

# Fifteenth Census of Seabird Populations in the Sanctuaries of the North Shore of the Gulf of St. Lawrence, 1998-1999

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For the first time since the tradition began in 1925, the quinquennial census of seabirds in the Migratory Bird Sanctuaries of the North Shore of the Gulf of St. Lawrence was divided between two years in 1998-1999. Trends between 1993 and 1998-1999 were variable across species and sanctuaries. In particular, following the large decreases in both species noted in 1993, the 1998-1999 survey showed that Black-legged Kittiwakes had declined further, while the number of Herring Gulls had stabilized. Alcids were all doing well except for the Atlantic Puffin which showed severe yet unexplained drops at all major colonies. Law enforcement efforts appear reflected in seabird population trends, as well-patrolled sanctuaries such as St. Mary's Islands seem to do well, whereas many species at the Baie des Loups and Île à la Brume sanctuaries are far from their historical levels. In addition to a better law enforcement program, research is needed in order to identify other conservation problems that some species may be facing.

Pour la première fois depuis 1925, l'inventaire quinquennal des oiseaux marins des refuges d'oiseaux migrateurs de la Côte-Nord du Golfe Saint-Laurent fut mené sur deux ans, soit en 1998 et 1999. Les tendances des populations entre 1993 et 1998-1999 étaient variables selon l'espèce et le refuge. En particulier, suite à une décroissance notée chez les deux espèces en 1993, l'inventaire de 1998-1999 a démontré que la Mouette tridactyle avait encore diminué, tandis que le nombre de Goélands argentés s'était stabilisé. Les populations d'Alcidés ont toutes semblé en bonne santé sauf celle du Macareux moine dont les colonies importantes ont diminué de façon sévère et inexplicée. Les efforts de protection par l'application de la loi se reflètent visiblement dans les tendances des populations d'oiseaux de mer, puisque les refuges les mieux surveillés comme celui des Îles Sainte-Marie vont bien, alors que plusieurs espèces aux refuges de Baie des Loups et de l'île à la Brume sont loin de leurs niveaux historiques. En plus d'un meilleur programme d'application de la loi, la recherche est nécessaire pour identifier les autres problèmes de conservation auxquels certaines espèces font face.

**Key Words:** Seabirds, populations, sanctuaries, Gulf of St. Lawrence, Atlantic Puffin, larids, alcids.

Apart from its major use in providing updated information on seabird numbers and distribution throughout the migratory bird sanctuaries on the North Shore of the Gulf of St. Lawrence (Figure 1), another major application of the results of this traditional survey is in identifying trends. Follow-up censuses have been carried out fairly regularly since the first census in 1925 (Lewis 1925, 1931, 1937, 1942; Hewitt 1950; Tener 1951; Lemieux 1956; Moisan 1962; Moisan and Fyfe 1967; Nettleship and Lock 1973; Chapdelaine 1980, 1995; Chapdelaine and Brousseau 1984, 1991), providing the trends over a period of approximately 75 years, including the present survey. This survey also provides one of the ways we monitor the broader marine environment. In effect, these wide-ranging birds are acting as our sampling agents. As human impact on the seas increases, whether directly by exploitation of resources or marine pollution, or less directly by factors such as global warming, early indications of changes are vital. Clearly any changes in the size of seabird breeding colonies are of major importance to conservationists to orient any concrete action to be taken or to seabird biologists to learn more about the regulation of seabird numbers and the wide range of factors known to influence the birds.

This article presents the current status of the 15 marine bird species breeding in the sanctuaries in 1998-1999, and compares them with those of the 1993 census. Scientific names are given in Table 1.

## Methods

The census of seabirds in the sanctuaries of the North Shore of the Gulf of St. Lawrence was conducted over two years. All of the technical details of this census (methods, estimates calculations, mapping of the colonies, weather conditions) are discussed in Rail and Chapdelaine (2002) and summarized below for each family of birds.

**GAVIIDS** – We counted all Red-throated Loon nests by systematically walking around the ponds on the islands of each sanctuary. In a few exceptional cases we noted the presence of adults instead of landing on the island.

**HYDROBATIDS** – We conducted a systematic count of active burrows. A burrow was considered active if we were able to reach an adult inside, or detect signs of recent occupation (soil freshly excavated or oily odour characteristic of petrels at the entrance of the burrow).

**ANATIDS** – On Corossol Island, we used a system of quadrats from which we extrapolated and average density (nests/ha) for the entire area deemed suitable

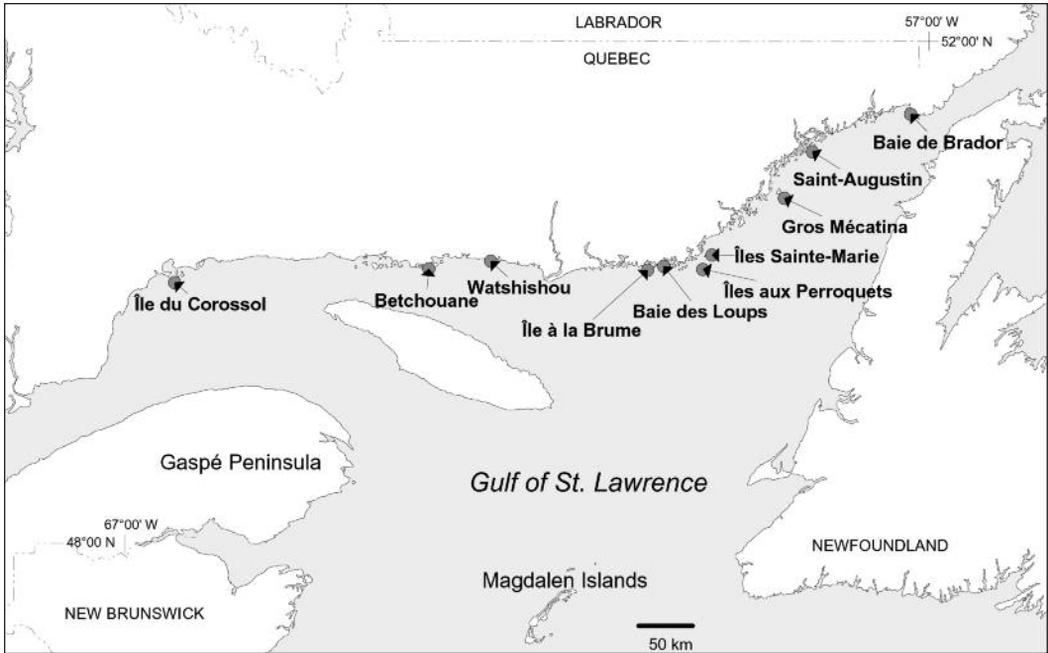


FIGURE 1. Location of the sanctuaries of the North Shore of the Gulf of St. Lawrence.

for Common Eiders (Chapdelaine 1978\*). In the Betchouane Bird Sanctuary, we conducted a systematic nest count on Calculot Island, and (as in preceding censuses) used a system of line-transects of varying length on Innu Island (*see* Caughley 1977). In sanctuaries featuring many islands (e.g., Watshishou, île à la Brume, Baie des Loups), we counted all the nests on at least 27% of the land area and extrapolated an average density over the entire area of all the islands. On the Îles aux Perroquets and Îles Sainte-Marie sanctuaries, extrapolation was done after systematic counts were made on most large islands, covering 57% and 98% of total land area, respectively (*but see* Rail and Chapdelaine 2002 *for details*).

**PHALACROCORACIDS** – Systematic counts of all Great and Double-crested Cormorant nests were carried out. At the Corossol Island colony, Double-crested Cormorant nests in treetops were counted from an elevated lookout point.

**LARIDS** – In the large Herring Gull colony of Corossol Island, we sampled sub-colonies where the number of nests ( $N_p$ ) and the number of adults ( $N_i$ ) were determined. Then, using the factor  $k$  ( $k=N_p/N_i$ ), we estimated the number of pairs in sectors where we counted only the number of adults present. In the Betchouane Sanctuary, all gull nests were counted systematically, and were attributed to Herring and Great Black-backed gulls according to the observed proportions of adults of both species. In the other sanctu-

aries all larids were censused with a combination of nest counts and adult counts. Proportions of Arctic and Common terns in mixed tern colonies were not always determined, so the results for the two species are combined in Table 1. All Black-legged Kittiwake nests attended by adults were counted.

**ALCIDS** – We carried out systematic counts of eggs and active burrows in colonies of Atlantic Puffins, Razorbills and Common Murres that could be accessed with minimal disturbance. Elsewhere we counted individuals at the colony and on adjacent waters from a distance. All colonies with large numbers of Common Murres were carefully avoided because of their sensitivity to disturbance. In particular, at the Îles Sainte-Marie Sanctuary, where 87% of breeding Common Murres on the North Shore are found, 98% of the population estimate for the Common Murre results from adult counts. For Atlantic Puffins nesting on the Blacklands Island in the Baie des Loups Sanctuary, we used the factor  $k$  method described above for larids. On Île aux Perroquets in the Baie de Brador Sanctuary, we used evenly spaced grids and line transects to delimit the area of both the puffin and Razorbill colonies, evaluate mean nest densities, and then extrapolated the populations (*see* Nettleship 1973\* ; Chapdelaine 1978\*). The Black Guillemot population was estimated from adult bird counts around the islands, although exceptionally we recorded a pair when a nest was found with no adult in sight.

TABLE 1. Census of seabirds (number of individuals) in the bird sanctuaries of the North Shore of the Gulf of St. Lawrence 1993 and 1998-99.

Species	Île du Corossol		Betchouane		Wataishou		Île à la Brume		Baie des Loups		Îles aux Perroquets		Îles Sainte-Marie		Gros Mécatina		Baie de Brador		Total		
	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	1993	1998	
Red-throated Loon																					
<i>Gavia stellata</i>																					
Leach's Storm Petrel																					
<i>Oceanodroma leucorhoa</i>	1614	718																			
Great Cormorant									226												
<i>Phalacrocorax carbo</i>																					
Double-crested Cormorant																					
<i>Phalacrocorax auritus</i>	1278	950			714	1078															
Common Eider																					
<i>Somateria mollissima</i>	1010	1162	4872	3088	4444	4754	1072	916	1392	2090	560	484	1198	578	-	-	-	-	-	-	-
Ring-billed Gull																					
<i>Larus delawarensis</i>									443	76											
Herring Gull																					
<i>Larus argentatus</i>	1224	1968	1006	950	964	831	164	202	404	391	174	187	860	342	-	59	83	58	4879	4988	
Great Black-backed Gull																					
<i>Larus marinus</i>	662	1160	112	122	338	185	28	22	320	206	96	95	518	385	-	46	210	206	2284	2427	
Black-legged Kittiwake																					
<i>Rissa tridactyla</i>	5898	3384	144	170																	
Caspian Tern																					
<i>Sterna caspia</i>																					
Common and Arctic Terns																					
<i>Sterna hirundo</i>																					
<i>Sterna paradisaea</i>																					
Common Murre																					
<i>Uria aalge</i>	280	316			260	38	113	46	34	32	72	65	66	96	-	100	17	545	394		
Razorbill																					
<i>Alca torda</i>	589	815	142	244					8	32	5233	3593	25308	26156	-	13	14	30829	30124		
Black Guillemot																					
<i>Cepphus grylle</i>	99	223																			
Atlantic Puffin																					
<i>Fratercula arctica</i>																					
Total	12654	10699	6552	4898	6733	7380	1489	1267	13834	8318	3354	1585	5650	3020	-	103	23570	15780	46684	29133	
									16620	12135	12779	8239	38777	39316	-	890	24819	18755	120423	103579	

TABLE 2. Changes in the numbers of seabirds in sanctuaries on the North Shore of the Gulf of St Lawrence, Québec, 1988 to 1998-1999.

Species	Years of survey			Compound annual growth* rate by period	
	1988	1993	1998-1999	1988-1993	1993-1998**
Red-throated Loon	76	66	80	-2.82%	3.21%
Leach's Storm-Petrel	1744	1840	718	1.07%	-18.78%
Great Cormorant	86	78	340	-1.95%	24.54%
Double-crested Cormorant	4558	3472	2830	-5.44%	-3.49%
Common Eider	8536	14548	13072	10.66%	-2.10%
Ring-billed Gull	288	104	484	-20.37%	31.04%
Herring Gull	16195	4879	4929	-24.00%	0.49%
Great Black-backed Gull	1883	2284	2381	3.86%	1.15%
Black-legged Kittiwake	8536	6294	3816	-6.09%	-10.02%
Caspian Tern	15	0	0	-100.00%	-
Common and Arctic Terns	1350	545	294	-18.14%	-12.03%
Common Murre	26049	30829	30111	3.37%	-0.39%
Razorbill	7036	8389	13953	3.52%	8.58%
Black Guillemot	521	411	651	-4.74%	8.70%
Atlantic Puffin	35142	46684	29030	5.68%	-7.92%

$$\log_e N(t) - \log_e N(o)$$

$$*r = \frac{\log_e N(t) - \log_e N(o)}{t} \times 100\%$$

\*\* Populations in sanctuaries censused in 1999 were back-calculated to 1998 to get the compound annual growth rate for all North Shore sanctuaries after 5 years

## Results

In the eight sanctuaries censused in 1993 and 1998-1999 (Gros Mecatina excluded), the total number of birds had decreased by 15% or 17 734 individuals (see Table 1 for details). This is mostly due to the dramatic 38% decline of the Atlantic Puffin (-17 654 individuals), which was by far the most abundant seabird in the North Shore sanctuaries in 1993 (but was outnumbered by the Common Murre in 1999). Leach's Storm-Petrels, Black-legged Kittiwakes and Common and Arctic Terns also declined at a very rapid rate between 1993 and 1998-1999 (Table 2). Double-crested Cormorants numbers also diminished. The Razorbill is the only abundant species showing a large increase, with the 1998-1999 population estimate exceeding by 5564 individuals the result of 1993 (+66%). This species has made a spectacular comeback since 1972, when less than 3000 individuals were recorded in the sanctuaries (compared to 14 341 in 1998-1999). The small populations of Great Cormorants, Ring-billed Gulls and Black Guillemots also grew rapidly between 1993 and 1998-1999, as did Red-throated Loons but more slowly. In four species, numbers appeared rather stabilized, the Common Eider and Herring Gull after having showed very sharp trends between 1988 and 1993 (annual growth rates of +11% and -24%, respectively), the Great Black-backed Gull and Common Murre following less striking but significant rises (annual growth

rate of +3.9 and +3.4%, respectively). Finally, no Caspian Terns were found for the second quinquennial census in a row.

We visited the Corossol Island Sanctuary on 30 and 31 May 1998. Major increases in large gulls (Herring and Great Black-backed gulls) were noted. Populations of alcids also expanded, and in particular the number of Black Guillemots more than doubled compared to 1993. Puffins were recorded for the first time during quinquennial censuses, bringing up to 10 the number of seabird species breeding there. The Common Eider was also more abundant. On the other hand, the colony of Leach's Storm-Petrels was reduced to less than half between 1993 and 1998, and Black-legged Kittiwakes also declined quite rapidly. Double-crested Cormorants were down 25%, and colony localization had seemed to change a bit, possibly prompted by forest decay caused by their long-term occupation (nests are in tree-tops of conifers) in some areas.

On 2 and 3 June 1998, we visited the Betchouane Bird Sanctuary. The most important change in the seabird community was the 36% decrease in Common Eider, by far the most abundant bird there. The Razorbill apparently continued its spectacular comeback, with a 72% population increase between 1993 and 1998. Herring Gulls, Great Black-backed Gulls, Black-legged Kittiwakes and Atlantic Puffins were almost stable or slightly increasing.

After a tremendous population explosion following 1982, the population growth of the Common Eider in Watshishou appeared to have slowed down considerably between 1993 and 1998. The Black Guillemot population increased threefold during the same period. Double-crested Cormorant and Great Black-backed Gull numbers showed opposite trends; the former species underwent a 50% increase whereas the latter was reduced by half. Herring Gull population size appeared slightly reduced compared to 1993, but the 1998 result was by far the highest for the species in Watshishou, except for 1993. The 1998 survey confirmed a catastrophic (-96%) and inexplicable decline of terns in Watshishou since 1988. In the past, this sanctuary, consisting of more than 200 islands, always had a fair number of terns (range 128 – 1490 individuals), and was the most important sanctuary on the North Shore in that regard. In 1998, however, despite better coverage (more islands were visited than in previous censuses), we found only 19 breeding pairs distributed in 5 very small colonies. The Watshishou Bird Sanctuary was visited on 6, 7 and 8 June 1998.

The following year (in 1999), seabirds were censused on 14 June at the Île à la Brume Sanctuary. The Common Eider had decreased slightly since 1993, but was still relatively abundant. Population trends were up for Herring and Ring-billed gulls; however numbers of these two species are rather small and tended to vary a lot in the past. The number of Great Black-backed Gulls dropped further between 1993 and 1999, reaching its lowest level ever in 1999. Terns declined sharply during the same period, and in fact since 1988 their population trends at the Île à la Brume (-84%) and Watshishou sanctuaries are similar. Status of the very small populations of Red-throated Loon and Razorbill are still precarious, as their numbers remained stable between 1993 and 1999 at two and eight individuals, respectively. Finally, no Caspian Terns were found for the second quinquennial census in a row at Île à la Brume, the only traditional breeding site for this species in the Province of Québec.

We visited the Baie des Loups Bird Sanctuary on 18 June. The most abundant bird there, the Atlantic Puffin, had declined by 40% since 1993. The Great Black-backed Gull population also decreased noticeably (36%). Breeding Leach's Storm-Petrels apparently deserted the sanctuary, which leaves the Corossol Island Sanctuary as the only active breeding site of that species on the North Shore, and maybe in the whole province. On the brighter side, the Common Eider population increased by 50%. Also, the Common Murre and the Razorbill, once abundant in the sanctuary but which had declined steadily up to the very low and worrying levels observed in 1993, bounced back and increased threefold between 1993 and 1999. Red-throated Loon, Herring Gull, terns, and Black Guillemot numbers remained fairly stable.

The Îles aux Perroquets Bird Sanctuary was visited on 11 and 21 June 1999. The population of Atlantic Puffin showed a similar drop (-53%) as in the other large colonies on the North Shore. In contrast to the general upward trend observed in these species at the other sanctuaries, a decrease in Common Murres and Razorbills was noted at the Îles aux Perroquets Bird Sanctuary in 1999. The number of Common Eiders declined only slightly. Except for the Black-legged Kittiwakes whose population collapsed (-82%) between 1993 and 1999, numbers of larids were quite stable. With only 11 nests found in 1999, the kittiwake may well disappear as a breeding species at the Îles aux Perroquets in the future. On the positive side, the two smallest seabird populations breeding in the sanctuary in 1993, those of the Red-throated Loon and Black Guillemot, both showed large increases (140% and 164%, respectively). Also worthy of notice is the addition of the Great Cormorant as a breeding species in the sanctuary.

The Îles Sainte-Marie Bird Sanctuary (visited on 10, 11, 13, 17 and 19 June) was again found to have the highest seabird diversity (12 breeding species) and abundance (total of 39 316 individuals). Common Murres represented two-thirds of the seabird population with an estimated 26 156 breeding birds. The number of murres appeared quite stable between 1993 and 1999, after the spectacular and steady recovery of the species following 1972 (when only 4120 birds were counted). Razorbills show the same long-term trend as murres, but were still going up in 1999 (116% rise compared to 1993). The Great Cormorant colony expanded unexpectedly (+318%) to become the largest of this species on the North Shore. Increases were noted in Black-legged Kittiwakes, Black Guillemites and terns as well. Numbers of Double-crested Cormorants, Common Eiders, and Atlantic Puffins were reduced roughly by half. Herring Gulls were again found to be declining very sharply, whereas Great Black-backed Gulls showed a moderate decrease. Finally, the number of Red-throated Loons in 1999 was only one pair short of the highest counts which were recorded on the two preceding censuses.

A little farther to the east, a few small offshore islands constitute the Gros Mécatina Bird Sanctuary, which was created in 1996. On 23 June 1999, the sanctuary was included for the first time in a quinquennial census. Species diversity was impressive for such a small sanctuary, as nine seabird species were found breeding. Numbers of each species were low though, and the most abundant species was the Razorbill with 388 birds observed. According to naturalists such as Coues (1862), these islands were once inhabited by tens of thousands of Common Murres, so the sanctuary has definite potential for seabird conservation if it is well protected.

The Baie de Brador Bird Sanctuary is well-known for its colonies of Atlantic Puffin and Razorbill. On 28 and 29 June 1999 however, we were quite surprised to discover the addition of Black-legged Kittiwakes and terns breeding there for the first time, as well as Common Murres which had not bred there since 1965. Herring Gulls and Great Black-backed Gulls seemed well established as breeders for the second census in a row (they were present in very small numbers or absent prior to 1993). Also, as in most other sanctuaries, Razorbill numbers grew very fast between 1993 and 1999 (+175%). Nevertheless, all these results were darkened by the finding that Atlantic Puffins had declined by a third since 1993, when the population seemed on its way to get back to historic levels. Because it has always been the stronghold of puffins in our province, the Baie de Brador Bird Sanctuary plays a leading role in the conservation of the species in Québec.

### Discussion

Total number of seabirds recorded in 1998-1999 in the North Shore Bird Sanctuaries dropped 15% (or 17 734 birds, Gros Mécatina excluded). But most of this decrease could be attributed to the Atlantic Puffin whose 38% decline represent a loss of 17 551 birds. Population trends in other species were variable, as four species increased rapidly, four species decreased at a fast rate, and the others showed more stable or moderate trends. Numbers of Razorbills and Black Guillemots increased at a very rapid rate in almost every sanctuary (where they are present). The only Great Cormorant colony recorded during the 1993 census was found at the Îles Sainte-Marie Bird Sanctuary; by 1999, that colony had grown so much that immigration must be partly involved. Also, three new colonies of this species were found elsewhere in the sanctuaries in 1999. The Ring-billed Gull is the last seabird species which increased at a very fast rate since 1993. However, this species is poorly represented in the North Shore Bird Sanctuaries, where their numbers always fluctuated widely in the past. Instead of suggesting a real population trend, our results may rather reflect colony displacements as the species exhibits poor site fidelity on the North Shore.

The Atlantic Puffin was not the only species showing a sharp decline between the last two censuses of the North Shore sanctuaries. The case of the Leach's Storm-Petrel is equally worrying; the species was found breeding in four sanctuaries in 1988, but in 1998-1999 only the Corossol Island colony was still active, and its number of nests was reduced to less than half compared to 1993. Moreover, this may be the only Leach's Storm-Petrel colony left in the whole province. Thus the status of the species appears precarious in Québec. The Black-legged Kittiwake was found breeding in six sanctuaries in 1998-1999, whereas in the past it had been breeding in no more than four sanctuaries.

However, over 90% of the kittiwakes in the sanctuaries are concentrated at the Corossol Island colony, where a 39% drop was observed between 1993 and 1998. In fact the colony decreased by 55% since 1988 and the trend was even faster in the last five years. Observations made on diet and breeding success of larids at Corossol Island in 1996-1998 showed that kittiwake breeding success was severely affected by Herring Gull predation on large chicks, especially when capelin appeared less available. The poor kittiwake productivity measured in 1997-1998 (0.60 and 0.27 young fledged per pair, respectively) means that recruitment is likely not enough to compensate for natural mortality, so that further decline of the colony is expected. Terns, after the fashion of Ring-billed Gulls, are poorly represented in the sanctuaries and their population trends partly reflect the unpredictability of their breeding activities. However, their numbers dropped severely for a second quinquennial census in a row, resulting in a 80% decline since 1988. The case of the Watshishou Bird Sanctuary, which has always been the most important for terns, is particularly intriguing as that tern population reached an unprecedented low level in 1998.

Among species with near-stable population trends between 1993 and 1998-1999 are the Common Eider and the Common Murre, two species whose numbers finally appeared to level off after spectacular increases were noted in each of the four preceding censuses. Herring Gull population trends on the North Shore (and especially at Corossol Island) have been correlated with cod fishery, an industry that provided significant amounts of fish offal available to gulls (Chapdelaine and Rail 1997). After a boom in the early 1980s, cod fishery and Herring Gull populations collapsed concurrently in the late 1980s-early 1990s. But in 1998-1999 it seemed that after a drastic (-78%) decline between 1988 and 1993, the Herring Gull population was stabilized, perhaps to a more "natural" level. The number of Red-throated Loons increased only slightly between the last two surveys, yet the 1998-1999 total (82 individuals) is the highest ever recorded in the sanctuaries. The Double-crested Cormorant population declined but only at a slow rate after 1993, and in 1998-1999 the total population estimate for the sanctuaries was still the third highest since 1925. The steady rise of Great Black-backed Gull numbers continued to slow down to be nearly stable between 1993 and 1998. Finally, the Caspian Tern did not breed in 1993 and 1999 at the Île à la Brume Sanctuary, where it consistently nested between 1925 and 1988. The more time passes by, the more unlikely this species will be back, unless appropriate measures are taken to prevent disturbance of the only breeding site of Caspian Terns in Québec.

While some population trends varied regionally, others suggest large-scale factors are involved. In particular, Black-legged Kittiwake and Herring Gull declines since the end of the 1980s are reported not only

in North Shore sanctuaries, but also at all large colonies around the Gaspé Peninsula and at the Magdalen Islands (Chapdelaine et al. 2003\*). Atlantic Puffin numbers dropped at all major North Shore concentrations between 1993 and 1999. On the other hand, Razorbill colonies continued to expand everywhere in the Gulf and in the Estuary (Chapdelaine et al. 2001), and the small populations of Great Cormorant on the North Shore and around the Gaspé Peninsula grew significantly since 1988-1990. So far we have presented some evidence that the Herring Gull population had been influenced by cod fishery activities (Chapdelaine and Rail 1997), and that an abundance of small fish such as sandlance (*Ammodytes* sp.) and Capelin (*Mallotus villosus*) had a positive effect on alcid breeding performance and populations (Chapdelaine and Brousseau 1991, 1996; Rail et al. 1996). But most population trends are left unexplained.

The fact that law enforcement efforts have not been distributed uniformly across sanctuaries probably explains why, in sanctuaries such as Île à la Brume and Baie des Loups, many seabird populations are at low levels and signs of disturbance are omnipresent. Conversely, the well-patrolled Îles Sainte-Marie Bird Sanctuary appears in good shape. Seabird conservation in North Shore bird sanctuaries face many challenges: ecotourism, disturbance, poaching, episodic fox invasion in the sanctuaries, seabird bycatch in nearby fishing nets, along with ecological factors at all scales. This stresses the need to maintain and improve law enforcement and public educational programs, and highlights the importance of research to tackle the factors responsible for the observed seabird population trends.

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