temporary disaffection. Tips play a major role in Herring Gulls' feeding in March (47.7%) and in October (53.5%).

The role of agricultural land in feeding Herring Gulls is probably slightly overestimated in our study since some birds which head inland by following the Somme Canal and abandon Boismont tip can continue their route, not for feeding on the cultivated land, but for feeding on tips at Mareuil-Caubert and Sains-en-Amienois, situated, respectively, at 18 and 64 kilometres from the littoral. However, for several years there have been very few Laridae on either of these two sites because there has been more rapid burial and less waste following the construction of a treatment plant for the agglomeration of Amiens and its surroundings. The role of agricultural land thus seems to be important in March (33.8%), September (21.8%) and in November and December (almost 25%) while in January, when food resources are at a minimum in each habitat, each has an almost equivalent role: 33.9% for cultivated land, 33.5% for the shore and 32.6% for tips. Equally, in December, a similar situation arises with, however, a lower role for agricultural land.

The exploitation of urban food resources, such as that found in Normandy (VINCENT, 1988 et 1994), is of little importance on Picardy shore.

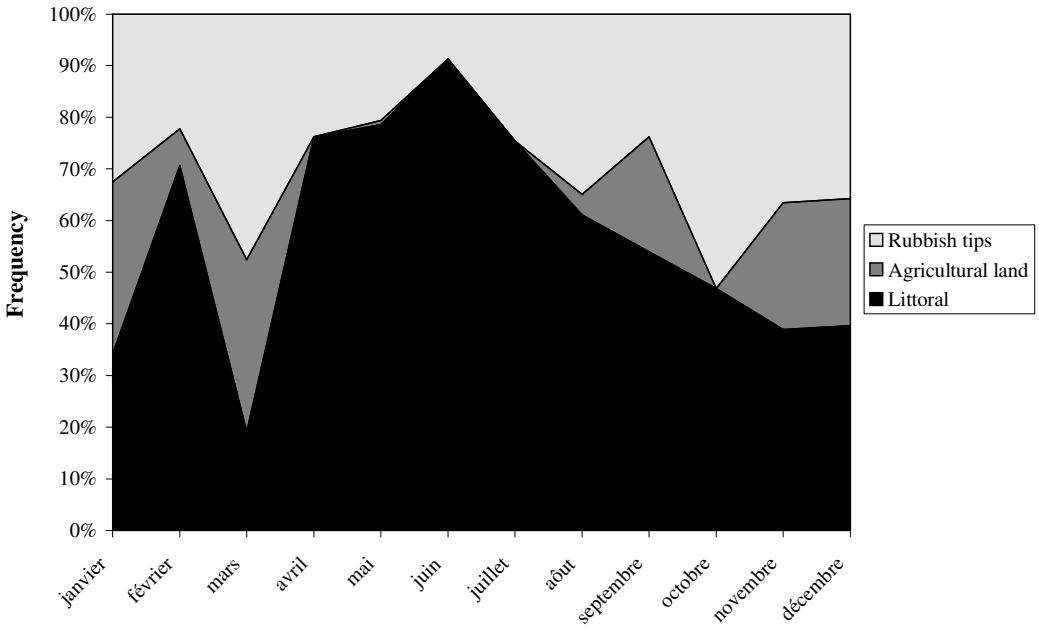


Figure 6: Variations in the use of different feeding grounds by Herring Gull *Larus argentatus* during the annual cycle (n = 18 203 birds).

Yellow-legged Herring Gull *Larus cachinnans*

On the Picardy coast, Yellow-legged Herring Gulls mainly frequent part of the shore between mussel farming beds to the South of Quend-Plage and the Authie estuary to the North (66 to 303 birds chiefly in summer from 1989 to 1992), and also beyond to at least Canche estuary, Pas-de-Calais. They are rather rare in the Somme estuary, in the Ornithological Park of Marquenterre, on the southern littoral of shingle and in sites peripheral to the latter such as Hable d'Ault.
Yellow-legged Herring Gull was only uncounted on a single tip at Nampont-Saint-Martin (13 counts from January to December 1992) where there were less than five individuals. This is curious since birds feed in significant numbers in areas of human habitation in the Bouches-du-Rhone (ISENMANN, 1976b), in the Seine Valley (BAUDOIN et Le MARÉCHAL, 1988) and in Spain (SUEUR, 1993a).

Great Black-backed Gull *Larus marinus* (figure 7)

Most Great Black-backed Gulls alight at low tide and feed almost exclusively in the delta beyond the Somme estuary which consists of sandy sediments populated by benthic fauna more marine than estuarine (SUEUR, 1989). Only a few individuals frequent mudflats and they tend to have very specialized diets including birds, mainly waders, injured by hunters. Numbers on coast, compared with those present in the estuary, are low: from 0% in April (period of minimum numbers) to between 22 and 47% in January (period of maximum dispersal because of the scarcity of food resources; SUEUR, 1993a).

Great Black-backed Gull only occasionally visits tips and there are always fewer than ten individuals present at any one time.

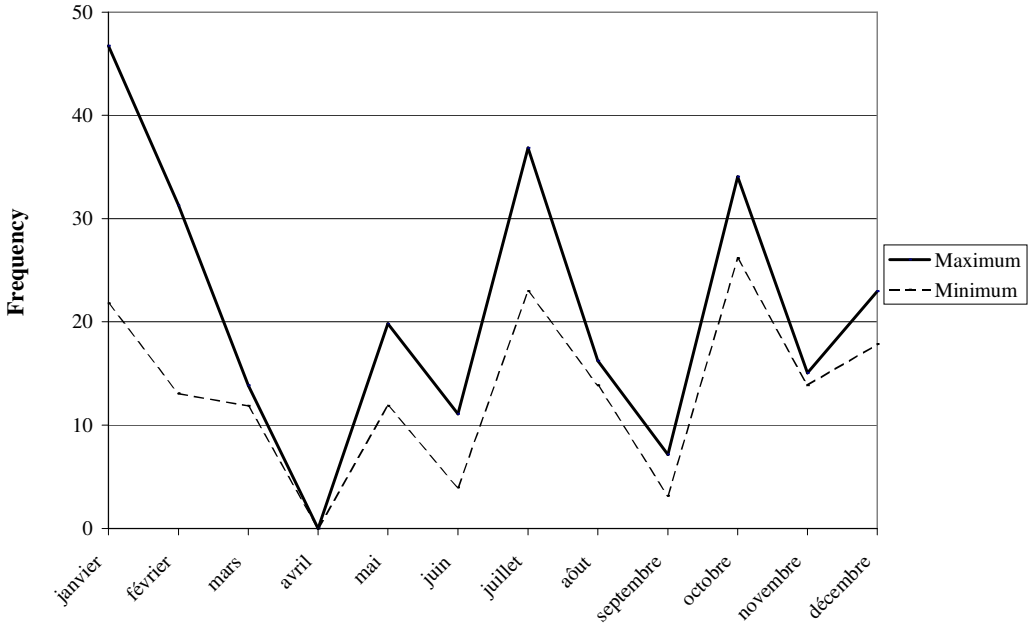


Figure 7: The proportion of Great Black-backed Gulls *Larus marinus* occurring on coast outside the estuary during an annual cycle (maximum and minimum; n = 15,800 birds).

Discussion

As in many West European estuaries (MUDGE et FERNS, 1982; personal observations), Laridae population in Somme Bay comprises five main species: Black-headed Gull, Common Gull, Lesser Black-backed Gull, Herring Gull, and Great Black-backed Gull.

Most important feeding grounds of laridae in the coastal plain of Picardy are synthesized in table 2. Two species, Lesser and Great Black-backed Gulls, mainly frequent the delta beyond the estuary and are also found on the sedimentary coast, and near benthic populations, very close to this zone. The three other species feed mainly on mudflats in the estuary but also make incursions inland.

Black-headed Gull, the smallest of these species, is the least marine of these Laridae. For most of the year (10 months out of 12), it feeds mainly on land sites (agricultural land, marshes, and rubbish tips), rarely in the estuary (except in July and August) and is the rarest of the five to frequent the sandy coast in the north or the shingle in the south. It also rarely visits the rocky coast between Ault and Mers-les-Bains.

Yellow-legged Herring Gulls are the only ones to frequent almost exclusively the part of the northern littoral between Quend and Authie estuary. Mediterranean and Little Gulls, mainly migratory species, have been seen in many coastal sites, particularly in the outer estuary.

Lesser Black-backed Gulls only occasionally frequent inland sites in the Picardy plain while they regularly winter in such sites in England in increasing numbers over the last forty years (HICKLING, 1954, 1967, 1977 et 1984 ; BARNES, 1961): numbers rose by 412% between 1953 and 1963, by another 260% to 1973 and by about 78% to 1983 (BOWES & *al.*, 1984). It may even settle in some inland sites for most of the year

(RAYNER, 1963) and make numerous incursions in the North (J.C.TOMBAL), however a neighbouring region of Picardy.

Yellow-legged Herring Gull rarely visits the Somme estuary possibly because the species is not yet adapted to the tides which do not exist in its main Mediterranean habitat. Equally, it prefers to feed in the very sandy sedimentary areas in a similar manner to the Lesser and Great Black-backed Gulls.

Table 2. Most important feeding grounds of laridae in the coastal plain of Picardy

	Larus ridibundus	*Larus canus*	*Larus fuscus*	*Larus argentatus*	*Larus cachinnans*	*Larus marinus*
J	F	F	L	FLR	L	L
F	F	F	L	L	L	L
M	F	F	L	R	L	L
A	F	F	L	L	L	L
M	M	L	L	L	L	L
J	M	L	L	L	L	L
J	L	L	L	L	L	L
A	L	L	L	L	L	L
S	F	L	L	L	L	L
O	F	L	L	R	L	L
N	F	F	L	L	L	L
D	F	F	L	L	L	L

Feeding habitats, F : fields; M : marsh ; L : littoral ; R : rubbish tips

Like the Lesser Black-backed Gull, and in a much more obvious way, Great Black-backed Gull rarely frequents inland sites on the coastal Picardy plain (SUEUR, 1993a), in Picardy (SUEUR, 1989) and even in the rest of France, whereas in England it is frequent and abundant (HICKLING, 1954, 1967 et 1977): numbers have risen by almost 193% between 1953 and 1963, by around 49% up to 1973, but slightly dropped in the following ten years (BOWES *& al*., 1984).

Cultivated areas comprise the main feeding grounds of Black-headed Gull from September to April (75.1 to 97% of birds) in the coastal plain of Picardy, as in the inner Bristol Channel, Great Britain, in winter time (MUDGE & FERNS, 1982). They (rice fields excluded) have, however, always been of less importance than other habitat types in the Camargue region of the Mediterranean littoral: 2.2% to 17.3% from October to June with larger numbers of Black-headed Gulls, 22.8% to 32.7% of birds, from July to September (ISENMANN, 1977).

Wetlands (these comprise marshlands and lagoons on the coastal plain of Picardy, where they play a marginal role, and rice fields and salt marshes in Camargue) are birds' main feeding grounds in May and June around the Somme Bay (respectively 63.7% and 80.6% of birds) as in the Camargue (68.1% and 62.2%; ISENMANN, 1977). But the importance of these habits begins earlier in this region (59.5% in April), lasts until November (67.1% to 79.8%) and regains its importance again in January (56.6%). Equally, aquatic habitats are the most important feeding grounds from April to June (67.5% to 86% of birds) in Moravia, in the Czech Republic, according to HONZA (1993). With the displacement of the two most important colonies on the coastal plain of Picardy, the wetlands became marginal zones for feeding Black-headed Gulls in this region in 1993 and 1994; these habitats being replaced by cultivated areas. This fact is probably explained by the tendency for this bird to reduce the average distance from its feeding grounds during the reproduction period (HONZA, 1993). At this time it tends to exploit areas closest to its colonies.

The coast, notably mudflats of the Somme Bay, is an important feeding ground for Black-headed Gull in July and August (about 94% of birds), as in Scotland and Norway with 62.3% of birds (HUNT et HUNT, 1973). It remains marginal, however, in the Camargue where it is placed in the miscellaneous category with airspace and roads (0% to 6.3%; ISENMANN, 1977). The lack of intertidal mudflats with benthic fauna providing substantial biomass explains this difference. In August in Dobroudja, Romania, these shore-line habitats comprise the main feeding grounds of Black-headed Gull with 92% of birds (DUBOIS, 1982), about the same proportion as in neighbouring areas of Somme Bay, divided between the sea (47%) and the bordering mudflats of the lagoons (45%).

In the coastal Picardy plain, rubbish tips attract few birds (0.9% to 4.9% during most of the annual cycle) with, however, a small peak in January (16.2%). They are completely abandoned in May and June. The reverse is true in Camargue (ISENMANN, 1977), where this habitat plays a major role in December, February and March (52.4% to 67.8%) and is still important in January, and April to June (24.3% to 39.5%). The large size of rubbish tips in this region (the tip at Entressen-en-Crau takes the rubbish from the commune of Marseille with about 910000 inhabitants in 1975 according to a study by ISENMANN, 1978) must limit the competition between Black-headed Gull and Yellow-legged Herring Gull on these sites. Indeed, the Black-headed Gull loses out to Herring Gull on the two more modest tips (which take the waste of less than 60 000 inhabitants) situated on the periphery of the Picardy coastal plain.

In Picardy, Common Gull feeds mainly on the coast from May to October. A similar situation has been observed in the north of Norway while the species is present from April to October (STRANN et VADER, 1992), about the same as in Picardy.

In the coastal Picardy plain, it feeds mainly in cultivated areas from November to April. A similar situation was observed in winter around the inner Bristol Channel (MUDGE et FERNS, 1982). On the other hand, in Scotland and Norway, cultivated areas are the main feeding grounds in July and August (74.6% of birds) according to HUNT et HUNT (1973) while, at this time of year, they feed on the coastal areas adjacent to the Somme Bay.

Lesser Black-backed Gull feeds almost exclusively on the littoral in Picardy, just as in northern Norway (STRANN et VADER, 1992). The difference between these two regions is that in the first it uses little of the open sea whereas in the second this habitat is paramount. This difference is perhaps due to the different food ecology of the subspecies concerned: *graellsii* and, more importantly, *intermedius* in Picardy; and *fuscus* in northern Norway. These two groups, moreover, can probably be distinguished in specific ways (STRANN et VADER, 1992). A very different situation has been observed near the inner Bristol Channel where Lesser Black-backed Gull feeds mainly on rubbish tips in summer, and in the fields and, to a lesser extent, tips in winter (MUDGE et FERNS, 1982) but many birds have migrated away from Britain. In Scotland and central Norway, they also make the most of rubbish left by man, such as, in this case, flotsam in residual waters (HUNT et HUNT, 1973).

The Somme Bay is an important feeding ground for Herring Gull in February, from April to September, and in November and December. In northern Norway, the coast is only important from April to August (STRANN et VADER, 1992).

Rubbish tips are important feeding grounds for this bird in the coastal plain of Picardy throughout almost the whole year, except in June. In March and October it is the most important feeding ground of all. This is a similar situation to that observed around the inner Bristol Channel in summer and winter (MUDGE & FERNS, 1982), and in Holland in winter when more than 81% of birds feed on the tips (Spaans, 1971). This biotope, associated with fish canning factories, dominates from January to March, and is paramount in northern Norway from September to March (STRANN et VADER, 1992). Tips and residual waters also play the same role during the breeding season in Maine (USA), in July and August in Scotland and in central Norway (HUNT & HUNT, 1973).

On the Picardy coast, Yellow-legged Herring Gull feed almost exclusively on the coast while present mainly from the end of July to October. A similar situation has been observed in the Canaries in November (F. SUEUR, pers. obs.). In Roumania, this environment is paramount in August (55% of birds) although birds also frequent other biotopes including lagoons, farmland and steppe (DUBOIS, 1982). During

the same month on Costa Brava in Catalonia, Spain, three environments have almost equal importance for the Yellow-legged Herring Gull: the sea (where 36% of 1455 birds feed, of which more than half follow boats), rubbish tips (34%), farmland and meadows (more than 27%), while marshes and airspace only play minor roles (F. SUEUR, pers. obs.). In the Camargue, this bird mainly feeds on rubbish tips (more than 91% of individuals) during the period of reproduction (ISENMANN, 1979).

During the whole annual cycle around the Somme Bay, Great Black-backed Gulls feed almost exclusively on the littoral, a similar situation to that found in the inner Bristol Channel (MUDGE & FERNS, 1982). In northern Norway, this biotope only dominates from May to August. Rubbish tips and fish canning factories play this role during the rest of the year (STRANN et VADER, 1992). The environment containing food of human origin (on rubbish tips and in residual waters) also plays a major role during the reproductive period in Maine (USA), in July and August in Scotland, and in central Norway (HUNT et HUNT, 1973).

Compared to other European countries, the almost exclusive use of the Picardy coast by Lesser Black-backed Gull, Yellow-legged Herring Gull, and Great Black-backed Gull is one of the most original aspects of the use of these environments by larids. Another difference is the relatively limited use of resources of human origin within rubbish tips (except for Herring Gull) and in agglomerations compared with other regions, such as Normandy and Brittany, or neighbouring countries, such as Belgium.

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