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Census of terns, gulls, kittiwakes and cormorants along the coast of insular Newfoundland, 2000-2002

Andrew W. Boyne, Paul M. Regular, Gregory J. Robertson, Peter Thomas, Brad E. Toms, Laura McFarlane Tranquilla, and Sabina I. Wilhelm

Atlantic Region

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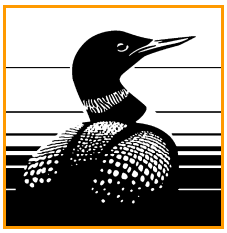

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CENSUS OF TERNS, GULLS, KITTIWAKES AND CORMORANTS ALONG THE COAST OF INSULAR NEWFOUNDLAND, 2000-2002

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AUSSI DISPONIBLE EN FRANÇAIS

SUMMARY

Aerial and ground surveys were conducted to estimate the population size and distribution of breeding Common (*Sterna hirundo*) and Arctic Terns (*S. Paradisaea*) in insular Newfoundland. The coast was surveyed in three sections (eastern, northern, and southwestern) over three years (2000-2002) during the tern breeding season. Colonies of Herring Gull (*Larus argentatus*), Great Black-backed Gull (*L. marinus*), Ring-billed Gull (*L. delawarensis*), Caspian Tern (*Hydroprogne caspia*), Black-legged Kittiwake (*Rissa tridactyla*) and cormorant (*Phalacrocorax spp.*) were also identified during these surveys. This marks the first complete coastal tern survey for insular Newfoundland since 1973 and the first ever complete survey of other colonial waterbird species with a widespread distribution in Newfoundland.

From aerial surveys, a total of 21,291 terns were counted at 244 colonies, compared to 16,201 terns at 131 colonies found in 1973. The median colony size in 2000-2002 was 48 individuals. Terns were distributed throughout coastal insular Newfoundland with notable concentrations along the northeast coast, the Northern Peninsula, and from Fortune Bay to the head of Placentia Bay. Ground counts were conducted at a subset of 78 colonies to confirm breeding, determine tern species ratio, estimate productivity through clutch size, and develop a correction factor for aerial estimates. Breeding was confirmed at all but one site identified through aerial surveys. Of terns identified to species, 41% were Arctic Terns with more Common Terns occupying sites along the southern part of the survey area. The overall average clutch size was 2.7 eggs per nest. One Caspian Tern colony estimated at a minimum of 75-98 pairs was found amongst a large gull colony on Ladle Island on the northeast coast in 2000, confirming the continued use of this island as a traditional breeding site for this species. A subset of 74 matched aerial/ground counts were used to develop a correction factor following a generalized non-linear model which was then applied to all aerial counts for which ground counts were not available to predict the number of breeding pairs. Combining ground and corrected aerial counts, we estimate the total tern breeding population at 20,462 ± 768 (SD) pairs for the 2000-2002 survey period.

The size of other coastal seabird colonies was limited to categorical estimates of number of individuals [small (1-100), medium (101-500), large (501-1,000), and very large (>1,000)]. Herring Gulls were widely distributed in high concentrations along all three sections of the coast. Great Black-backed Gulls had a distribution similar to Herring Gulls but were found in lower concentrations. Ring-billed Gull colonies were primarily concentrated along the Northern Peninsula and northeast coasts. Black-legged Kittiwakes were concentrated along the coasts of the Avalon Peninsula, Trinity Bay, and the northeast coast while cormorants were sporadically distributed mostly along the southwest coast. Overall, the tern population in insular Newfoundland is similar in size or possibly larger since 1973. Given the widespread distribution and high concentrations of coastal seabirds around insular Newfoundland, long-term complete coastal surveys continue to be recommended to monitor the status of populations and the persistence of colony sites.

RÉSUMÉ

Des relevés aériens et au sol ont été réalisés pour estimer la taille et la répartition des populations reproductrices de sterne pierregarins (*Sterna hirundo*) et de sterne arctiques (*S. Paradisaea*) sur l'île de Terre-Neuve. La côte a fait l'objet de relevés dans trois zones (est, nord et sud-ouest) sur une période de trois ans (de 2000 à 2002) pendant la saison de reproduction des sternes. Ces relevés ont permis d'observer également des colonies de goélands argentés (*Larus argentatus*), de goélands marins (*L. marinus*), de goélands à bec cerclé (*L. delawarensis*), de sternes caspiennes (*Hydroprogne caspia*), de mouettes tridactyles (*Rissa tridactyla*) et de cormorans (*Phalacrocorax spp.*). Ces activités marquent le premier relevé côtier complet de sternes réalisé sur l'île de Terre-Neuve depuis 1973, et le tout premier relevé complet d'autres espèces d'oiseaux aquatiques coloniaux très répandues à Terre-Neuve-et-Labrador.

Les relevés aériens ont dénombré un total de 21 291 sternes dans 244 colonies, comparativement à 16 201 sternes dans 131 colonies dénombrées en 1973. Entre 2000 et 2002, la taille moyenne des colonies était de 48 individus. Les sternes étaient réparties sur toutes les côtes de l'île de Terre-Neuve avec des concentrations notables le long de la côte nord-est, dans la péninsule Northern, et de la baie Fortune jusqu'à l'entrée de la baie Placentia. Les dénombrements au sol ont été menés dans un sous-ensemble de 78 colonies pour confirmer la reproduction de l'espèce, déterminer le ratio d'espèces de sternes, estimer la productivité par la taille de la couvée et élaborer un facteur de correction pour les estimations aériennes. Les relevés aériens ont confirmé la reproduction à tous les sites sauf un. Parmi les sternes identifiées à l'espèce, 41 % étaient des sternes arctiques avec plus de sternes pierregarins qui occupaient les sites le long de la partie sud de la zone du relevé. La taille globale moyenne de la couvée était de 2,7 œufs par nid. En 2000, une colonie de sternes caspiennes estimée entre 75 et 98 couples au minimum a été observée parmi une grande colonie de goélands sur l'île Ladle sur la côte nord-est, ce qui confirme l'utilisation continue de cette île comme un site de reproduction traditionnel pour cette espèce. Un sous-ensemble de 74 dénombrements aériens et au sol appariés a servi à élaborer un facteur de correction suivant un modèle non linéaire généralisé qui a ensuite été appliqué à tous les dénombrements aériens pour lesquels les dénombrements au sol n'étaient pas disponibles pour estimer le nombre de couples reproducteurs. En combinant les dénombrements au sol et aériens corrigés, nous estimons le total de la population reproductrice de sternes à 20 462 avec $\pm$ 768 couples pour la période de relevé de 2000 à 2002.

La taille des autres colonies d'oiseaux de mer côtiers a été limitée à des estimations catégoriques (petite [ente 1 et 100], moyenne [entre 101 et 500], grande [entre 501 et 1 000] et très grande [plus de 1 000]). Les goélands argentés sont largement répartis en concentrations élevées le long des trois zones de la côte. Le Goéland marin a une répartition semblable à celle du Goéland argenté, mais il a été observé dans des concentrations plus faibles. Les colonies de goélands à bec cerclé étaient principalement concentrées dans la péninsule Northern et sur la côte nord-est. Les mouettes tridactyles étaient concentrées le long des côtes de la presqu'île Avalon, de la baie de la Trinité et le long de la côte nord-est, tandis que les cormorans étaient principalement répartis de façon sporadique le long de la côte sud-ouest. Dans l'ensemble, la population de sternes sur l'île de Terre-Neuve est semblable ou plus grande depuis 1973. Étant donné la répartition généralisée et les concentrations élevées d'oiseaux de mer côtiers autour de l'île de

Terre-Neuve, la réalisation de relevés complets à long terme est toujours recommandée pour surveiller l'état des populations et la persistance de sites de colonies.

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INTRODUCTION

Common (*Sterna hirundo*) and Arctic Terns (*S. paradisaea*) are a common nesting species in Atlantic Canada (Boyne et al. 2001, Boyne and Hudson 2002, Devlin et al. 2008). However, long-term declines in tern populations have been suspected throughout this region (Lock 1990, Boyne and McKnight 2005, Boyne et al. 2006). In response to the need for tern population data to address this concern, the Canadian Wildlife Service (CWS) – Atlantic Region initiated a program in 1999 to conduct surveys of tern colonies every five years in New Brunswick, Prince Edward Island, and insular Newfoundland (Boyne et al. 2001, Boyne and Hudson 2002, Boyne and Beukens 2004, Boyne et al. 2006, Dubé et al. 2011, Davis et al. 2011). The CWS partners with the Province of Nova Scotia who initiated province-wide aerial surveys of tern colonies in 1995 on a four year cycle (Nova Scotia Department of Natural Resources, unpubl. data). This report details the first complete coastal tern survey for insular Newfoundland since 1973 (Lock 1990).

Assessing the status of breeding populations using aerial surveys can be inaccurate because colony attendance estimates vary with breeding success (Ratcliffe 2004), breeding chronology (Johnson and Krohn 2001, Ratcliffe 2004), and food supply (Monaghan et al. 1992), and because aerial counts will typically include a number of non-breeders attending colony sites (Diamond 2000). Although ground surveys are considered more reliable (Diamond 2000, Ratcliffe 2004), a complete ground-survey of all Newfoundland tern colonies was not feasible, making aerial count surveys the best option. Biases associated with variation in attendance can be corrected by comparing aerial/flush counts with ground nest counts to estimate the number of breeding pairs (Ratcliffe 2004). Therefore, ground counts were completed at a subset of tern colonies to confirm breeding, determine tern species ratio, estimate productivity through clutch sizes, and develop a correction factor for aerial estimates.

To optimize the significant investment of time and resources to survey Newfoundland, all species of colonial seabirds were included in the aerial surveys, except the alcids (which were not a survey target, but instead recorded opportunistically only when observed), Northern Gannets (*Morus bassanus*), and Leach's Storm-Petrels (*Oceanodroma leucorhoa)* which have been covered by other studies or are not well surveyed by aerial techniques (Chardine 2000, Chardine et al. 2003, Rodway et al. 2003, Robertson et al. 2001, 2004, 2006). In addition to reporting on the status and trends of terns, this report presents results of the first complete coastal survey of other seabirds with widespread distribution in Newfoundland.

METHODS

Individual coastal blocks that form insular Newfoundland's coastline, as used in CWS' Coastal Waterbirds Survey (Lock et al. 1996), were grouped into three sections, each to be surveyed in three consecutive years. The coast from Devil Brook Island north of Garnish (47.274°N, 55.323°W) counter clockwise to Ladle Cove (49.471°N, 54.060° W) was surveyed in 2000 (referred to as the eastern coast); Rocky Harbour (49.597°N, 57.922°W) clockwise to Ladle Cove was surveyed in 2001 (referred to as the northern coast); and Devil Brook Island clockwise to Rocky Harbour was surveyed in 2002 (referred to as the southwestern coast; Fig. 1). Aerial surveys were conducted during the peak tern nesting period from 22-25 June in 2000, 19-22 June

in 2001 and 15-19 June in 2002. Ground surveys generally overlapped temporally with aerial surveys, from 14 June - 5 July in 2000, 19-30 June 2001 and 16-23 June 2002. Seabird species included in the survey were: Arctic Tern, Common Tern, Caspian Terns (*Hydroprogne caspia*), Black-legged Kittiwake (*Rissa tridactyla*), Herring Gull (*Larus argentatus*), Great-Black-backed Gull (*L. marinus*), Ring-billed Gull (*L. delawarensis*), Great Cormorant (*Phalacrocorax carbo*), and Double-crested Cormorant (*P. auritus*). For the purpose of this survey, both cormorant species were grouped together as all nesting records were of cormorants nesting on the ground or on cliffs (i.e., not on trees), therefore the species could not be differentiated from the air and no ground surveys were conducted at the identified colonies.

The colonies of Funk Island (49.750°N, 53.167°W), Gull, Green and Great Islands in Witless Bay (47.247°N, 52.781°W), Cape St. Mary's (46.823°N, W 54.198°), and Baccalieu Island (48.130°N, 52.801°W) were not surveyed by air because they do not currently host any breeding terns, have regulations prohibiting over-flights and it is unsafe for a low-flying aircraft to pass over a site with high densities of flying birds where a bird-strike would be inevitable. Belle Isle (47.247°N, 52.782°W) was not surveyed because of its distance from the coast, while two stretches of coastline along the southern part of the Avalon Peninsula were not surveyed due to fog.

Aerial Methods

Seabird colonies were identified during aerial surveys. The same two observers (AWB and PT), plane (Cessna 185 on floats; Thorburn Aviation), and pilot were used in the three survey years. The two observers sat on the side of the plane closest to the coast. Aerial surveys were flown at an altitude of 500 m at a speed of 80-100 knots. In some cases, flight altitude neared 15 m to flush terns from their colonies (because ground cover prevents accurate counting of terns sitting on the ground). Colony locations were marked on 1:250,000 topographic maps (Department of Environment and Lands 1990) or on 1:50,000 topographic maps in areas with high concentrations of islands. Colony locations were also recorded using the U.S. Fish and Wildlife survey software, "Voice Survey and Mapping Program", loaded onto a laptop computer linking a global positioning system to a voice-activated voice data recorder. The observer in the rear seat (PT) operated the survey software.

For tern colonies, both observers estimated the number of birds flushed from the colony during the overflight. Estimates from the first and second observers were averaged to a Mean Colony Count (at each colony) and summed to obtain a Total Mean Count (of individuals) for the entire survey period. To determine Mean Colony Size, Total Count was divided by total number of colonies surveyed aerially, for each observer, and then averaged:

$$\text{Mean Colony Size} = [(\text{Total Tern Count}_{obs1} / \text{Total Colonies Counted}_{obs1}) + (\text{Total Tern Count}_{obs2} / \text{Total Colonies counted}_{obs2})] / 2$$

Tern colony sizes (counts of individuals) were compared between observers for the 2000-2002 period using a Wilcoxon Signed Rank Test.

Time limitations restricted estimates of Herring Gulls, Great Black-backed Gulls, Ring-billed Gulls, Black-legged Kittiwakes and cormorant colonies to four categories: small (1-100 individuals), medium (101-500 individuals), large (501-1,000 individuals), and very large (>1,000 individuals). Although these categories are too broad to derive accurate information on population size, they are useful to identify areas with high concentrations of breeding seabirds. Such maps were derived by using the median value for each category (small: 50.5; medium: 300.5; large: 750.5). Survey methods did not dictate an upper limit to the "very large" category[1], thus an arbitrary upper limit of 2,500 was assigned to this category, yielding a median value of 1,750.5.

The Territorial Collectivity of Saint-Pierre et Miquelon (a territory of France) off the southern coast of Newfoundland was surveyed in 2002. Observations of gulls and terns were collected in the same manner as the rest of the survey but will be presented separately from the total Newfoundland count data.

Ground Methods

Ground surveys, conducted at a subset of aerially detected tern colonies, were generally initiated during the same week as the aerial census and extended beyond; two colonies were surveyed one week earlier in 2000 by Parks Canada staff at Terra Nova National Park. Colonies were selected for ground surveys based on accessibility, safety, distance from a boat launch site, timing of the aerial surveys, and proximity of other colony sites. Priority was given to larger colonies, to better enable aerial/ground count correction factors for these important large colonies. The ground survey crew communicated with the aerial surveyors to learn of colony locations that were accessible by boat. Therefore the selection of colonies for ground surveys cannot be considered random, but rather dependent upon logistical constraints, and was preferential to larger colonies (more than 100 birds counted from the air) and nearby smaller colonies. However, an effort was made to reach a diversity of areas throughout the survey range for each year.

Each ground census was undertaken by two to six biologists. Biologists walked parallel transects at about an arm's length from each other. The outside line of each transect was flagged with standard forestry flags and each nest was marked with a wooden stir stick to avoid double counting. Flags were picked up during the next transect. The number of eggs in each nest was recorded and, in the case of colonies with multiple species (i.e. gulls and terns), the species occupying the nest was determined by a combination of egg size, nest location, direct observation of incubating birds, and hatching chronology. Although Arctic and Common Tern nests are visually indistinguishable from one another (Bullock and Gomersall 1981), species proportions were obtained by counting a subset of terns flying overhead when flushed from the colony during ground counts. An attempt was to identify to species 20 individuals terns, with a minimum of 10 before an assessment of the proportion was recorded.

Nesting populations of terns are known to be dynamic (Bullock and Gomersall 1981, Devlin et al. 2008), moving between locations within a region from year to year. To account for terns shifting between local colonies between years, aerial and ground surveys overlapped the start

[1] Note: in future surveys actual estimates of "very large" colonies should be undertaken.

and end location of previous surveys. The additional (overlap) surveys were not included in the total survey count for that year.

To account for varying attendance patterns of terns (c.f. Bullock and Gomersall 1981, Ratcliffe 2004), and to calculate a more accurate representation of actual nesting pairs or "potentially occupied territories" (Walsh et al. 1995) at each colony, counts from aerial surveys were compared with ground counts to assess the accuracy and potential predictive ability of aerial counts. Upon inspection of the relationship, a curve-linear relationship was apparent and a generalized non-linear model with the following power equation best fit the data:

$$N_g = \alpha \cdot N_a^{\beta}$$

Where N_g and N_a are ground and air counts, respectively, α represents the scale of the y-axis and β defines the magnitude of the rate of change. To account for over-dispersion in the count data, the quasi-poisson family was used with the standard log link. This model was applied to all overlapping aerial and ground counts, and was also run separately for each census year. Using these models, aerial counts from around the entire coast of Newfoundland were used to predict the number of breeding individuals on the ground. Estimates of the total population were then calculated by adding available ground counts with the predicted values of the colonies that were not included in the ground survey. The error around colony-specific and total population predictions were assessed using a bootstrapping procedure, whereby empirical distributions of predicted values were generated by resampling ground count x aerial count data points, with replacement, 1,000 times and selecting predicted values from a new model from each iteration. Confidence intervals were calculated using these empirical distributions.

RESULTS AND DISCUSSION

Aerial Surveys of Tern Colonies

Aerial surveys detected 244 tern colonies over three years: 123 along the eastern coast in 2000, 91 along the northern coast in 2001 and 30 along the southwestern coast in 2002 (Table 1). Terns were distributed throughout coastal insular Newfoundland with notable concentrations along the northeast coast, the Northern Peninsula, and from Fortune Bay to the head of Placentia Bay (Fig. 2).

The Total Mean Count (see methods) was 21,291 individuals (Table 2). The first observer recorded 238 colonies with a range of 1-1,200 individuals and the second observer recorded 221 colonies with a range of 1-650 individuals (Table 1). Over the entire survey period, median colony size was 48 individuals (mean = 86 individuals) and was not significantly different between the two observers (W = -1519, Z = -1.362, P = 0.17). The five largest colonies (>500 terns) were found at: 1) Pouch Island (Bonavista Bay), 2) Little Island, St. Pauls' Inlet (Northern Peninsula), 3) Horn Island (Northern Peninsula), 4) Gull Island, Loon Bay (Notre Dame Bay), and 5) Roti Bay (southern coast; Table 1).

During surveys in 1973, Lock (1990) counted 16,201 individual terns (Table 2) within 131 colonies (Table 3). The mean colony size in 1973 was 124 individuals (range: 2-3,000; Table 3)

with the largest colony estimated to have 3,000 individuals (Lock 1990). It is difficult to directly compare tern numbers between the 1973 survey and current survey years as the former was conducted by one observer and the entire survey was carried out in one season (Lock 1990). However, seasonal timing was similar, with surveys carried out from 8 June - 23 June in 1973 and from 15 June - 25 June in 2000-2002. It seems that at least the northern section of the province has seen an increase in tern numbers since 1973. The southern and eastern sections appear to hold roughly the same or a slightly lower number of terns since 1973 (Table 2). Certainly the number of colonies is higher than in 1973 in all sections of the province (Table 3), particularly in the eastern section that rose from 40 to 119 colonies (Table 3).

Ground Surveys of Tern Colonies

Ground surveys were conducted at 78 sites (Table 4). Only one ground site had no active nests (Little Sagona Island, Fortune Bay in 2002, but it did have attending birds). The average breeding colony size of visited colonies was 115 active nests (range: 0-677) and the average clutch size was 2.7 eggs per nest (range: 0-5; Table 4). Four colonies were detected during ground surveys but not by air: Slab Island, Herb Island, Gooseberry Island (all located on the Northern Peninsula) and Codroy River estuary (south coast; Table 4).

The overall proportion of Arctic Terns was 0.41 (Table 4). Along the eastern and northern coasts, average tern species proportions were close to equal (0.50, $n = 25$ and 0.51, $n = 30$, respectively; Table 4). However, the 2002 surveys revealed Common Terns almost exclusively breeding along the southwestern coast of Newfoundland (proportion of Arctic Terns = 0.06, $n = 15$; Table 4). Because the species ratio was obtained from non-random ground surveys which were preferential to accessible larger colonies, this ratio cannot be applied to infer province-wide estimates of Arctic and Common Terns separately. One large section of the southern coastline was not accessible by boat for ground surveys so species ratios cannot be confirmed for this area.

One Caspian Tern colony was located amongst breeding gulls on the northeast coast in Notre Dame Bay (Ladle Island in 2000; Table 4). An accurate nest count was not possible as chicks had already hatched and were mobile when the ground count was attempted. However, 29 Caspian Tern nests containing eggs and an additional 69 chicks were counted, providing a minimal estimate of 75-98 nests (assuming 1 to 1.5 chicks per nest). This sighting confirms Ladle Island's continued importance as a traditional breeding site for the largest Caspian Tern colony along the Atlantic Coast of North America, which was previously estimated at 75-100 pairs in 1997 (Wires and Cuthbert 2000). Single Caspian Tern nests were also found on 2 islands in St. John Bay in 2001 by ground crews (East Turr Island and south Fox Island) among larger gull and/or tern colonies. Caspian Terns are known to breed among large gulls and are difficult to distinguish from Herring Gulls, Ring-billed Gulls and even Black-legged Kittiwakes during aerial surveys. Because ground surveys focused on islands hosting breeding Arctic and/or Common Terns, it is possible that other Caspian Tern colonies exist along the coast of insular Newfoundland but were not detected because of the low search effort of gull colonies by ground.

Paired aerial-ground surveys from 78 sites were used to develop a generalized non-linear model (see Methods) to correct aerial counts for which ground counts were not available. Using this

model and adding nesting pairs obtained from ground counts, we estimate that 20,462 ± 768 pairs of terns were nesting along coastal insular Newfoundland in 2000-2002 (Table 5).

Other Species

Herring Gulls

During aerial surveys, 260 Herring Gull colonies were identified. Sixty-four percent (166) of observed colonies were small, 30% (78) were medium, 4% (11) were large and 2% (5) were very large (Table 6). Herring Gull numbers were widely distributed in high concentrations along all three sections of the coast of Newfoundland (Fig. 3), with 108 colonies found along the eastern coast in 2000, 91 along the northern coast in 2001, and 61 along the southwestern coast; see Table 7).

Great Black-backed Gulls

During aerial surveys, 179 Great Black-backed Gull colonies were observed. Ninety-three percent (166) of the colonies were small and 7% (13) were medium-sized (Table 6). Great Black-backed Gulls were widely distributed throughout coastal Newfoundland but in generally low concentrations (Fig. 4), with 37 colonies located in 2000 (eastern coast), 71 in 2001 (northern coast) and 71 in 2002 (southwestern coast; Table 8).

Ring-billed Gulls

During aerial surveys, 49 Ring-billed Gull colonies were observed. Thirty-one percent (15) were small, 65% (32) were medium and 4% (2) were large (Table 6). Ten colonies were identified in 2000 (eastern coast), 29 in 2001 (northern coast), and 10 in 2002 (southwestern coast; Table 9). Their colonies were primarily concentrated along the Northern Peninsula and northeast coast (Fig. 5).

Black-legged Kittiwakes

During aerial surveys, 83 Black-legged Kittiwakes colonies were observed. Forty-nine percent (41) of the colonies were small, 34% (28) were medium, 11% (9) were large and 6% (5) were very large (Table 6). Forty-one colonies were identified in 2000 (eastern coast), 33 in 2001 (northern coast), and 9 in 2002 (southwestern coast; Table 10). Kittiwakes were concentrated along the Avalon Peninsula and Trinity Bay (Fig. 6). However, it should be noted this summary does not include the large numbers of kittiwakes breeding at the major colonies not flown as part of this survey.

Cormorant species

During aerial surveys, 13 cormorant (Double-crested and/ or Great) colonies were observed. Small colonies represented 54% (7) and medium colonies 46% (6) (Table 6). No colonies were identified in 2000 (eastern coast), while five were seen in 2001 (northern coast) and eight in

2002 (southwestern coast; Table 11) and were sporadically distributed along these two coasts (Fig. 7).

This survey marks the first complete Newfoundland-wide survey for seabird species other than terns (Lock 1990) and Northern Gannets (which are surveyed every five years at 3 major colonies; Chardine 2000, Chardine et al. *in press*). Until now, seabird surveys in Newfoundland have mostly focused on obtaining population estimates for species breeding within Seabird Ecological Reserves, which host the majority of insular Newfoundland's breeding alcids, Leach's Storm-Petrels, and important Black-legged Kittiwake, Herring Gull, and Great Black-backed Gull colonies (Chardine et al. 2003, Rodway et al. 2003, Robertson et al. 2004, 2006, Gaston et al. 2009). However, regular survey efforts at these large, localized colonies do not capture the trends in abundance and distribution of dispersed nesting species such as terns, gulls, kittiwakes and cormorants. Range expansions influenced by changing oceanographic regimes affect seabird distributions and assemblages (Chaulk et al. 2004). Limited evidence from select colonies and neighbouring areas suggests that some species are increasing (e.g. Double-crested Cormorants (Chapdelaine 1995, Chaulk et al. 2004), while others (e.g. Herring Gulls) have shown increases or decreases depending on the local region (Robertson et al. 2001, Boyne and Hudson 2002, Boyne and Beukens 2004, Boyne et al. 2006). It is not uncommon for species with differing ecologies to be affected differently by the same environmental conditions encountered in any one region (Wanless et al. 2009). Therefore, it is important to understand the local influences on distributions, populations and demographic trends of all seabird species within a region. This will be particularly important as the impact of coastal development increases in eastern Canada.

Saint-Pierre et Miquelon

The islands of Saint-Pierre et Miquelon (France) were surveyed as a part of the 2002 survey. One colony of apparently breeding terns (estimated at 50 individuals by both observers) was observed at Batture de la Chatte (47.095°N, 56.341°W) and a large group of roosting terns was observed at Goulet de Langlade (46.98°N, 56.303°W). Also identified during this section of the survey were two Herring Gull colonies, one Ring-billed Gull colony, three Great Black-backed Gull colonies and three Black-legged Kittiwake colonies (Table 12).

In summary, the overall tern population in insular Newfoundland is either a similar size or possibly larger than during the original survey of 1973. Furthermore, important concentrations, or "hotspots" of terns and other coastal seabirds are widely distributed around the island (Fig. 8 and 9). Potential management plans offering protection to coastal waterbird colonies might target these hotspots or target the largest colony sites (Lock 1990). Given the inter-annual variation in colony persistence, long-term complete coastal surveys are recommended to monitor the abundance of populations and the persistence of colony sites.

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Table 1. Tern colonies and counts of individuals identified during aerial surveys of insular Newfoundland in 2000-2002. Colonies marked with * were censused twice during overlap surveys between years and were not included in annual totals.

Year	Colony Name	Latitude	Longitude	Month	Day	Observer 1	Observer 2
	Placentia Bay						
2000	Gilberts Cove, uni SE of	47.4189	-54.5919	6	22	70	50
2000	Shag Islands, Nonsuch Inlet	47.3767	-54.6840	6	22	80	60
2000	Cape Roger, uni NW of	47.3693	-54.7399	6	22	55	
2000	Mouse Island, uni N of	47.3714	-54.7920	6	22	40	30
2000	Mouse Island, Placentia Bay	47.3671	-54.7974	6	22	100	
2000	Woody Island [1]	47.2171	-55.0355	6	22	25	
2000	Point Verde	47.2393	-54.0131	6	24	16	
2000	Cross Rocks	47.6103	-54.3339	6	22	15	12
2000	Big Rock	47.6733	-54.1093	6	24	120	110
2000	Fish Islands, small uni 1 km N of	47.5694	-54.2517	6	24	80	
2000	White Islands, uni	47.5898	-54.2817	6	24	240	
2000	North Tilt Island, small uni E of	47.6270	-54.1814	6	24	60	60
2000	Holletts Islands, uni N of	47.6474	-54.1679	6	24	25	30
2000	Shag Rock, Woody Islands	47.7675	-54.2144	6	22	60	
2000	Creve Islands	47.5317	-54.2439	6	24	90	110
2000	The Grandies, small uni E of	47.5703	-54.2418	6	24	40	30
2000	The Jerseyman	47.6993	-54.0867	6	24	40	50
2000	Goose Island, S (PB)	47.7468	-53.9977	6	24	75	
2000	Seal Islet	47.7296	-53.9669	6	24	100	
2000	Poor Island	47.0073	-55.179	6	22	170	140
2000	Jean de Baie Islands	47.1841	-55.0123	6	22	4	
2000	Long Rock	47.2139	-54.7899	6	22	100	
2000	Shag Rocks, W of Ship Island	47.6753	-54.2968	6	22	27	21
2000	Vicuna Island	47.8705	-54.1835	6	22	80	
2000	Charley Rock	47.8476	-54.0826	6	24	15	15
2000	Dirty Island	47.3871	-54.2784	6	24	120	
2000	Saddleback Island	47.5078	-54.2618	6	24	40	30
2000	Green Island, off Long Island	47.6151	-54.0686	6	24		2
2000	Dog Islands	47.4928	-54.0661	6	24	150	180
2000	Green Island, Central Channel	47.5427	-54.1138	6	24	250	230
2000	Salls Island	47.6452	-53.9467	6	24	20	20
2000	Grassy Island [S]	47.5062	-53.941	6	24	45	50
2000	Trinny Cove, uni	47.4856	-53.9466	6	24	6	6
2000	Graves Island	47.4237	-53.9686	6	24	2	2
2000	King Island, Iona Island	47.402	-53.972	6	24		2
2000	Little Island	47.4062	-53.9682	6	24	8	8
2000	The Neck at Isaac Heads	47.3255	-53.9234	6	24	8	8
2000	Brine Islands	47.4438	-53.9436	6	24		2
	Burin Peninsula						
2000	Offer Island	46.867	-55.633	6	22	90	70
2000	Duck Island, S	46.858	-55.79	6	22	400	
2000	Little Green Island, S	46.852	-55.83	6	22	100	
2002	Calmer Point*	46.893	-55.947	6	15	138	138
	St. Mary's Bay						
2000	John's Pond	47.1441	-53.6186	6	24	3	3
2000	Half Island, uni N of	47.1928	-53.5844	6	24	36	33
2000	Newbridge	47.1364	-53.4813	6	24	30	23
2000	O'Donnell's	47.0636	-53.5715	6	24	190	200
2000	O'Donnell's lagoon, small uni in	47.0738	-53.5654	6	24	6	6
2000	Coote Pond	46.9483	-53.5197	6	24	60	60
2000	Point la Haye	46.8977	-53.6023	6	24	130	110
	Eastern Avalon Peninsula						
2000	Biscay Bay Pond	46.7525	-53.2808	6	24	5	8
2000	Renews Harbour	46.9315	-52.9506	6	24	130	150
2000	Hare's Ears	47.0146	-52.8549	6	24	40	40
2000	Islington, uni off	47.7612	-53.4842	6	24	31	25
2000	Stones Islands	47.0446	-52.8605	6	24	5	5
2000	Goose Islands	47.0374	-52.8580	6	24	25	25
	Conception Bay						
2000	Job's Cove Point, uni off	47.9516	-53.0371	6	24	60	55
2000	Ochre Pit Rock	47.8053	-53.1333	6	24	40	40
2000	Salmon Cove, uni in	47.7835	-53.1557	6	24	14	15

Year	Colony Name	Latitude	Longitude	Month	Day	Observer 1	Observer 2
2000	Spaniards Bay Spit	47.5971	-53.2821	6	24	22	23
2000	Fergus Island	47.6081	-53.2152	6	24	28	28
2000	Mollys Island	47.5352	-53.2038	6	24	80	70
	Trinity Bay						
2000	Perlican Island	48.0839	-53.0282	6	24	50	40
2000	Dildo Islands, south	47.5625	-53.5924	6	25	45	
2000	Dildo Islands, north	47.5716	-53.5925	6	25	100	
2000	Dildo Islands, rock SW of	47.5606	-53.5938	6	25	80	90
2000	Inside Chapel Arm	47.5203	-53.6610	6	25	130	110
2000	Shag Islands, Bull Arm	47.7590	-53.8485	6	25	60	15
2000	Duck Islands, Bull Arm, uni N of	47.7835	-53.8297	6	25	2	2
2000	Bull Island, rocks NE of	47.7834	-53.7709	6	25	2	2
2000	Harbour Rocks, Shoal Bay	47.8645	-53.7287	6	25	45	52
2000	Southeast Point, uni off	48.0185	-53.6342	6	25	80	65
2000	East Random Head, rocks NE of	48.103	-53.5647	6	25	8	8
2000	Copper Island, S of Verge Island	48.1138	-53.5295	6	25	15	16
2000	Silldown Point, uni NE of	48.1750	-53.5373	6	25	45	40
2000	Northwest Arm, uni in	48.1723	-53.5385	6	25	20	23
2000	Maiden Islet	48.2723	-53.4263	6	25	150	170
2000	Green Island, uni inside (off Salvage Head)	48.3431	-53.3569	6	25	10	10
2000	Admiral Island	48.369	-53.3442	6	25	160	140
2000	Elliston Cove, uni in [outer]	48.623	-53.0324	6	25	12	12
2000	Elliston Cove, uni in [inner]	48.6334	-53.0327	6	25	85	70
	Bonavista Bay						
2000	Castle Cove, south uni in	48.6097	-53.4200	6	25	60	
2000	Castle Cove, north uni in	48.6119	-53.4161	6	25	200	230
2000	Red Cliff Island	48.5644	-53.4950	6	25	110	120
2000	Wolf Island, uni N of	48.4804	-53.6396	6	25	120	120
2000	Kate Head	48.5021	-53.5867	6	25	7	7
2000	Long Islands, Middle-East side	48.5908	-53.6364	6	25	280	
2000	Goose Head, uni N of	48.4049	-53.8495	6	25	24	22
2000	Goose Bay, uni in	48.375	-53.8500	6	25	2	2
2000	Clode Sound, The Narrows, uni	48.4086	-54.0826	6	25	40	30
2000	Lion's Den, Terra Nova NP uni in	48.5333	-53.7942	6	25	140	150
2000	Little Harbour, uni in	48.5670	-53.7544	6	25	320	260
2000	Little Harbour Gull Rock	48.5709	-53.7689	6	25	13	12
2000	Holbrook Head, uni S of	48.6309	-53.7604	6	25	35	30
2000	Keats Island	48.6572	-53.6477	6	25	25	20
2000	Sailor's Harbour, uni in	48.6905	-53.6623	6	25	9	6
2000	Baldric Head, uni N of	48.6875	-53.7280	6	25	38	35
2000	Shoe Island, uni SE of	48.7403	-53.6929	6	25	110	120
2000	Varket Island	48.7559	-53.7177	6	25	7	5
2000	Long Reach Island, uni N of	48.7488	-53.8340	6	25	320	320
2000	Hail Island, uni 1 km E of	48.7684	-53.7805	6	25	2	2
2000	Hail Island, small uni 0.5km NE of	48.7739	-53.7831	6	25	10	10
2000	Shalloway Cove, uni 2.5 km SW of	48.8217	-53.7079	6	25	160	180
2000	Inner Gooseberry Islands, East, uni inside	48.8809	-53.6387	6	25	75	75
2000	Inner Gooseberry, uni inside, Middle	48.8842	-53.6431	6	25	25	30
2000	Inner Gooseberry Islands, West, uni inside	48.8804	-53.6612	6	25	15	15
2000	Gull Islets	48.8493	-53.7474	6	25	35	40
2000	Lakeman Island, uni S of	48.8201	-53.7821	6	25	3	3
2000	Grassy Island, Locker's Reach	48.8982	-53.7988	6	25	30	40
2000	Doctor's Island	48.8003	-54.0911	6	25	70	
2000	Freshwater Bay, uni in mouth of	48.8300	-54.0581	6	25	65	65
2000	Hare Bay, uni off	48.8598	-53.9918	6	25	100	100
2000	Deer Island, small uni NE of	48.9487	-53.7025	6	25	70	70
2000	Southwest Island	48.9783	-53.7278	6	25	160	140
2000	Partridge Island, small island off	48.9994	-53.6919	6	25	6	6
2000	Maiden Island	49.0586	-53.5792	6	25	150	170
2000	Bennett's Low Island	49.122	-53.5609	6	25	400	
2000	Butterfly Islets	49.126	-53.4852	6	25	60	70
2000	Pouch Island	49.1711	-53.4766	6	25	600	350
2000	Boat's Island, Uni SW of	49.1898	-53.5374	6	25	3	3
	Northern Peninsula						
2001	Little Island, St. Paul's Inlet	49.8537	-57.7867	6	19	1,200	400
2002	Little Island, St. Paul's Inlet*	49.8537	-57.7867	6	19	1,100	950
2001	Middle Island, St. Paul's Inlet	49.8404	-57.7782	6	19	100	120
2001	Western Island, St. Paul's Inlet	49.8272	-57.7867	6	19	105	75
2001	St. Paul's Bay	49.8688	-57.7930	6	19	5	5
2001	Gull Island, Hawkes Bay	50.6227	-57.1628	6	19	100	90

Year	Colony Name	Latitude	Longitude	Month	Day	Observer 1	Observer 2
2001	Keppel Island	50.6257	-57.3170	6	19	6	6
2001	Seal Rocks	50.7892	-57.2768	6	19	30	30
2001	Sheep Island, Good Bay	50.8191	-57.2019	6	19	35	30
2001	Horn Island	50.8003	-57.2215	6	19	1,000	600
2001	Twin Islands, south	50.8954	-57.2784	6	19	40	20
2001	Whale Islands	50.8838	-57.1282	6	19	130	160
2001	Fox Islands, east	50.9209	-57.1036	6	19	50	55
2001	Fox Islands, south	50.9180	-57.1226	6	19	150	160
2001	White Island (St. John Bay)	50.9319	-57.0188	6	19	150	170
2001	Rase Island	51.0061	-56.9586	6	19	45	50
2001	Green Islands, large (St.MargB)	51.0278	-56.9621	6	19	35	60
2001	Lobster Island, (SGB)	51.1616	-56.8243	6	19	100	80
2001	Gooseberry Island, uni E of	51.1603	-56.8261	6	19	65	45
2001	Beef Island, uni E of	51.1639	-56.8125	6	19	20	15
2001	Mutton Island, uni N of	51.1769	-56.8164	6	19	80	100
2001	Seal Islands, northeast	51.2842	-56.7657	6	19	90	110
2001	Seal Islands, southeast	51.2895	-56.7721	6	19	35	25
2001	Green Island, Green Island Cove	51.4069	-56.5725	6	19	45	40
2001	Cow Point	51.6135	-55.8895	6	20	25	25
2001	Long Point, uni off	51.5902	-55.8687	6	20	70	70
2001	Boisee Island (Pistolet Bay)	51.5558	-55.8528	6	20	3	3
2001	Triangle Point, uni W of	51.5128	-55.8607	6	20	80	90
2001	Moyac Islands, middle	51.5873	-55.6146	6	20	80	90
2001	Moyac Islands, east	51.5872	-55.6159	6	20	20	20
2001	White Cape Harbour, uni in	51.5122	-55.4630	6	20	45	45
2001	Northeast Island	51.3863	-55.5699	6	20	40	35
2001	Grassy Island, Lock's Cove	51.335	-55.9458	6	20	120	130
2001	Brent Islands, uni between	51.2614	-55.9616	6	20	260	230
2001	Cailloux Island	51.2007	-55.9945	6	20	120	150
2001	Demetre Island	51.2390	-55.9351	6	20	40	40
2001	Death's Head Island	51.2119	-55.7565	6	20	500	250
2001	Massacre Island	51.1989	-55.7108	6	20	275	200
2001	Goose Island, uni N of	51.1097	-55.7367	6	20	225	160
2001	St. Julian Tickle	51.1026	-55.7311	6	20	45	55
2001	Micmac Island, uni SE of	51.4940	-55.7141	6	20	20	20
2001	Bad Rock	50.7808	-56.1595	6	20	200	220
2001	Western Island, Nervous Rocks	50.2162	-55.848	6	21		30
2001	Eastern Island, uni off SE	50.1931	-55.6994	6	21	25	20
2001	Steering Rock	49.8583	-56.5523	6	21	60	45
2001	Lower Parlee Cove Island	50.0855	-56.0854	6	21	25	20
2001	Bois Island, uni N of	50.0233	-55.8815	6	21	20	20
	Notre Dame Bay						
2000	Southern Cat Island	49.3066	-53.5893	6	25	30	23
2000	North Penguin	49.4497	-53.8096	6	25	100	100
2000	South Penguin	49.4324	-53.7936	6	25	10	10
2000	Ladle Island	49.4918	-54.0503	6	25	25	
2001	West Grassy Island	49.5711	-55.7544	6	21	160	150
2001	East Grassy Island	49.5716	-55.7498	6	21	80	50
2001	Gull Island, uni SE of	49.4516	-55.5541	6	21	90	120
2001	Gull Island, Thimble Tickles	49.4866	-55.4955	6	21	120	160
2001	Alcock Island, uni E of	49.5122	-55.3988	6	21	15	20
2001	Besom Cove, uni NE of	49.4801	-55.3317	6	21	30	35
2001	Strong Island, uni NW of	49.4386	-55.3409	6	21	50	65
2001	Passage Rocks (north)	49.3654	-55.3885	6	21	45	45
2001	Grassy Island, Point of Bay	49.2599	-55.2379	6	21	65	75
2001	Red Currant Island, uni NE of	49.4105	-55.0347	6	22	20	20
2001	Jock Island	49.4516	-54.9587	6	22		140
2001	Knights Island, uni E of	49.4233	-54.9149	6	22	25	20
2001	Duck Islands, large island of (NDB)	49.3934	-54.8978	6	22	20	16
2001	Gull Island, Loon Bay	49.3548	-54.8526	6	22	650	650
2001	Green Island, S of Coal All Island	49.3785	-54.7963	6	22	135	160
2001	Tarpaulin Island	49.5261	-55.0023	6	22	300	250
2001	North Trump Island, uni E of	49.5762	-54.7875	6	22	35	55
2001	Crow Head Island, uni SW of	49.5615	-54.7319	6	22	5	5
2001	Bluff Head Cove, uni in	49.6059	-54.7406	6	22	50	45
2001	Back Harbour Gull Island (ia)	49.6561	-54.8087	6	22	200	230
2001	Main Tickle Island	49.6285	-54.6801	6	22		70
2001	Herring Island	49.6726	-54.5370	6	22	50	45
2001	Ninepin Arm, uni SE of	49.5554	-54.5900	6	22	30	25
2001	Smoker Island	49.6122	-54.4541	6	22	55	60

Year	Colony Name	Latitude	Longitude	Month	Day	Observer 1	Observer 2
2001	Steering Island, Dog Bay	49.5174	-54.4576	6	22	140	105
2001	Dog Island N	49.4971	-54.4704	6	22	10	11
2001	Seal Island	49.4358	-54.4571	6	22	55	60
2001	Storehouse Island	49.4133	-54.4169	6	22	180	175
2001	Noggin Cove Islands	49.4562	-54.3150	6	22	25	20
2001	Cann Island, uni E of	49.5842	-54.1733	6	22	20	17
2001	Goose Island, NE (near Fogo)	49.5073	-54.3474	6	22	300	200
2001	Wood Island	49.6139	-54.4285	6	22	60	75
2001	Hare Island, uni W of	49.6059	-54.3753	6	22	95	80
2001	Woody Island, uni SW of	49.5609	-54.3821	6	22	80	70
2001	Indian Island West, uni W of (2)	49.5379	-54.3624	6	22	40	30
2001	Island Harbour Head	49.6305	-54.3097	6	22	35	30
2001	Shag Island, Fogo	49.7100	-54.2949	6	22	30	25
2001	Steering Island, Little Fogos	49.7878	-54.1967	6	22	50	45
2001	Shoal Bay (middle)	49.6862	-54.2027	6	22	30	40
2001	Shoal Bay (south)	49.6823	-54.2022	6	22	45	45
2001	Joe Batt's Arm, uni in	49.7255	-54.1628	6	22	105	130
2001	Wadham Island, Offer	49.5947	-53.7636	6	22	475	250
2001	Coleman Island	49.5558	-53.8216	6	22	25	20
2001	Pigeon Island (NDB)	49.553	-53.8631	6	22	55	50
2001	Muddy Shag Island	49.4912	-53.9418	6	22	35	30
	Hermitage Bay - Fortune Bay						
2000	Grand Beach	47.1433	-55.4877	6	22	390	
2002	Grand Beach*	47.1433	-55.4877	6	15	35	30
2000	L'Anse au Loup Barasway*	47.0928	-55.6792	6	22	20	
2002	L'Anse au Loup Barasway	47.0928	-55.6792	6	15	65	55
2002	Frenchman's Cove Barasway, uni west	47.2039	-55.4167	6	15	30	40
2002	Petticoat Island, uni NE of	47.5984	-54.9866	6	15	1	1
2002	Hare Harbour, uni in	47.5839	-55.1511	6	15	45	40
2002	Barrow Rock	47.5783	-55.3901	6	15	35	25
2002	English Harbour Island	47.4498	-55.5002	6	15	60	70
2002	Little Sagona Island	47.3866	-55.7756	6	15	35	40
2002	Black Island	47.4619	-55.8463	6	15	25	25
	South Coast						
2002	Grole Cove, uni in	47.5248	-56.1214	6	18	30	25
2002	Beck Bay Barasway, uni behind	47.5021	-56.1685	6	18	35	35
2002	Shag Islands, Coppett Harbour	47.5922	-57.2687	6	18	160	175
2002	Turks Island	47.5784	-57.6623	6	18	70	50
2002	Big Barasway, uni in	47.6505	-57.7288	6	18	20	25
2002	Smoky Island	47.6499	-57.9989	6	18	40	50
2002	Shag Island, Roti Bay	47.6637	-58.2580	6	18	35	35
2002	Buffet Island	47.6620	-58.2665	6	18	90	80
2002	Harbour Island, Roti Bay	47.6566	-58.2826	6	18	110	75
2002	Roti Bay, uni in	47.6608	-58.2998	6	18	700	550
2002	Hiscock's Point, uni E of	47.5970	-58.8188	6	19	45	55
2002	Lobster Claw Island, uni S of	47.5709	-59.0033	6	19	110	115
2002	Money Island	47.5833	-59.1299	6	19	28	25
	West Coast (St. George's Bay)						
2002	Crabbes River estuary, uni	48.2083	-58.8657	6	19	25	20
2002	Robinsons River sandspit	48.2485	-58.8200	6	19	9	8
2002	Flat Island (GSt.L)	48.4499	-58.5156	6	19	50	50
2002	Stephenville Crossing, uni N lagoon	48.5013	-58.4164	6	19	70	80
2002	Stephenville Crossing	48.4975	-58.4308	6	19	130	170
	West Coast (Port Aux Port Bay)						
2002	Gravels Pond, uni in	48.55793	-58.7267	6	19	210	210
2002	Point au Mal	48.64685	-58.6722	6	19	50	50
2002	Fox Island River	48.69676	-58.6778	6	19	10	10
	West Coast (Bay of Islands)						
2002	McIver's Island	49.0696	-58.3241	6	19	425	450

Table 2. Number of individual terns (raw counts) identified during aerial surveys of insular Newfoundland 2000-2002, compared with 1973 (Lock 1990).

	Eastern Newfoundland		**Northern Newfoundland**		**Southern Newfoundland**		**Total**	
	Observer 1	Observer 2	Observer 1	Observer 2	Observer 1	Observer 2	Observer 1	Observer 2
1973[1]	8,492		4,107		3,602		16,201	
2000[2]	9,454	6,103						
2001[2]			10,034	8,433				
2002[2]					2,748	2,639	22,236	17,175
Total							21,291	

[1]The 1973 survey was conducted with one observer and was completed in one season; numbers presented are raw observations.
[2]These numbers represent raw observations from each observer and are used here for comparison purposes. Neither observer provided estimates for all colonies.

Table 3. Number of tern colonies and average colony size (individuals) observed during aerial surveys of insular Newfoundland 2000-2002, compared with 1973 (Lock 1990).

Year	**Eastern Newfoundland**	**Northern Newfoundland**	**Southern Newfoundland**	**Total**	**Average colony size (SD)**	**Colony size range**
1973	40	68	23	131	124 (299)	2-3,000
2000-2002	123	91	30	244	86 (115)	1-1,200

Table 4. Clutch sizes, number of chicks observed and species proportions for tern colonies visited during ground surveys of insular Newfoundland 2000-2002. See Figure 3 for distribution of colonies.

Year	Colony	Latitude	Longitude	Month	Day	Nests with # Eggs						Total Active Nests	Chicks	Species Proportion[2] (ARTE)
						0	1	2	3	4	5			
	Bonavista Bay													
2000	Doctor's Island	48.8	-54.091	6	14	0	26	45	99	1	0	171		-
2000	Freshwater Bay, uni [1] in mouth of	48.83	-54.058	6	14	0	16	62	56	0	0	134		-
2000	Castle Cove, north uni in	48.612	-53.416	7	5	39	50	76	51	0	0	177	47	0.3
2000	Red Cliff Island	48.562	-53.497	7	5	43	19	24	10	0	0	53	1	0.43
	Placentia Bay													
2000	Point Verde	47.239	-54.013	6	20	0	2	4	5	0	0	11		0
2000	Gilberts Cove, uni SE of	47.419	-54.592	6	29	3	13	29	6	0	0	48	6	0.7
2000	Cape Roger, uni NW of	47.369	-54.74	6	29	0	7	29	2	0	0	38		1
2000	Mouse Island, Placentia Bay	47.367	-54.797	6	29	50	17	38	31	13	0	99		0.98
2000	Mouse Island, uni N of	47.371	-54.792	6	29	0	8	13	12	0	0	33		-
2000	Cross Rocks	47.61	-54.337	7	1	1	5	5	3	0	0	13	1	0
2000	Big Rock	47.672	-54.112	7	1	1	31	28	0	0	0	59	16	0.2
2000	Fish Islands, uni	47.562	-54.258	7	1	0	32	36	2	0	0	70	2	0.95
2000	White Islands, uni	47.59	-54.277	7	1	62	94	101	23	0	0	218	99	0.15
2000	North Tilt Island, small uni E of	47.627	-54.181	7	1	15	8	19	15	0	0	42	1	-
2000	Holletts Islands, uni N of	47.647	-54.168	7	1	8	4	3	2	0	0	9		0.2
2000	Shag Rock, Woody Islands	47.768	-54.214	7	2	0	3	16	16	0	0	35	9	-
2000	Creve Islands	47.532	-54.244	7	2	14	18	49	8	1	0	76	2	0.15
2000	The Grandies, small uni E of	47.57	-54.242	7	2	11	6	7	7	0	0	20		0.9
2000	The Jerseyman	47.698	-54.088	7	3	11	12	12	3	0	0	27	1	1
2000	Goose Island, S (PB)	47.748	-53.998	7	3	13	9	24	10	0	0	43		0.3
2000	Seal Islet	47.732	-53.97	7	3	28	35	70	48	4	0	157	44	0.5

Year	Colony	Latitude	Longitude	Month	Day	Nests with # Eggs						Total Active Nests	Chicks	Species Proportion[2] (ARTE)
						0	1	2	3	4	5			
	Burin Peninsula													
2000	Little Green Island, S	46.852	-55.83	6	27	3	33	58	0	0	0	91	1	1
2000	Offer Island	46.867	-55.633	6	27	4	15	18	0	0	0	33		1
2000	Duck Island, S	46.858	-55.79	6	27	70	65	137	45	0	0	247	65	0.9
	Trinity Bay													
2000	Dildo Islands, south	47.566	-53.591	7	3	5	4	11	2	0	0	17		0
2000	Dildo Islands, north	47.572	-53.593	7	3	8	44	28	11	0	0	83		0
2000	Dildo Islands, rock SW of	47.561	-53.594	7	3	2	32	39	17	0	0	88		0.9
2000	Inside Chapel Arm	47.52	-53.661	7	3	1	55	87	20	4	0	166	2	0.2
2000	Admiral Island	48.369	-53.344	7	4	24	5	33	63	1	0	102	1	0.1
	Northern Peninsula													
2001	Little Island, St. Paul's Inlet *(West)*	49.854	-57.788	6	19	0	24	184	442	0	0	650	3	0.63
2001	Middle Island, St Paul's Inlet *(West)*	49.841	-57.778	6	19	0	6	13	21	1	0	41		-
2001	Western Island, St. Paul's Inlet *(West)*	49.826	-57.784	6	19	0	3	13	6	0	0	22		0.11
2001	Slab Island *(West)**	51.309	-56.737	6	20	0	0	6	0	0	0	6		
2001	Herb Island *(West)**	51.309	-56.734	6	20	0	5	21	26	0	0	52		-
2001	Moyac Islands, middle *(Sacred Bay)*	51.587	-55.615	6	21	0	4	6	0	0	0	10		0.25
2001	Moyac Islands, east *(Sacred Bay)*	51.587	-55.616	6	21	0	17	31	3	0	0	51		0.5
2001	White Cape Harbour, uni in *(East)*	51.512	-55.463	6	21	4	11	7	0	0	0	18		0.5
2001	Grassy Island, Lock's Cove *(HB)*	51.335	-55.946	6	22	0	31	53	14	0	0	98		0.95
2001	Brent Islands, uni between *(HB)*	51.262	-55.964	6	22	0	14	37	47	0	0	98		0.25
2001	Death's Head Island *(Hare Bay)*	51.211	-55.755	6	22	0	61	243	68	0	0	372		0.4
2001	Cailloux Island *(Hare Bay)*	51.202	-55.992	6	23	7	18	89	101	0	0	208		0.25
2001	Demetre Island *(Hare Bay)*	51.238	-55.935	6	24	0	6	9	3	0	0	18		1
2001	Lobster Island, (SGB) *(West)*	51.162	-56.824	6	25	17	20	59	4	0	0	83		0.6

Year	Colony	Latitude	Longitude	Month	Day	Nests with # Eggs						Total Active Nests	Chicks	Species Proportion[2] (ARTE)
						0	1	2	3	4	5			
2001	Gooseberry Island, uni E of *(West)*	51.16	-56.827	6	25	3	5	31	4	0	0	40		0.1
2001	Beef Island, uni E of *(West)*	51.164	-56.81	6	25	3	2	8	8	0	0	18		0.4
2001	Gooseberry Island, uni S of *(West)**	51.152	-56.839	6	25	1	2	11	2	0	0	15		0
2001	Sheep Island, Good Bay *(West)*	50.819	-57.202	6	26	0	2	8	2	0	0	12		0.8
2001	Horn Island *(West)*	50.801	-57.223	6	26	3	68	466	115	0	0	649	2	0.9
2001	Fox Islands, east *(West)*	50.923	-57.105	6	26	0	1	30	1	0	0	32	4	1
2001	Fox Islands, south *(West)*	50.918	-57.124	6	26	1	13	133	2	0	0	148		1
2001	White Island (St. John Bay) *(West)*	50.932	-57.022	6	27	7	18	113	78	0	0	209	1	0.3
2001	Rase Island *(West)*	51.006	-56.959	6	27	0	3	24	12	0	0	39		0.4
2001	Green Islands, large (St.Marg.Bay)	51.028	-56.962	6	27	0	11	10	1	0	0	22		0.95
	Notre Dame Bay													
2000	Ladle Island	49.49	-54.05	7	5	10	1	3	1	0	0	5[3]		0
2001	Grassy Island, Point of Bay	49.26	-55.238	6	28	4	6	11	38	0	0	55	11	0
2001	Gull Island, Loon Bay	49.355	-54.853	6	29	12	146	163	187	3	0	499	564	0
2001	Green Island, S of Coal All Island	49.379	-54.796	6	29	25	26	36	39	1	0	102	95	0
2001	Goose Island, NE (near Fogo)	49.503	-54.347	6	30	19	79	227	285	5	0	596	363	0.2
2001	Hare Island, uni W of	49.606	-54.375	6	30	4	17	45	29	0	0	91	6	0.7
2001	Woody Island, uni SW of	49.561	-54.382	6	30	0	6	31	3	0	0	40	11	1
2001	Indian Island West, unis W of (2)	49.538	-54.362	6	30	14	5	6	0	0	0	11		1
2001	Wadham Island, Offer	49.583	-53.767	7	8							184		1
	West Coast (Bay Of Islands)													
2002	McIvor's Island	49.07	-58.324	6	16	1	49	262	359	7	0	677	382	0.03
	West Coast (St George's Bay)													
2002	Flat Island (GSt.L)	48.45	-58.517	6	17	4	8	7	0	0	0	15		0
2002	Stephenville Crossing	48.498	-58.431	6	17	3	12	31	104	1	1	149		0
2002	Stephenville Crossing, uni N lagoon	48.501	-58.416	6	20	2	12	35	65	0	0	112		0

Year	Colony	Latitude	Longitude	Month	Day	Nests with # Eggs						Total Active Nests	Chicks	Species Proportion[2] (ARTE)
						0	1	2	3	4	5			
	West Coast (Port aux Port Bay)													
2002	Gravels Pond, uni in	48.558	-58.728	6	18	0	20	86	114	0	0	220		0.1
2002	Point au Mal	48.647	-58.672	6	18	21	18	13	7	0	0	38		0.05
	Fortune Bay													
2000	Grand Beach	47.138	-55.492	6	24	35	82	199	98	2	0	381	6	0.64
2002	Hare Harbour, uni in	47.584	-55.151	6	22	6	14	57	31	0	0	102		0.05
2002	Barrow Rock	47.578	-55.39	6	22	0	5	8	11	0	0	24		0
2002	English Harbour Island	47.45	-55.501	6	22	0	7	34	22	0	0	63		0
2002	Little Sagona Island	47.387	-55.777	6	23	6	0	0	0	0	0	0		0
	South Coast													
2002	Lobster Claw Island, uni S of	47.571	-59.003	6	20	3	27	89	34	0	0	150		0.05
2002	Money Island	47.583	-59.13	6	20	0	0	6	5	0	0	11		0.65
2002	Codroy River estuary, uni in*	47.843	-59.269	6	21	0	12	24	22	0	0	58		0
2002	Grole Cove, uni in	47.525	-56.121	6	23	0	7	10	8	0	0	25		0
2002	Beck Bay Barasway, uni behind	47.502	-56.169	6	23	2	10	22	19	1	0	52		0
	Total: 78 Colonies											**8,931**	**1,746**	**0.41**

[1] *uni* = unnamed island

[2] species ratio determined by identifying individuals during ground surveys

[3] In addition to these five Common Tern nests, 29 Caspian Tern nests with eggs (14 nests with 1 egg and 15 nests with 2 eggs) and 69 chicks (most of which were approximately 2 weeks of age) were found amongst a gull colony. The Caspian Tern ground census was not completed due to the large number of mobile chicks present; therefore, the nest count for this species should be viewed as a minimum.

*Colonies located during ground surveys and not observed during aerial surveys

Table 5. Estimated Newfoundland tern population using aerial-ground corrections from 2000-2002 based on a generalized lineal model (see methods for details).

Year	No. paired ground-aerial counts	Total no. aerial counts	Total estimated terns	SD	Lower confidence limit	Upper confidence limit
2000	31	123	8,775	420	8,081	9,708
2001	29	91	8,654	312	8,121	9,341
2002	12	30	3,018	97	2,863	3,246
Total	*72*	*244*	*20,462*	*768*		

Table 6. Number of seabird colonies other than terns, categorized by size, that were observed during aerial surveys of insular Newfoundland 2000-2002.

Species	Small (1-100)	Medium (101-500)	Large (501-1,000)	Very Large (>1,001)
Herring Gull	166	78	11	5
Great Black-backed Gull	166	13	0	0
Ring-billed Gull	15	32	2	0
Black-legged Kittiwake	41	28	9	5
Cormorant spp.	7	6	0	0

Table 7. Herring Gull colonies and counts of individuals identified during aerial surveys of insular Newfoundland in 2000-2002. Colonies marked with * were censused twice during overlap surveys between years and were not included in annual totals.

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
	Burin Peininsula					
2000	Colombier Island (NE)	46.891	-55.574	6	22	Small 1-100
2000	Little Green Islands	46.864	-56.095	6	22	Medium 101-500
2000	Little Green	46.853	-55.829	6	22	Very large > 1000
2000	Morgans Island	46.853	-55.823	6	22	Very large > 1000
2000	Barred Island near Cat Island	46.853	-55.758	6	22	Medium 101-500
2000	Colombier Island (SW)	46.889	-55.578	6	22	Small 1-100
2000	Swale Island	46.897	-55.607	6	22	Small 1-100
	Placentia Bay					
2000	Charlie Island	47.043	-55.151	6	22	Small 1-100
2000	Iron Island [SW]	47.040	-55.122	6	22	Small 1-100
2000	Western Island	47.070	-55.096	6	22	Small 1-100
2000	Eastern Head	47.103	-55.069	6	22	Small 1-100
2000	Jean de Baie Islands	47.184	-55.012	6	22	Small 1-100
2000	Flat Island [1]	47.273	-54.926	6	22	Very large > 1000
2000	Flat Island [2]	47.273	-54.929	6	22	Small 1-100
2000	Hiscock Rocks	47.258	-54.913	6	22	Very large > 1000
2000	Yardie Island	47.272	-54.878	6	22	Small 1-100
2000	Copper Island	47.241	-54.955	6	22	Medium 101-500
2000	Woody Island [1]	47.215	-55.036	6	22	Small 1-100
2000	Green Island [4]	47.323	-54.750	6	22	Small 1-100
2000	Grandmother Rocks	47.526	-54.357	6	22	Medium 101-500
2000	Green Islands, south	47.495	-54.305	6	24	Small 1-100
2000	Gooseberry Island, uni S of [White Islands]	47.593	-54.275	6	24	Small 1-100
2000	Marshall Island	47.626	-54.200	6	24	Medium 101-500
2000	Little Seal Island	47.451	-54.140	6	24	Small 1-100
2000	Goose Island, S (PB)	47.747	-53.998	6	24	Medium 101-500
2000	Duck Island, E (PB)	47.724	-53.981	6	24	Medium 101-500
2000	Grassy Island [N]	47.695	-53.977	6	24	Small 1-100
2000	Woody Island, Southern Harbour	47.689	-53.974	6	24	Small 1-100
2000	Salls Island	47.645	-53.947	6	24	Small 1-100
2000	Little Harbour Island	47.613	-53.958	6	24	Medium 101-500
2000	Pinchgut Point, uni near	47.601	-53.939	6	24	Small 1-100
2000	Shag Roost	47.571	-53.905	6	24	Small 1-100
2000	Grassy Island [S]	47.506	-53.941	6	24	Small 1-100
2000	Trinny Island south, rock NW of	47.501	-53.938	6	24	Small 1-100
2000	Trinny Island south, rock NE of	47.486	-53.943	6	24	Small 1-100
2000	Grassy Island, Brine Islands	47.458	-53.950	6	24	Small 1-100
2000	Woody Island, Brine Islands	47.447	-53.950	6	24	Small 1-100
2000	East Green Island	47.433	-53.966	6	24	Small 1-100
2000	North Green Island	47.433	-53.979	6	24	Small 1-100
2000	Harbour Island, Iona Islands, uni off	47.427	-53.977	6	24	Small 1-100
2000	Harbour Island, Iona Islands	47.423	-53.974	6	24	Small 1-100
2000	Merchant Island	47.401	-53.967	6	24	Medium 101-500
2000	Hole in the Wall Island	47.392	-53.981	6	24	Small 1-100
2000	Fox Island	47.353	-53.994	6	24	Medium 101-500
2000	Shag Rocks	47.410	-53.915	6	24	Small 1-100
	St. Mary's Bay					
2000	Gull Island, S of Little Colinet Island	47.036	-53.680	6	24	Small 1-100
2000	Great Colinet Island, South Point	46.950	-53.714	6	24	Large 501-1000
2000	Frapeau Point	46.946	-53.618	6	24	Small 1-100
	Avalon Peninsula					
2000	Crow Island	47.015	-52.884	6	24	Medium 101-500
2000	Bois Island	47.030	-52.867	6	24	Medium 101-500
2000	Goose Islands	47.037	-52.861	6	24	Medium 101-500
2000	Pigeon Island [SE]	47.802	-52.782	6	24	Medium 101-500
2000	Shoe Cove Island	47.764	-52.725	6	24	Small 1-100
2000	Sprigg's Point	47.544	-52.676	6	24	Small 1-100
2000	Long Point	47.372	-52.715	6	24	Small 1-100
2000	Ship Island	47.197	-52.835	6	24	Large 501-1000
2000	Pee Pee Island	47.190	-52.835	6	24	Medium 101-500
2000	Wrens Island	47.030	-52.874	6	24	Small 1-100
2000	Costellos Island	47.029	-52.871	6	24	Small 1-100

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
	Trinity Bay					
2000	Hopeall Island	47.649	-53.547	6	24	Medium 101-500
2000	Sugar Loaf	47.954	-53.349	6	24	Small 1-100
2000	Hants Head	48.020	-53.286	6	24	Small 1-100
2000	Perlican Island	48.084	-53.028	6	24	Very large > 1000
2000	Grates Cove, uni E of	48.170	-52.918	6	24	Small 1-100
2000	Bellevue Beach PP, uni off	47.640	-53.754	6	25	Small 1-100
2000	Dildo Islands, north	47.572	-53.593	6	25	Small 1-100
2000	Copper Island, Trinity Bay	47.849	-53.722	6	25	Small 1-100
2000	St. Jones Island	47.922	-53.670	6	25	Small 1-100
2000	Green Islands, N of Long Island	48.046	-53.604	6	25	Medium 101-500
2000	Verge Island	48.118	-53.535	6	25	Large 501-1000
2000	Duck Island (TB)	48.164	-53.479	6	25	Medium 101-500
2000	Green Island (TB)	48.200	-53.432	6	25	Medium 101-500
2000	Green Island, S of Salvage Hill	48.348	-53.354	6	25	Medium 101-500
2000	Ragged Islands, South	48.482	-53.062	6	25	Small 1-100
2000	Bird, South	48.623	-53.011	6	25	Medium 101-500
2000	North Bird Island	48.632	-53.018	6	25	Medium 101-500
2000	Spillar's Point	48.672	-53.054	6	25	Small 1-100
	Conception Bay					
2000	Western Bay, uni in	47.890	-53.080	6	24	Small 1-100
2000	Perry's Cove, N of	47.811	-53.131	6	24	Small 1-100
2000	Carbonear Island	47.741	-53.168	6	24	Large 501-1000
2000	Harbour Grace Islands	47.708	-53.145	6	24	Large 501-1000
2000	Fergus Island	47.608	-53.215	6	24	Medium 101-500
	Bonavista Bay					
2000	Green Island, Cape Bonavista	48.696	-53.910	6	25	Small 1-100
2000	Castle Cove, south uni in	48.610	-53.420	6	25	Medium 101-500
2000	Red Cliff Island	48.563	-53.495	6	25	Small 1-100
2000	Gull Island, Sweet Bay	48.517	-53.618	6	25	Small 1-100
2000	Gull Island, uni N of	48.519	-53.618	6	25	Small 1-100
2000	Long Island, Middle, Center of Island	48.584	-53.657	6	25	Small 1-100
2000	Copper Island	48.577	-53.714	6	25	Small 1-100
2000	Little Denier Island	48.686	-53.599	6	25	Small 1-100
2000	Sailor's Island, uni E of	48.698	-53.666	6	25	Medium 101-500
2000	Brown Store Islet	48.717	-53.733	6	25	Small 1-100
2000	Grassy Gull Islet	48.758	-53.669	6	25	Small 1-100
2000	Ship Island, uni SW of	48.744	-53.663	6	25	Small 1-100
2000	Shag Rock, Varket Channel	48.778	-53.645	6	25	Small 1-100
2000	Puffin Island	48.794	-53.612	6	25	Small 1-100
2000	Black Puffin	48.809	-53.603	6	25	Medium 101-500
2000	Great Black Island, uni NW of Gulch Island	48.833	-53.622	6	25	Small 1-100
2000	Gull Island, Offer Gooseberry	48.923	-53.550	6	25	Small 1-100
2000	Great Content Cove, small uni outside	48.847	-53.868	6	25	Small 1-100
2000	Deer Island, small uni NE of	48.949	-53.703	6	25	Medium 101-500
2000	South Pound Island	49.091	-53.557	6	25	Medium 101-500
2000	Swain's Shag Rock	49.141	-53.526	6	25	Small 1-100
2000	Pouch Island	49.171	-53.477	6	25	Small 1-100
2000	Gull Island, Cape Freels	49.257	-53.428	6	25	Small 1-100
2000	Middle Bill Island	49.274	-53.485	6	25	Medium 101-500
	Notre Dame Bay					
2000	Southern Cat Island	49.307	-53.589	6	25	Small 1-100
2000	South Penguin	49.432	-53.794	6	25	Medium 101-500
2000	North Penguin	49.450	-53.810	6	25	Medium 101-500
2000	Ladle Island	49.492	-54.050	6	25	Small 1-100
	Northern Peninsula					
2001	Stearin Island (off Cow Head)	49.937	-57.829	6	19	Small 1-100
2002	Stearin Island (off Cow Head)*	49.937	-57.829	6	19	Medium 101-500
2001	Belldowns Island	49.939	-57.786	6	19	Small 1-100
2001	Hare Island	50.820	-57.155	6	19	Small 1-100
2001	Savage Island	50.727	-57.314	6	19	Small 1-100
2001	Green Island, St. John Bay	50.752	-57.244	6	19	Small 1-100
2001	Turr Islands, west	50.839	-57.097	6	19	Medium 101-500
2001	Twin Islands, north spit	50.892	-57.288	6	19	Medium 101-500
2001	Twin Islands, north	50.901	-57.284	6	19	Medium 101-500
2001	Dolman Island	50.885	-57.150	6	19	Medium 101-500
2001	James Island	50.925	-57.182	6	19	Medium 101-500
2001	Fox Islands, east	50.921	-57.104	6	19	Medium 101-500
2001	Bird Islands, middle (St.MargB)	51.016	-56.934	6	19	Small 1-100
2001	Gooseberry Island	51.161	-56.838	6	19	Medium 101-500

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
2001	Green Island, Green Island Cove	51.407	-56.572	6	19	Medium 101-500
2001	Green Island, uni N of	51.612	-55.821	6	20	Medium 101-500
2001	Hostis Island	51.589	-55.630	6	20	Small 1-100
2001	Wreck Island	51.596	-55.583	6	20	Small 1-100
2001	Green Island, LAM	51.616	-55.519	6	20	Small 1-100
2001	White Island, north	51.592	-55.355	6	20	Small 1-100
2001	White Island, south	51.579	-55.358	6	20	Medium 101-500
2001	Notre Dame Island	51.312	-55.583	6	20	Small 1-100
2001	Vert Island	51.268	-55.977	6	20	Small 1-100
2000	Demetre Island	51.239	-55.933	6	20	Small 1-100
2001	Spring Island	51.246	-55.829	6	20	Medium 101-500
2001	Starboard Island	51.214	-55.769	6	24	Medium 101-500
2001	Port Island	51.208	-55.762	6	20	Small 1-100
2001	Great Verdon Island	51.207	-55.667	6	20	Medium 101-500
2001	Rouge Island	50.901	-55.764	6	20	Medium 101-500
2001	Groais Island, uni NW of (1)	50.971	-55.631	6	21	Small 1-100
2001	The Sisters Rocks	50.986	-55.519	6	21	Small 1-100
2001	Northeast Rock	50.811	-55.453	6	21	Small 1-100
2001	Ile aux Canes	50.692	-55.613	6	21	Small 1-100
2001	Nid Island	50.706	55.629	6	21	Small 1-100
2001	Northeast Granby	49.748	-56.725	6	21	Small 1-100
2001	Steering Rock	49.858	-56.552	6	21	Small 1-100
2001	Fish Point, uni S of	49.898	-56.497	6	21	Small 1-100
2001	Middle Arm, uni in mouth of	49.898	-56.459	6	21	Small 1-100
2001	Pound Rocks	49.944	-56.412	6	21	Small 1-100
	White Bay - Baie Verte					
2001	Tim Pot Island, W	50.050	-56.085	6	21	Small 1-100
	Notre Dame Bay					
2001	Nippers Islands, eastern Most of	49.786	-55.823	6	21	Small 1-100
2001	Gull Rock (GB)	49.684	-55.696	6	21	Medium 101-500
2001	Middle Islands	49.676	-55.672	6	21	Small 1-100
2001	Crab Island	49.666	-55.655	6	21	Small 1-100
2001	Duck Island, northeast	49.654	-55.623	6	21	Medium 101-500
2001	Duck Island, northwest	49.653	-55.628	6	21	Medium 101-500
2001	Duck Islands, south	49.648	-55.617	6	21	Large 501-1000
2001	Indian Island	49.595	-55.618	6	21	Small 1-100
2001	Big Triton Island	49.548	-55.584	6	21	Medium 101-500
2001	League Rock	49.573	-55.511	6	21	Medium 101-500
2001	Duck Island, uni E of	49.471	-55.644	6	21	Small 1-100
2001	Gull Island, Seal Bay	49.458	-55.548	6	21	Small 1-100
2001	Gull Island, Thimble Tickles	49.487	-55.495	6	21	Small 1-100
2001	Burnt Island	49.508	-55.492	6	21	Small 1-100
2001	Sculpin Island	49.541	-55.412	6	21	Medium 101-500
2001	Besom Island	49.485	-55.344	6	21	Medium 101-500
2001	Woody Island (NDB)	49.543	-55.296	6	21	Large 501-1000
2001	Gull Island, Notre Dame Bay	49.545	-55.224	6	21	Medium 101-500
2001	Indian Cove Point	49.537	-55.220	6	21	Medium 101-500
2001	Peckford Island	49.550	-53.849	6	22	Small 1-100
2001	High Gull Island	49.542	-55.068	6	22	Medium 101-500
2001	Sculpin Island, East of Exploits	49.529	-55.024	6	22	Medium 101-500
2001	Pig Island	49.525	-55.026	6	22	Medium 101-500
2001	Tarpaulin Island	49.526	-55.002	6	22	Medium 101-500
2001	Double Island	49.524	-55.014	6	22	Small 1-100
2001	Hell Grapple Head	49.530	-55.017	6	22	Medium 101-500
2001	Storehouse Island (BoEx)	49.560	-54.957	6	22	Small 1-100
2001	Green Island, off Bridgeport	49.548	-54.914	6	22	Small 1-100
2001	Mouse Island, Friday Bay	49.599	-54.779	6	22	Medium 101-500
2001	High Shag Island	49.687	-54.824	6	22	Small 1-100
2001	Sleepy Cove Gull Island	49.686	-54.818	6	22	Small 1-100
2001	Gull Island (NDB)	49.704	-54.758	6	22	Medium 101-500
2001	Spithers Point	49.679	-54.712	6	22	Small 1-100
2001	Main Tickle Island	49.629	-54.680	6	22	Small 1-100
2001	Main Tickle Island, uni SE of	49.624	-54.676	6	22	Medium 101-500
2001	Goose Island (NDB)	49.669	-54.559	6	22	Medium 101-500
2001	Grassy Island, uni E of	49.645	-54.534	6	22	Small 1-100
2001	Herring Island	49.673	-54.537	6	22	Small 1-100
2001	Smoker Island	49.612	-54.454	6	22	Small 1-100
2001	Grandfather Island	49.539	-54.172	6	22	Small 1-100
2001	Little Grandfather Island	49.548	-54.167	6	22	Small 1-100
2001	Hare Island, uni SE of	49.593	-54.348	6	22	Medium 101-500

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
2001	Steering Island, Little Fogos	49.788	-54.197	6	22	Small 1-100
2001	Seal Nest Islets# 3	49.801	-54.194	6	22	Small 1-100
2001	Storehouse Islets (1)	49.819	-54.181	6	22	Medium 101-500
2001	Storehouse Islets (2)	49.817	-54.180	6	22	Small 1-100
2001	Turr Islets, main south	49.829	-54.155	6	22	Medium 101-500
2001	Turr Islets, main north	49.831	-54.148	6	22	Small 1-100
2001	Little Fogo Islands, uni [1]	49.831	-54.114	6	22	Small 1-100
2001	Little Fogo Islands, uni [3]	49.815	-54.138	6	22	Small 1-100
2001	Barrack Islands	49.800	-53.999	6	22	Small 1-100
2001	Shoal Bay (south)	49.682	-54.202	6	22	Small 1-100
2001	Wadham Island, Offer	49.595	-53.764	6	22	Small 1-100
2001	Small Island, Wadham Is	49.578	-53.779	6	22	Small 1-100
2001	Coleman Island	49.556	-53.822	6	22	Small 1-100
	Fortune Bay					
2000	Bald Island, Flat Islands*	47.245	-54.939	6	22	Medium 101-500
2000	Harbour Islands*	47.213	-55.433	6	22	Small 1-100
2000	Frenchman's Cove Barasway, uni west*	47.204	-55.417	6	22	Small 1-100
2002	Devil Brook Island	47.275	-55.322	6	15	Small 1-100
2002	Green Island (Fortune Bay)	46.878	-56.090	6	15	Small 1-100
2002	Stearin Island (off Corbin Head)	47.615	-55.353	6	15	Small 1-100
2002	English Harbour Island	47.450	-55.500	6	15	Medium 101-500
2002	Brunette Island	47.280	-55.906	6	15	Medium 101-500
2002	Bird Island, uni SW of	47.240	-55.964	6	15	Small 1-100
2002	Bird Island, off Brunette	47.245	-55.956	6	15	Small 1-100
2002	Shag Rock/ Gull Rock	47.455	-55.661	6	15	Small 1-100
2002	Gull Island, Deadman's Bight	47.458	-55.842	6	15	Small 1-100
	South Coast					
2002	Jeddore Lake, uni in	47.958	-55.896	6	18	Medium 101-500
2002	Little Fox Island	47.580	-55.927	6	18	Large 501-1000
2002	Pass Island	47.490	-56.204	6	18	Large 501-1000
2002	New Harbour Island	47.599	-56.646	6	18	Medium 101-500
2002	Cape Island, La Hune Bay	47.542	-56.901	6	18	Small 1-100
2002	Penguin Islands	47.383	-56.996	6	18	Small 1-100
2002	Gulch Cove Island, west	47.569	-57.010	6	18	Small 1-100
2002	Baggs Island	47.596	-57.606	6	18	Small 1-100
2002	Turks Island	47.578	-57.662	6	18	Small 1-100
2002	Duck Island, Burgeo	47.578	-57.671	6	18	Small 1-100
2002	Harbour Island (CS)	47.583	-57.682	6	18	Medium 101-500
2002	Morgan Island	47.600	-57.619	6	18	Medium 101-500
2002	Green Island, near The Nuddick	47.633	-57.833	6	18	Small 1-100
2002	Baring Island	47.642	-57.854	6	18	Small 1-100
2002	Three Islands, middle	47.671	-58.195	6	18	Small 1-100
2002	Three Islands, north	47.674	-58.195	6	18	Small 1-100
2002	Green Island, Roti Bay	47.650	-58.281	6	18	Small 1-100
2002	Jacques Island	47.650	-58.332	6	18	Small 1-100
2002	Duck Island, uni S of	47.646	-58.474	6	19	Small 1-100
2002	Tinker Island, Little La Poile Bay	47.645	-58.494	6	19	Small 1-100
2002	Duck Island, Rose Blanche	47.599	-58.721	6	19	Small 1-100
2002	Green Island, Rose Blanche	47.601	-58.753	6	19	Small 1-100
2002	Duck Island, Ilse aux Morts	47.573	-58.989	6	19	Small 1-100
2002	Ilse aux Morts, uni S of	47.571	-58.998	6	19	Small 1-100
2002	Round Rock	47.569	-59.017	6	19	Small 1-100
2002	Flat Islands	47.569	-59.063	6	19	Small 1-100
2002	Duck Island, Port-aux-Basques	47.564	-59.193	6	19	Large 501-1000
2002	Durands Island, SE	47.572	-59.197	6	19	Small 1-100
2002	Durands Islands, NW	47.574	-59.201	6	19	Small 1-100
	West Coast					
2002	Codroy Island	47.876	-59.404	6	19	Small 1-100
2002	Gregory Island (GSt.L)	49.283	-58.299	6	19	Medium 101-500
	West Coast (St. George's Bay)					
2002	Ship Island, Port-aux-Port	48.508	-58.969	6	19	Small 1-100
2002	Red Island, Port-aux-Port	48.561	-59.235	6	19	Medium 101-500
	West Coast (Port-Aux-Port Bay)					
2002	Shag Island, N of Port-aux-Port Bay	48.871	-58.593	6	19	Medium 101-500
	West Coast (Bay of Islands)					
2002	Seal Island, Bay of Islands	49.082	-58.303	6	19	Medium 101-500
2002	Govenors Island, Bay of Islands	49.076	-58.324	6	19	Large 501-1000
2002	Sleep Island	49.107	-58.238	6	19	Medium 101-500
2002	Puffin Islands, SE	49.120	-58.233	6	19	Small 1-100
2002	Puffin Islands (CB)	49.124	-58.237	6	19	Small 1-100

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
2002	Eagle Island	49.164	-58.147	6	19	Small 1-100
2002	Hen Island (BOI)	49.231	-58.342	6	19	Small 1-100
2002	Hat Rock	49.221	-58.322	6	19	Small 1-100
2002	Green Island, (Bay of Islands)	49.236	-58.327	6	19	Small 1-100
2002	Saddle Island NF 1	49.250	-58.332	6	19	Small 1-100

Table 8. Great Black-backed Gull colonies and counts of individuals identified during aerial surveys of insular Newfoundland in 2000-2002. Colonies marked with * were censused twice during overlap surveys between years and were not included in annual totals.

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
	Placentia Bay					
2000	Green Island [4]	47.323	-54.750	6	22	Small 1-100
2000	Woody Island [1]	47.217	-55.033	6	22	Small 1-100
2000	Saddle Back Island	47.214	-54.796	6	22	Small 1-100
2000	Middle Island [E]	47.243	-54.774	6	22	Small 1-100
2000	Gull Islands (south)	47.355	-54.545	6	22	Small 1-100
2000	Grandmother Rocks	47.526	-54.357	6	22	Small 1-100
2000	Goose Island, S (PB)	47.747	-53.998	6	24	Small 1-100
2000	Little Harbour Island	47.613	-53.958	6	24	Small 1-100
2000	Pinchgut Point, uni near	47.601	-53.939	6	24	Small 1-100
2000	Trinny Island south, rock NE of	47.486	-53.943	6	24	Small 1-100
2000	East Green Island	47.433	-53.966	6	24	Small 1-100
2000	Harbour Island, Iona Islands	47.423	-53.974	6	24	Small 1-100
2000	Merchant Island	47.401	-53.967	6	24	Small 1-100
2000	Hole in the Wall Island	47.392	-53.981	6	24	Small 1-100
2000	Fox Island	47.353	-53.994	6	24	Small 1-100
	St. Mary's Bay					
2000	Great Colinet Island, South Point	46.950	-53.714	6	24	Small 1-100
	Avalon Peninsula					
2000	Goose Islands	47.037	-52.861	6	24	Small 1-100
	Trinity Bay					
2000	Hopeall Island	47.649	-53.547	6	24	Medium 101-500
2000	Perlican Island	48.084	-53.028	6	24	Small 1-100
2000	Dildo Islands, south	47.563	-53.592	6	25	Small 1-100
2000	Green Island (TB)	48.200	-53.432	6	25	Small 1-100
2000	Ragged Islands, W	48.241	-53.451	6	25	Small 1-100
2000	Ragged Islands, E	48.242	-53.449	6	25	Small 1-100
	Conception Bay					
2000	Carbonear Island	47.741	-53.168	6	24	Small 1-100
	Bonavista Bay					
2000	Gull Island, uni N of	48.519	-53.618	6	25	Small 1-100
2000	Chance Head, uni N of	48.549	-53.629	6	25	Small 1-100
2000	Southern Den	48.546	-53.794	6	25	Small 1-100
2000	Brown Store Islet	48.715	-53.732	6	25	Small 1-100
2000	Grassy Gull Islet	48.758	-53.669	6	25	Small 1-100
2000	Hail Island, small uni SE of	48.758	-53.797	6	25	Small 1-100
2000	Hail Island, small uni 1km E of	48.768	-53.781	6	25	Small 1-100
2000	Great Black Island, uni N of & west of Gulch Island	48.833	-53.622	6	25	Small 1-100
2000	Gull Island, Offer Gooseberry	48.923	-53.550	6	25	Small 1-100
2000	Great Content Cove, small uni outside	48.847	-53.868	6	25	Small 1-100
2000	Butterfly Islets	49.126	-53.485	6	25	Small 1-100
	Notre Dame Bay					
2000	North Penguin	49.450	-53.810	6	25	Small 1-100
2000	Ladle Island	49.492	-54.050	6	25	Small 1-100
	Northern Peninsula					
2001	Stearin Island (off Cow Head)	49.936	-57.830	6	19	Small 1-100
2001	Belldowns Island	49.939	-57.786	6	19	Small 1-100
2001	Moyac Island	51.099	-56.886	6	19	Small 1-100
2001	Savage Island	50.727	-57.314	6	19	Medium 101-500
2001	Green Island, St. John Bay	50.752	-57.244	6	19	Small 1-100
2001	Turr Islands, east	50.839	-57.105	6	19	Medium 101-500
2001	Twin Islands, south	50.895	-57.278	6	19	Small 1-100
2001	Twin Islands, north	50.901	-57.284	6	19	Small 1-100
2001	Twin Islands, north spit	50.892	-57.288	6	19	Small 1-100
2001	James Island	50.925	-57.182	6	19	Medium 101-500
2001	Green Islands, west (St.MargB)	51.030	-56.968	6	19	Small 1-100
2001	Cape Island	51.134	-56.858	6	19	Small 1-100
2001	Gooseberry Island, uni S of	51.152	-56.838	6	19	Small 1-100
2001	Gooseberry Island	51.161	-56.838	6	19	Small 1-100
2001	Beef Island, uni E of	51.164	-56.810	6	19	Small 1-100
2001	Herb Island	51.309	-56.733	6	19	Small 1-100
2001	Green Island, Green Island Cove	51.407	-56.572	6	19	Medium 101-500

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
2001	Rouge Island	50.901	-55.764	6	20	Medium 101-500
2001	Handy Harbour, uni W of	50.740	-56.137	6	20	Small 1-100
2001	Green Island, uni N of	51.612	-55.821	6	20	Small 1-100
2001	Hostis Island	51.589	-55.630	6	20	Small 1-100
2001	Moyac Islands, west	51.590	-55.615	6	20	Small 1-100
2001	Black Island, Sacred Bay	51.581	-55.623	6	20	Small 1-100
2001	White Island, north	51.592	-55.355	6	20	Small 1-100
2001	White Island, south	51.579	-55.358	6	20	Small 1-100
2001	Direction Island	51.239	-55.990	6	20	Small 1-100
2001	Gilliat Island	51.226	-55.952	6	20	Small 1-100
2001	Demetre Island	51.239	-55.933	6	20	Small 1-100
2001	Maria Island, W	51.238	-55.924	6	20	Small 1-100
2001	Spring Island	51.246	-55.829	6	20	Small 1-100
2001	Pigeon Island, Hare Bay	51.215	-55.663	6	20	Small 1-100
2001	Chasseurs Island	51.164	-55.725	6	20	Small 1-100
2001	The Sisters Rocks	50.986	-55.519	6	21	Small 1-100
2001	Northeast Rock, rock SW of	50.802	-55.472	6	21	Small 1-100
2001	Ile aux Canes	50.692	-55.613	6	21	Small 1-100
2001	Nid Island	50.706	55.629	6	21	Small 1-100
	White Bay - Baie Verte					
2001	Tim Pot Island, E	50.049	-56.074	6	21	Small 1-100
2001	Tim Pot Island, W	50.050	-56.085	6	21	Medium 101-500
2001	Grassy Island, (WBS)	50.000	-56.116	6	21	Medium 101-500
	Notre Dame Bay					
2001	West Grassy Island	49.571	-55.754	6	21	Small 1-100
2001	Lewis Island	49.599	-55.726	6	21	Small 1-100
2001	Middle Flint Island	49.617	-55.726	6	21	Small 1-100
2001	Duck Islands, south	49.648	-55.617	6	21	Small 1-100
2001	Big Triton Island	49.548	-55.584	6	21	Small 1-100
2001	Duck Island, uni E of	49.471	-55.644	6	21	Small 1-100
2001	Gull Island, Thimble Tickles	49.487	-55.495	6	21	Small 1-100
2001	Tinker Island [NDB]	49.519	-55.426	6	21	Small 1-100
2001	Sculpin Island	49.541	-55.412	6	21	Small 1-100
2001	Lobster Island, Exploits	49.359	-55.151	6	22	Small 1-100
2001	Steering Island, Indian Arm	49.311	-54.907	6	22	Small 1-100
2001	Double Island	49.524	-55.014	6	22	Small 1-100
2001	Green Island, off Bridgeport	49.548	-54.914	6	22	Small 1-100
2001	Mouse Island, Friday Bay	49.599	-54.779	6	22	Small 1-100
2001	Sleepy Cove Gull Island	49.686	-54.818	6	22	Small 1-100
2001	Gull Island (NDB)	49.704	-54.758	6	22	Small 1-100
2001	Main Tickle Island	49.629	-54.680	6	22	Small 1-100
2001	Goose Island (NDB)	49.669	-54.559	6	22	Small 1-100
2001	Indian Garden	49.581	-54.500	6	22	Small 1-100
2001	East Garden	49.591	-54.474	6	22	Small 1-100
2001	Smoker Island	49.612	-54.454	6	22	Small 1-100
2001	Grandfather Island	49.539	-54.172	6	22	Small 1-100
2001	Little Grandfather Island	49.548	-54.167	6	22	Small 1-100
2001	Indian Lookout, uni NE of	49.569	-54.318	6	22	Small 1-100
2001	Steering Island, Little Fogos	49.788	-54.197	6	22	Small 1-100
2001	Seal Nest Islets	49.800	-54.199	6	22	Medium 101-500
2001	Storehouse Islets (1)	49.817	-54.180	6	22	Small 1-100
2001	Turr Islets, main south	49.829	-54.155	6	22	Small 1-100
2001	Shoal Bay (south)	49.682	-54.202	6	22	Small 1-100
2001	Wadham Island, Offer	49.595	-53.764	6	22	Small 1-100
2001	Small Island, Wadham Is	49.578	-53.779	6	22	Small 1-100
2001	Coleman Island	49.556	-53.822	6	22	Small 1-100
	Fortune Bay					
2000	Harbour Islands*	47.213	-55.433	6	22	Small 1-100
2002	Green Island (Fortune Bay)	46.878	-56.090	6	15	Small 1-100
2002	Frenchman's Cove Barasway, uni west	47.204	-55.417	6	15	Small 1-100
2002	Frenchman's Cove Barasway, uni east	47.202	-55.401	6	15	Small 1-100
2002	Devil Brook Island	47.275	-55.322	6	15	Medium 101-500
2002	Shag Rock, East Bay	47.575	-54.861	6	15	Small 1-100
2002	Gull Island, Long Harbour	47.591	-55.099	6	15	Small 1-100
2002	Stearin Island	47.614	-55.354	6	15	Small 1-100
2002	English Harbour Island	47.450	-55.500	6	15	Small 1-100
2002	Brunette Island	47.280	-55.906	6	15	Medium 101-500
2002	Green Island [3]	47.260	-55.974	6	15	Small 1-100
2002	Shag Rock/ Gull Rock	47.455	-55.661	6	15	Small 1-100
2002	Little Fox Island	47.580	-55.927	6	18	Medium 101-500

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
2002	Fox Island, Hermitage Bay	47.568	-55.965	6	18	Small 1-100
2002	Pass Island, uni S of	47.482	-56.202	6	18	Small 1-100
2002	Seal Island, uni N of	47.479	-56.217	6	18	Small 1-100
2002	Middle Island [W]	47.617	-56.183	6	18	Small 1-100
2002	New Harbour Island	47.599	-56.646	6	18	Small 1-100
	South Coast					
2002	Jeddore Lake, uni in	47.958	-55.896	6	18	Small 1-100
2002	Gulch Cove Island, west	47.569	-57.010	6	18	Small 1-100
2002	Gulch Cove Island, east	47.569	-57.002	6	18	Small 1-100
2002	Turr Island	47.517	-57.349	6	18	Small 1-100
2002	Eastern Harbour Island	47.519	-57.343	6	18	Small 1-100
2002	Turnip Island	47.512	-57.374	6	18	Small 1-100
2002	Ramea Colombier Island	47.503	-57.442	6	18	Small 1-100
2002	Gull Island, Northeast Arm	47.624	-57.467	6	18	Small 1-100
2002	Rencontre Island	47.590	-57.613	6	18	Small 1-100
2002	Green Island, Burgeo	47.569	-57.681	6	18	Small 1-100
2002	Duck Island, Burgeo	47.578	-57.671	6	18	Small 1-100
2002	Harbour Island (CS)	47.583	-57.682	6	18	Small 1-100
2002	Harbour Island (CS), uni NE of	47.584	-57.681	6	18	Small 1-100
2002	Round Island	47.585	-57.688	6	18	Small 1-100
2002	Morgan Island	47.600	-57.619	6	18	Small 1-100
2002	Poll Island	47.624	-57.696	6	18	Small 1-100
2002	Green Island, near The Nuddick	47.633	-57.833	6	18	Small 1-100
2002	Baring Island	47.642	-57.854	6	18	Small 1-100
2002	Wreck Island	47.650	-57.882	6	18	Small 1-100
2002	Smoky Island	47.650	-57.999	6	18	Small 1-100
2002	Three Islands, south	47.670	-58.191	6	18	Small 1-100
2002	Three Islands, middle	47.671	-58.195	6	18	Small 1-100
2002	Three Islands, north	47.674	-58.195	6	18	Small 1-100
2002	Jones Island	47.653	-58.220	6	18	Small 1-100
2002	Green Island, Roti Bay	47.650	-58.281	6	18	Small 1-100
2002	Jacques Island	47.650	-58.332	6	18	Small 1-100
2002	Duck Island, uni S of	47.646	-58.474	6	19	Small 1-100
2002	Tinker Island, Little La Poile Bay	47.645	-58.494	6	19	Small 1-100
2002	Green Island, Rose Blanche	47.601	-58.753	6	19	Small 1-100
2002	Garden Islands, SW	47.569	-59.021	6	19	Small 1-100
2002	Western Island, Margaree Harbour	47.572	-59.066	6	19	Small 1-100
2002	Green Island, Port-aux-Basques	47.562	-59.185	6	19	Small 1-100
2002	Durands Island, SE	47.572	-59.197	6	19	Small 1-100
2002	Durands Islands, NW	47.574	-59.201	6	19	Small 1-100
2002	Copper Rock	47.582	-59.230	6	19	Small 1-100
2002	Shag Island, Port-aux-Basques	47.591	-59.244	6	19	Small 1-100
	West Coast					
2002	Codroy Island	47.876	-59.404	6	19	Small 1-100
2002	White Rocks	49.023	-58.476	6	19	Small 1-100
2002	Stearing Island	49.937	-57.829	6	19	Small 1-100
	West Coast (St. George's Bay)					
2002	Crabbes River estuary, unis	48.208	-58.866	6	19	Small 1-100
2002	Flat Island (GSt.L)	48.450	-58.516	6	19	Small 1-100
200						
2	Ship Island, Port-aux-Port	48.508	-58.969	6	19	Small 1-100
2002	Red Island, Port-aux-Port	48.561	-59.235	6	19	Small 1-100
	West Coast (Port-Aux-Port Bay)					
2002	Shag Island, N of Port-aux-Port Bay	48.871	-58.593	6	19	Medium 101-500
	West Coast (Bay of Islands)					
2002	Seal Island, Bay of Islands	49.082	-58.303	6	19	Small 1-100
2002	Govenors Island, Bay of Islands	49.076	-58.324	6	19	Small 1-100
2002	Sleep Island	49.107	-58.238	6	19	Small 1-100
2002	Puffin Islands, SE	49.120	-58.233	6	19	Small 1-100
2002	Puffin Islands (CB)	49.124	-58.237	6	19	Small 1-100
2002	Eagle Island	49.164	-58.147	6	19	Small 1-100
2002	Hen Island (BOI)	49.231	-58.342	6	19	Small 1-100
2002	Hat Rock	49.221	-58.322	6	19	Small 1-100
2002	Saddle Island NF 1	49.250	-58.332	6	19	Small 1-100
2002	Gregory Island (GSt.L)	49.283	-58.299	6	19	Small 1-100

Table 9. Ring-billed Gull colonies and counts of individuals identified during aerial surveys of insular Newfoundland in 2000-2002. Colonies marked with * were censused twice during overlap surveys between years and were not included in annual totals.

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
	Placentia Bay					
2000	Big Rock	47.6722	-54.1116	6	24	Medium 101-500
2000	The Neck at Isaac Heads	47.3255	-53.9234	6	24	Medium 101-500
2000	Ragged Islands, north	48.4894	-53.0538	6	25	Medium 101-500
	St. Mary's Bay					
2000	Newbridge	47.1364	-53.4813	6	24	Small 1-100
	Conception Bay					
2000	Fergus Island	47.6081	-53.2152	6	24	Medium 101-500
	Trinity Bay					
2000	Dildo Islands, north	47.5716	-53.5925	6	25	Small 1-100
	Bonavista Bay					
2000	Sailor's Harbour, uni in	48.6905	-53.6623	6	25	Small 1-100
2000	Locker's Flat Island, small uni W of	48.8783	-53.8781	6	25	Medium 101-500
2000	Doctor's Island	48.8003	-54.0911	6	25	Medium 101-500
2000	Bennett's Low Island	49.1220	-53.5609	6	25	Medium 101-500
	Northern Peninsula					
2001	Stearin Island (off Cow Head)	49.936	-57.8304	6	19	Small 1-100
2002	Stearin Island (off Cow Head)*	49.9365	-57.8286	6	19	Medium 101-500
2001	Round Island	50.7229	-57.3202	6	19	Medium 101-500
2001	Querre Island	50.7182	-57.3315	6	19	Medium 101-500
2001	Turr Islands, west	50.8393	-57.0967	6	19	Medium 101-500
2001	Rase Island	51.0061	-56.9586	6	19	Small 1-100
2001	Old Ferolle Island, uni N of	51.1014	-56.8855	6	19	Medium 101-500
2001	Cape Island	51.1344	-56.8578	6	19	Medium 101-500
2001	Herb Island	51.3088	-56.7330	6	19	Medium 101-500
2001	Slab Island	51.3088	-56.7378	6	19	Medium 101-500
2001	West Boat Head	51.5853	-56.0100	6	20	Small 1-100
2001	Long Point, uni off	51.5902	-55.8687	6	20	Small 1-100
2001	Triangle Point, uni W of	51.5128	-55.8607	6	20	Small 1-100
2001	Beak Point, uni off	51.6034	-55.5310	6	20	Medium 101-500
2001	Vert Island	51.2678	-55.9772	6	20	Medium 101-500
2001	Demetre Island	51.2392	-55.9327	6	20	Medium 101-500
	Baie Verte Peinisula					
2001	Guibert Island	50.0511	-56.1078	6	21	Medium 101-500
2001	Gentille Island	50.053	-56.1076	6	21	Medium 101-500
	Notre Dame Bay					
2001	Berry Head, uni east of but W of nav light	49.6354	-55.7743	6	21	Large 501-1000
2001	East Grassy Island	49.5716	-55.7498	6	21	Large 501-1000
2001	Passage Rocks (north)	49.3654	-55.3885	6	21	Medium 101-500
2001	Jock Island	49.4516	-54.9587	6	22	Small 1-100
2001	Burnt Bay, uni at head of	49.2257	-55.0396	6	22	Medium 101-500
2001	Green Island, S of Coal All Island	49.3785	-54.7963	6	22	Small 1-100
2001	Tarpaulin Island	49.5261	-55.0023	6	22	Medium 101-500
2001	Charley Island	49.5094	-54.4807	6	22	Medium 101-500
2001	Dog Island W	49.4887	-54.4765	6	22	Medium 101-500
2001	Storehouse Island	49.4133	-54.4169	6	22	Small 1-100
2001	Grandfather Island	49.5394	-54.1717	6	22	Medium 101-500
2001	Goose Island, NE (near Fogo)	49.5073	-54.3474	6	22	Medium 101-500
	Fortune Bay					
2002	Black Island	47.4619	-55.8463	6	15	Small 1-100
	South Coast					
2002	Jeddore Lake, uni in	47.9583	-55.8956	6	18	Medium 101-500
2002	White Island (off Burgeo)	47.5946	-57.6247	6	18	Small 1-100
2002	Big Barasway, uni in	47.6505	-57.7288	6	18	Small 1-100
2002	Smoky Island	47.6499	-57.9989	6	18	Medium 101-500
2002	Ireland Island	47.6331	-58.3707	6	19	Medium 101-500
2002	Durands Islands, NW	47.5742	-59.2009	6	19	Medium 101-500
	West Coast					
2002	Crabbes River estuary, unis	48.2083	-58.8657	6	19	Small 1-100
2002	Flat Island (GSt.L)	48.4499	-58.5156	6	19	Medium 101-500
	West Coast (Bay of Islands)					
2002	Eagle Island	49.1637	-58.1472	6	19	Medium 101-500

Table 10. Black-legged Kittiwake colonies and counts of individuals identified during aerial surveys of insular Newfoundland in 2000-2002.

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
	Burin Peninsula					
2000	Colombier Island (SW)	46.889	-55.578	6	22	Medium 101-500
2000	Colombier Island (NE)	46.891	-55.574	6	22	Large 501-1000
	Placentia Bay					
2000	Corbin Island	46.972	-55.205	6	22	Small 1-100
2000	Croney Island	47.105	-55.067	6	22	Small 1-100
2000	Red Island, Hole in the Wall Point	47.366	-54.219	6	24	Small 1-100
2000	Woody Island, Southern Harbour	47.689	-53.974	6	24	Small 1-100
	Trinity Bay					
2000	The Rookery (mainland cliffs)	46.652	-53.225	6	24	Very large > 1000
2000	Hopeall Island	47.649	-53.547	6	24	Medium 101-500
2000	Red Rocks	47.701	-53.517	6	24	Very large > 1000
2000	Flambro Head, N of	48.024	-52.970	6	24	Small 1-100
2000	Rantem Cove, uni in	47.715	-53.850	6	25	Small 1-100
2000	Shag Island, Bull Arm	47.758	-53.849	6	25	Medium 101-500
2000	Copper Island, Trinity Bay	47.849	-53.722	6	25	Medium 101-500
2000	St. Jones Island	47.922	-53.670	6	25	Medium 101-500
2000	Green Islands, N of Long Island	48.046	-53.604	6	25	Small 1-100
2000	Copper Island, S of Verge Island	48.113	-53.529	6	25	Small 1-100
2000	Green Island (TB)	48.200	-53.432	6	25	Medium 101-500
2000	Maiden Islet	48.272	-53.426	6	25	Medium 101-500
2000	Horse Chops, uni W of	48.355	-53.240	6	25	Small 1-100
2000	Northern Cove	48.395	-53.131	6	25	Large 501-1000
2000	Ragged Islands, Middle	48.485	-53.058	6	25	Small 1-100
	Conception Bay					
2000	Bradley's Cove	47.866	-53.068	6	24	Medium 101-500
2000	Roses Cliff	47.864	-53.071	6	24	Medium 101-500
2000	Ochre Pit Rock	47.805	-53.133	6	24	Small 1-100
2000	Harbour Grace Islands	47.708	-53.145	6	24	Very large > 1000
	Avalon Peninsula					
2000	The Peg	47.714	-52.702	6	24	Small 1-100
2000	Flat Rock Point	47.711	-52.695	6	24	Small 1-100
2000	Church Cove	47.689	-52.706	6	24	Very large > 1000
2000	Sprigg's Point	47.544	-52.676	6	24	Large 501-1000
2000	Blackhead	47.531	-52.637	6	24	Small 1-100
2000	Miner's Point	47.367	-52.718	6	24	Medium 101-500
2000	Gravelly Bank	47.280	-52.772	6	24	Medium 101-500
2000	Ship Island	47.197	-52.835	6	24	Small 1-100
	Bonavista Bay					
2000	Spillar's Point, S of	48.668	-53.054	6	25	Small 1-100
2000	Spillar's Point	48.672	-53.054	6	25	Small 1-100
2000	Cape Bonavista Island	48.703	-53.082	6	25	Small 1-100
2000	Gull Island, Cape Bonavista	48.711	-53.094	6	25	Medium 101-500
2000	Fish Point Gulch, S of	48.587	-53.323	6	25	Small 1-100
2000	Little Denier Island	48.681	-53.595	6	25	Small 1-100
2000	Gull Island, Offer Gooseberry	48.923	-53.550	6	25	Small 1-100
2000	Gull Island, Cape Freels	49.255	-53.429	6	25	Small 1-100
	Northern Peninsula					
2001	Belldowns Island	49.939	-57.786	6	19	Small 1-100
2001	Cape Degrat	51.616	-55.410	6	20	Small 1-100
2001	Notre Dame Island	51.312	-55.584	6	20	Medium 101-500
2001	Port Island	51.208	-55.762	6	20	Small 1-100
2001	Cape Fox, N of	50.869	-55.878	6	20	Medium 101-500
2001	Groais Island, uni NW of (2)	50.982	-55.627	6	21	Large 501-1000
2001	Groais Island, uni NW of (1)	50.971	-55.631	6	21	Medium 101-500
2001	The Sisters Rocks	50.986	-55.519	6	21	Medium 101-500
2001	Bell Island, Grey Islands	50.793	-55.452	6	21	Small 1-100
2001	Northeast Granby	49.748	-56.725	6	21	Medium 101-500
2001	Gull Rocks	49.780	-56.654	6	21	Small 1-100
2001	Fish Point, uni S of	49.898	-56.497	6	21	Medium 101-500
2001	Middle Arm, uni in mouth of	49.898	-56.459	6	21	Small 1-100
2001	Eastern Island, Horse Islands, uni off NW	50.236	-55.799	6	21	Small 1-100
	Baie Verte Peninsula					
2001	Tim Pot Island, E	50.049	-56.074	6	21	Large 501-1000
2001	Tim Pot Island, W	50.050	-56.085	6	21	Large 501-1000

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
2001	Grassy Island, (WBS)	50.000	-56.116	6	21	Small 1-100
2001	Ming's Islands	50.037	-56.002	6	21	Small 1-100
	Notre Dame Bay					
2001	Cape Cove, uni in	49.992	-55.505	6	21	Medium 101-500
2001	Bishop's Rocks	49.936	-55.444	6	21	Medium 101-500
2001	Nippers Islands, eastern Most of	49.787	-55.821	6	21	Small 1-100
2001	Riding Island	49.785	-55.835	6	21	Small 1-100
2001	Middle Flint Island	49.617	-55.726	6	21	Large 501-1000
2001	Gull Rock (GB)	49.684	-55.696	6	21	Small 1-100
2001	Duck Islands, south	49.648	-55.617	6	21	Small 1-100
2001	Indian Island	49.595	-55.618	6	21	Medium 101-500
2001	Big Triton Island	49.548	-55.584	6	21	Medium 101-500
2001	Great Denier Island	49.533	-55.549	6	21	Medium 101-500
2001	Sculpin Island	49.541	-55.412	6	21	Medium 101-500
2001	High Shag Island	49.687	-54.824	6	22	Small 1-100
2001	Gull Island (NDB)	49.704	-54.758	6	22	Small 1-100
2001	Little Fogo Islands, uni [2]	49.818	-54.122	6	22	Small 1-100
	Little Fogo Islands, uni [3]	49.815	-54.138	6	22	Medium 101-500
	Fortune Bay					
2002	Bird Island, uni SW of	47.240	-55.964	6	15	Small 1-100
	Gull Island, Deadman's Bight	47.458	-55.842	6	15	Medium 101-500
2002	**South Coast**					
2002	Pass Island	47.490	-56.204	6	18	Medium 101-500
2002	Ramea Colombier Island	47.503	-57.442	6	18	Medium 101-500
	Green Island, Burgeo	47.569	-57.681	6	18	Small 1-100
2002	**West Coast (St. George's Bay)**					
2002	Cape St. George, N of	48.467	-59.269	6	19	Large 501-1000
	Big Cove, Port-aux-Port	48.495	-59.245	6	19	Very large > 1000
	West Coast (Port-Aux-Port Bay)					
2002	Shag Island, N of Port-aux-Port Bay	48.871	-58.593	6	19	Small 1-100
	West Coast (Bay of Islands)					
2002	Saddle Island	49.250	-58.332	6	19	Large 501-1000

Table 11. Cormorant colonies and counts of individuals identified during aerial surveys of insular Newfoundland in 2000-2002.

Year	Colony Name	Latitude	Longitude	Month	Day	Range Estimate
	Northern Peninsula					
2001	Rouge Island	50.900	-55.764	6	20	Small 1-100
	Notre Dame Bay					
2001	Duck Islands, south	49.647	-55.617	6	21	Small 1-100
2001	Duck Island, northeast	49.654	-55.622	6	21	Small 1-100
2001	Duck Island, northwest	49.652	-55.628	6	21	Small 1-100
2001	Seal Nest Islets # 3	49.801	-54.194	6	22	Small 1-100
	Fortune Bay					
2002	Bird Island, uni SW of	47.239	-55.963	6	15	Medium 101-500
	South Coast					
2002	Gulch Cove Island, east	47.569	-57.002	6	18	Small 1-100
2002	Green Island, Burgeo	47.569	-57.681	6	18	Medium 101-500
2002	Shag Island, Port-aux-Basques	47.5901	-59.244	6	19	Medium 101-500
	West Coast (St. George's Bay)					
2002	Little Friars Cove, S of	48.066	-59.132	6	19	Small 1-100
	West Coast (Port-Aux-Port Bay)					
2002	Shag Island, N of Port-aux-Port Bay	48.871	-58.593	6	19	Medium 101-500
	West Coast (Bay of Islands)					
2002	Gregory Island (GSt.L)	49.283	-58.299	6	19	Medium 101-500
2002	Saddle Island	49.249	-58.332	6	19	Medium 101-500

Table 12. Gull colonies and counts of individuals identified during aerial surveys of Saint-Pierre et Miquelon (France) in 2002.

Year	Colony Name	Latitude	Longitude	Month	Day	Species	Range Estimate
2002	Rocher Hache	46.794	-56.128	6	15	HERG	Medium 101-500
2002	Isle Pigeons, St Pierre	46.793	-56.134	6	15	HERG	Small 1-100
2002	Rocher Hache	46.794	-56.128	6	15	GBBG	Small 1-100
2002	Isle Pigeons, St Pierre	46.793	-56.134	6	15	GBBG	Small 1-100
2002	Petit Colombier	46.823	-56.154	6	15	GBBG	Small 1-100
2002	Batture de la Chatte, mainland	47.095	-56.341	6	15	RBGU	Small 1-100
2002	Grand Columbier	46.820	-56.166	6	15	BLKI	Large 501-1000
2002	Petit Colombier	46.823	-56.154	6	15	BLKI	Small 1-100
2002	Cap du Nid a L'Aige	47.147	-56.347	6	15	BLKI	Small 1-100

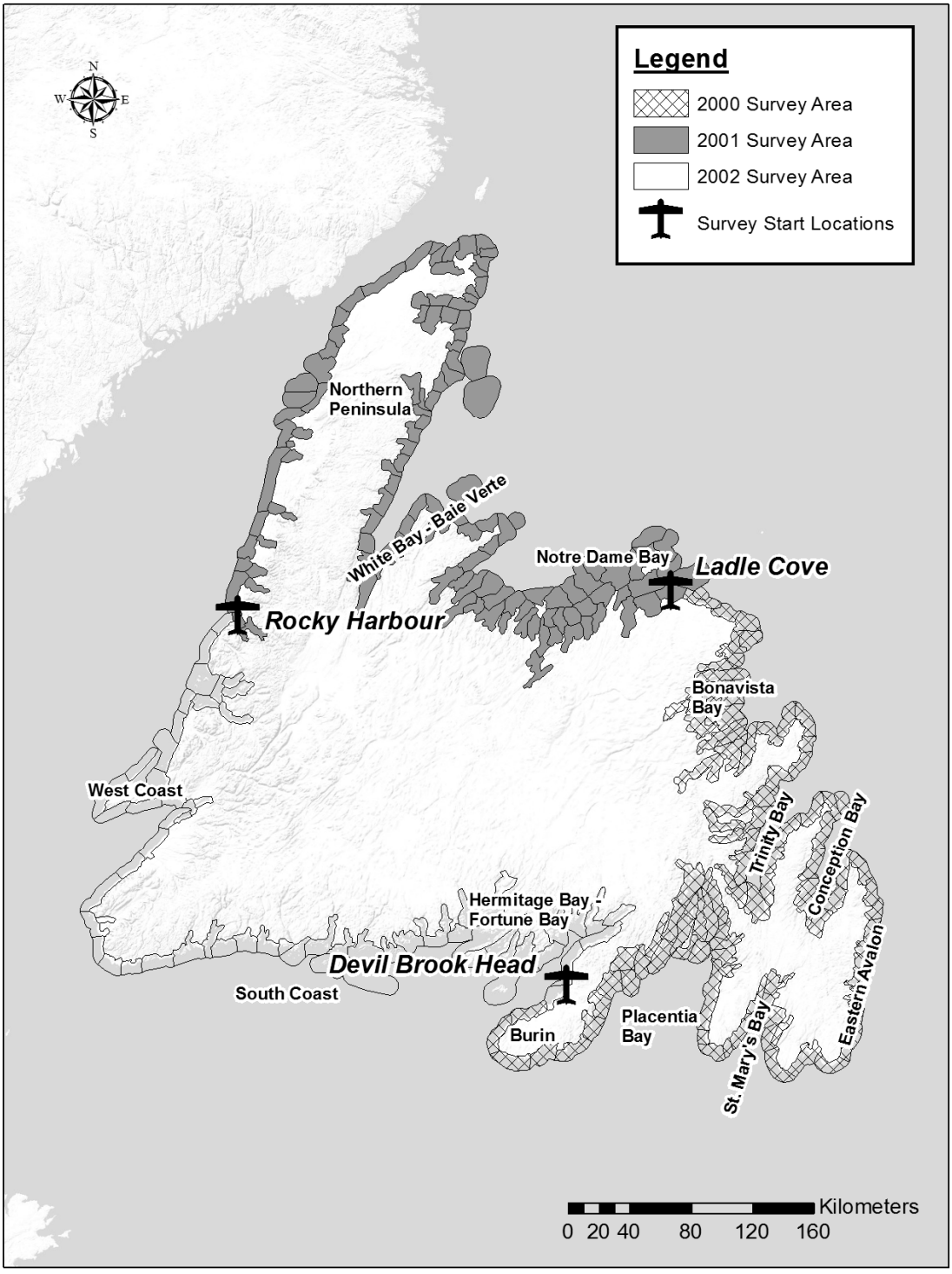


Figure 1. Coastal survey blocks for waterbird colonies in insular Newfoundland in 2000 (white blocks), 2001 (grey blocks), and 2002 (hatched blocks).

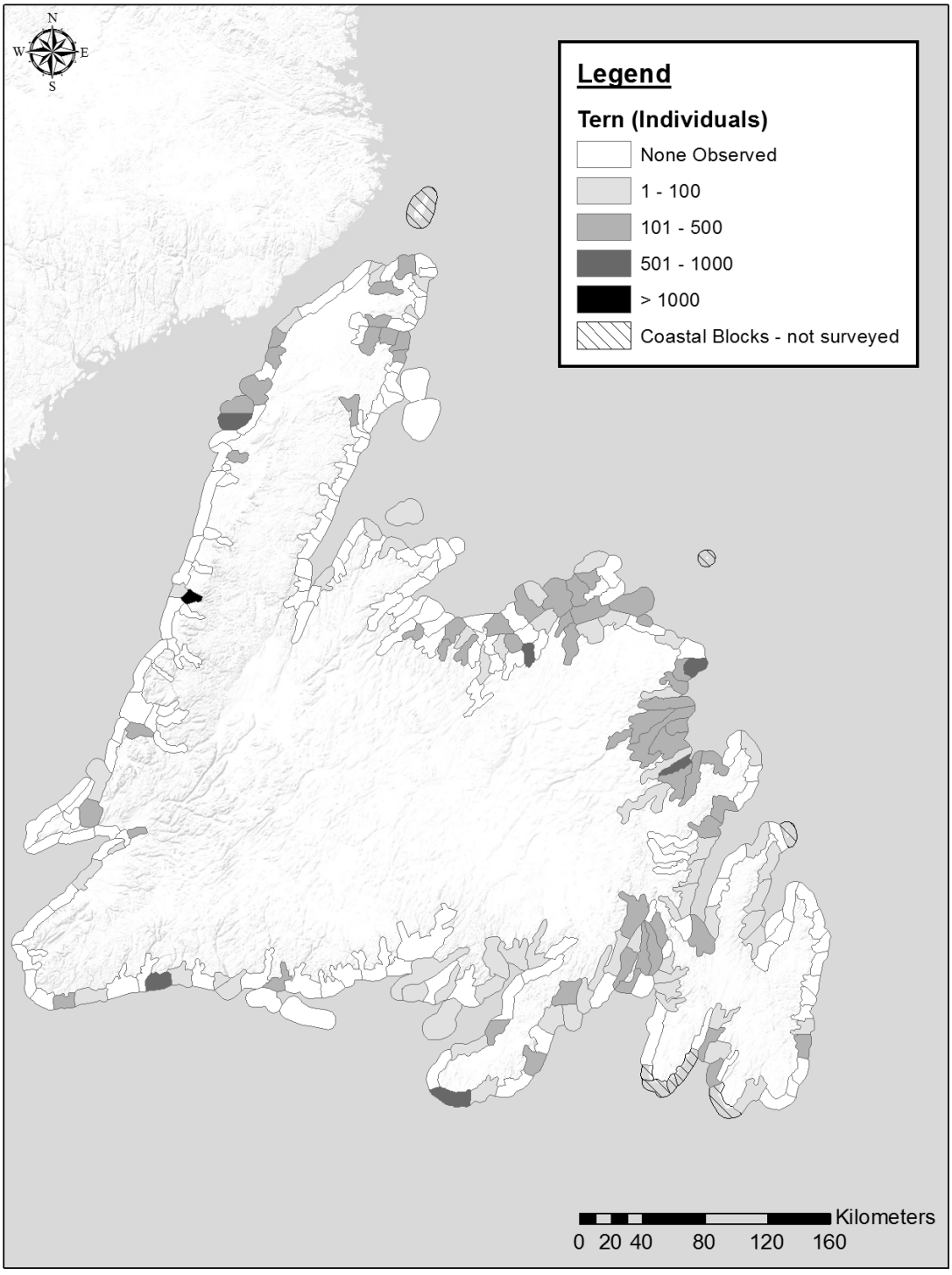


Figure 2. Total count of individual terns as identified during aerial surveys, per coastal survey block in Newfoundland, 2000-2002.

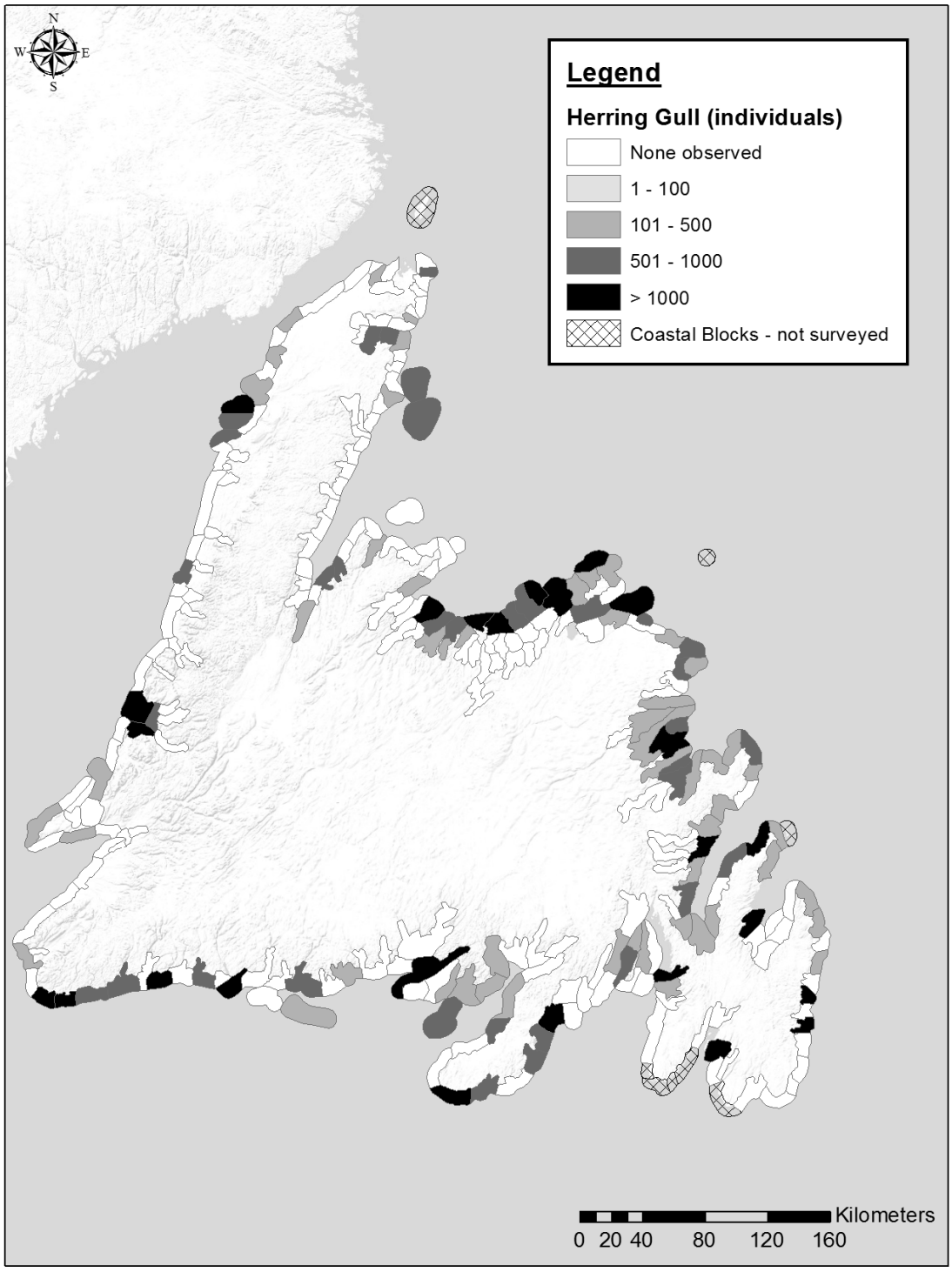


Figure 3. Sum of median counts for Herring Gulls identified during aerial surveys, per coastal survey block in Newfoundland, 2000-2002. Medians were estimated from quantitative categories of colony size (see methods): small (1-100 individuals), medium (101-500 individuals), large (501-1,000 individuals), and very large (>1,000 individuals).

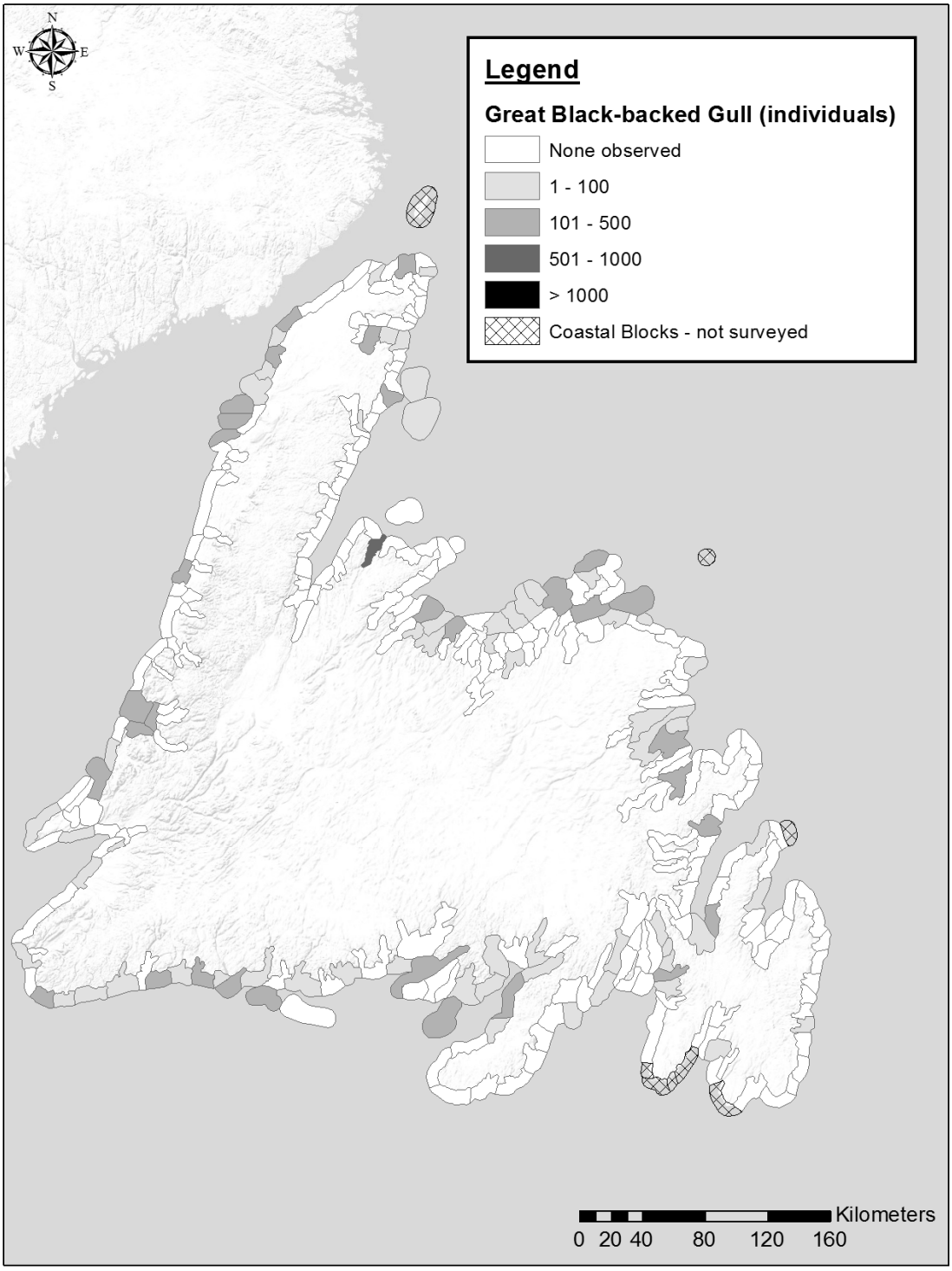


Figure 4. Sum of median counts for Great Black-backed Gulls identified during aerial surveys, per coastal survey block in Newfoundland, 2000-2002. Medians were estimated from quantitative categories of colony size (see methods): small (1-100 individuals), medium (101-500 individuals), large (501-1,000 individuals), and very large (>1,000 individuals).

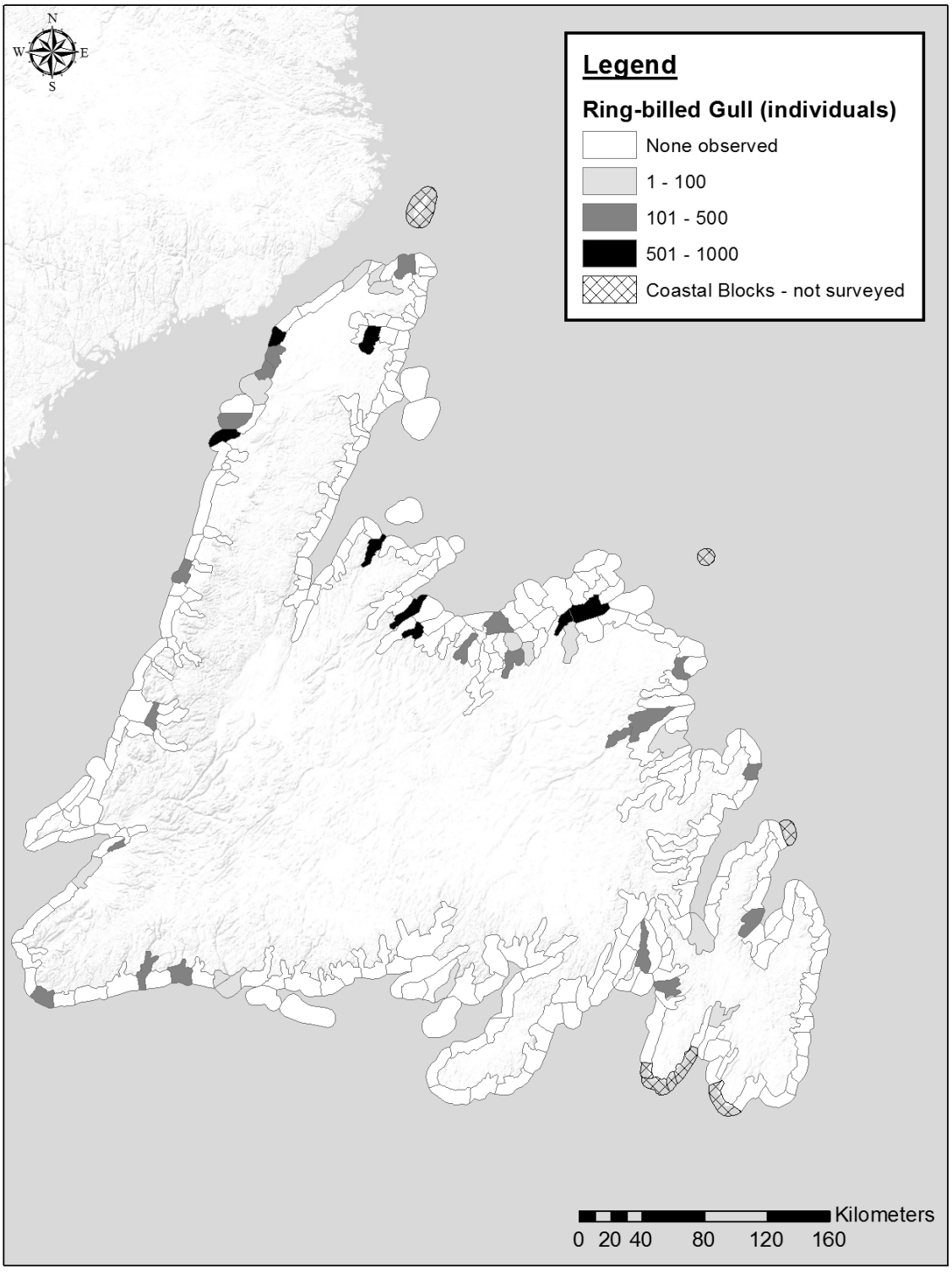


Figure 5. Sum of median counts for Ring-billed Gulls identified during aerial surveys, per coastal survey block in Newfoundland, 2000-2002. Medians were estimated from quantitative categories of colony size (see methods): small (1-100 individuals), medium (101-500 individuals), large (501-1,000 individuals), and very large (>1,000 individuals).

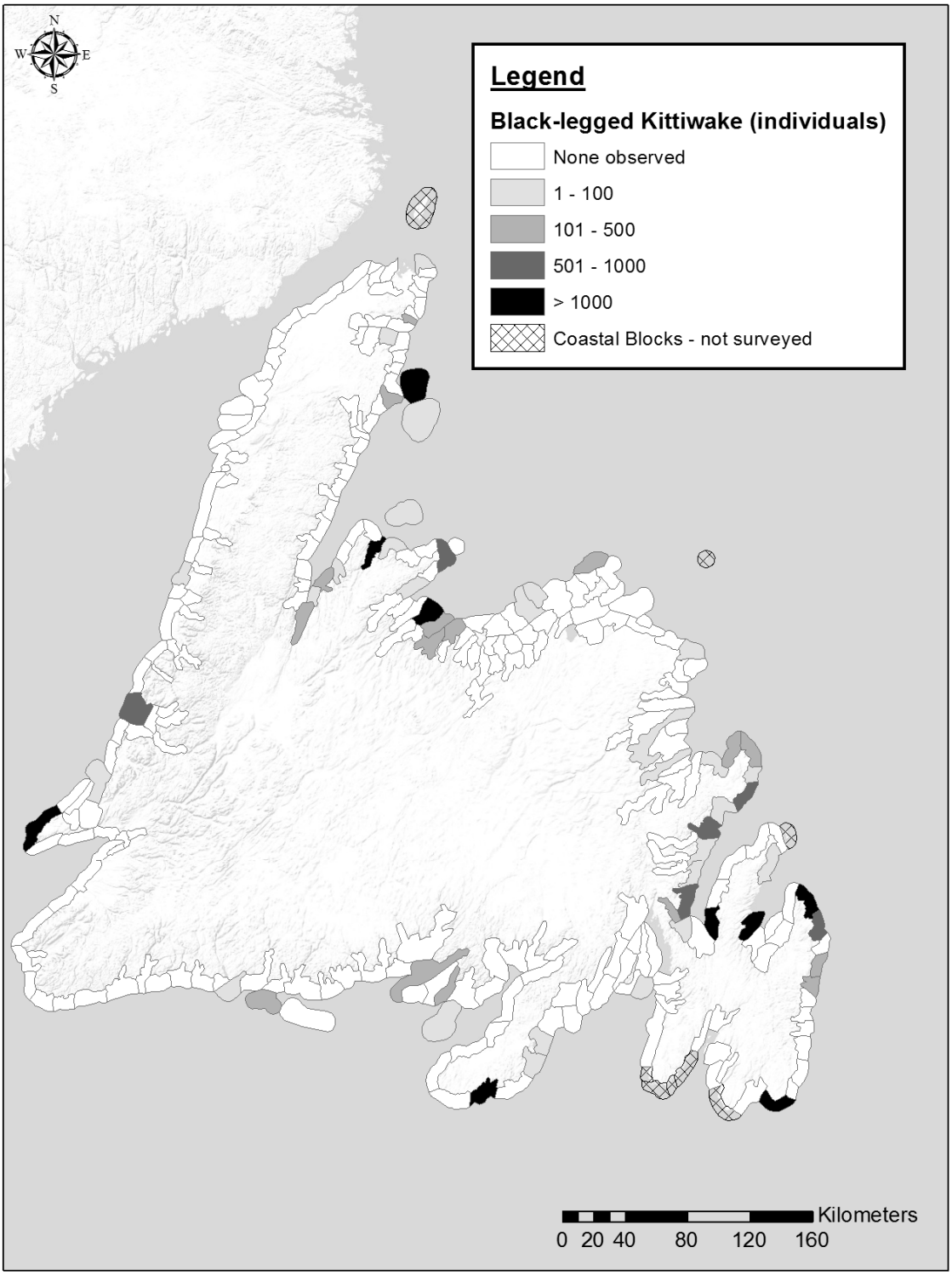


Figure 6. Sum of median counts for Black-legged Kittiwakes identified during aerial surveys, per coastal survey block in Newfoundland, 2000-2002. Medians were estimated from quantitative categories of colony size (see methods): small (1-100 individuals), medium (101-500 individuals), large (501-1,000 individuals), and very large (>1,000 individuals).

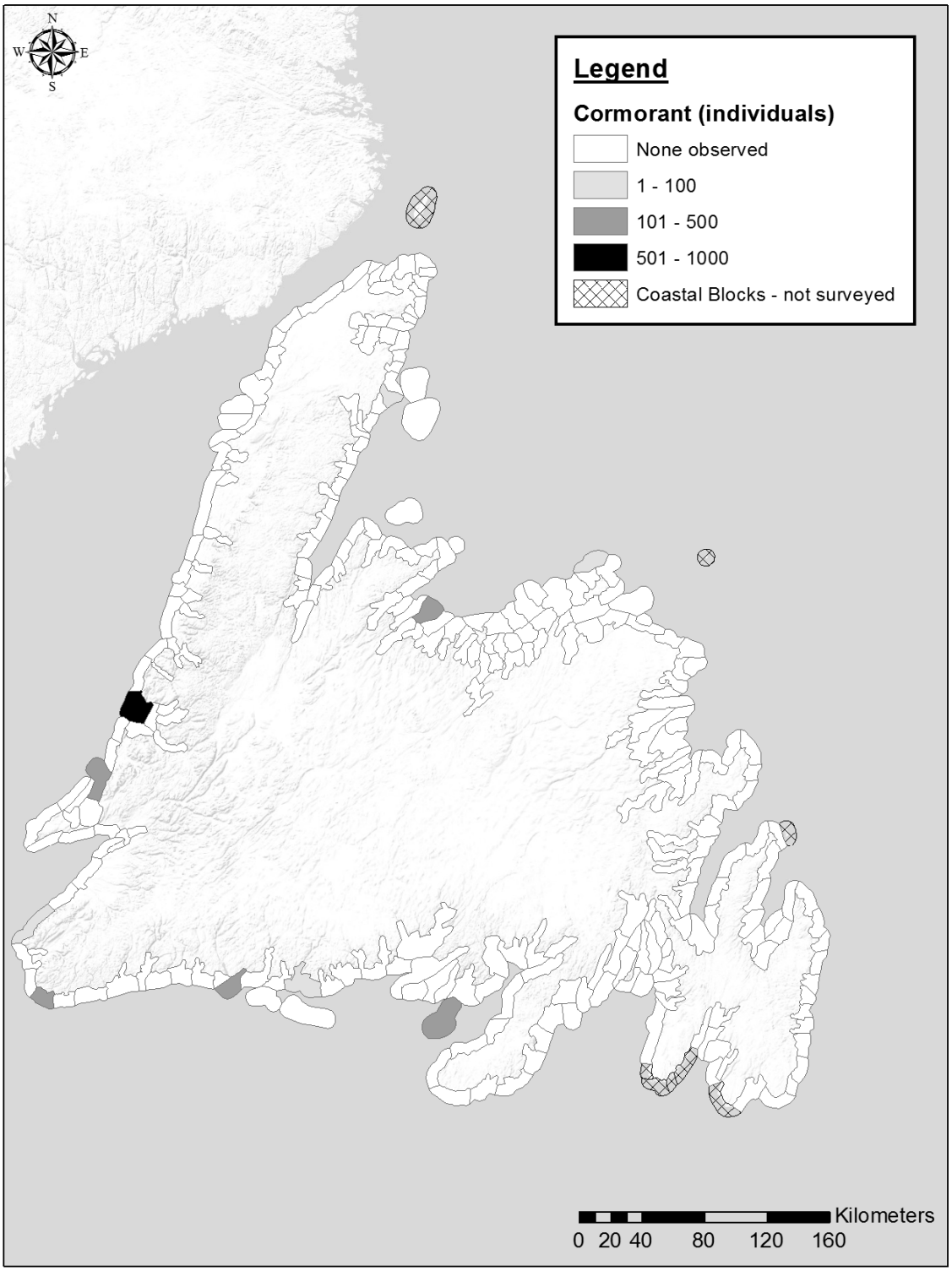


Figure 7. Sum of median counts for cormorant species identified during aerial surveys, per coastal survey block in Newfoundland, 2000-2002. Medians were estimated from quantitative categories of colony size (see methods): small (1-100 individuals), medium (101-500 individuals), large (501-1,000 individuals), and very large (>1,000 individuals).

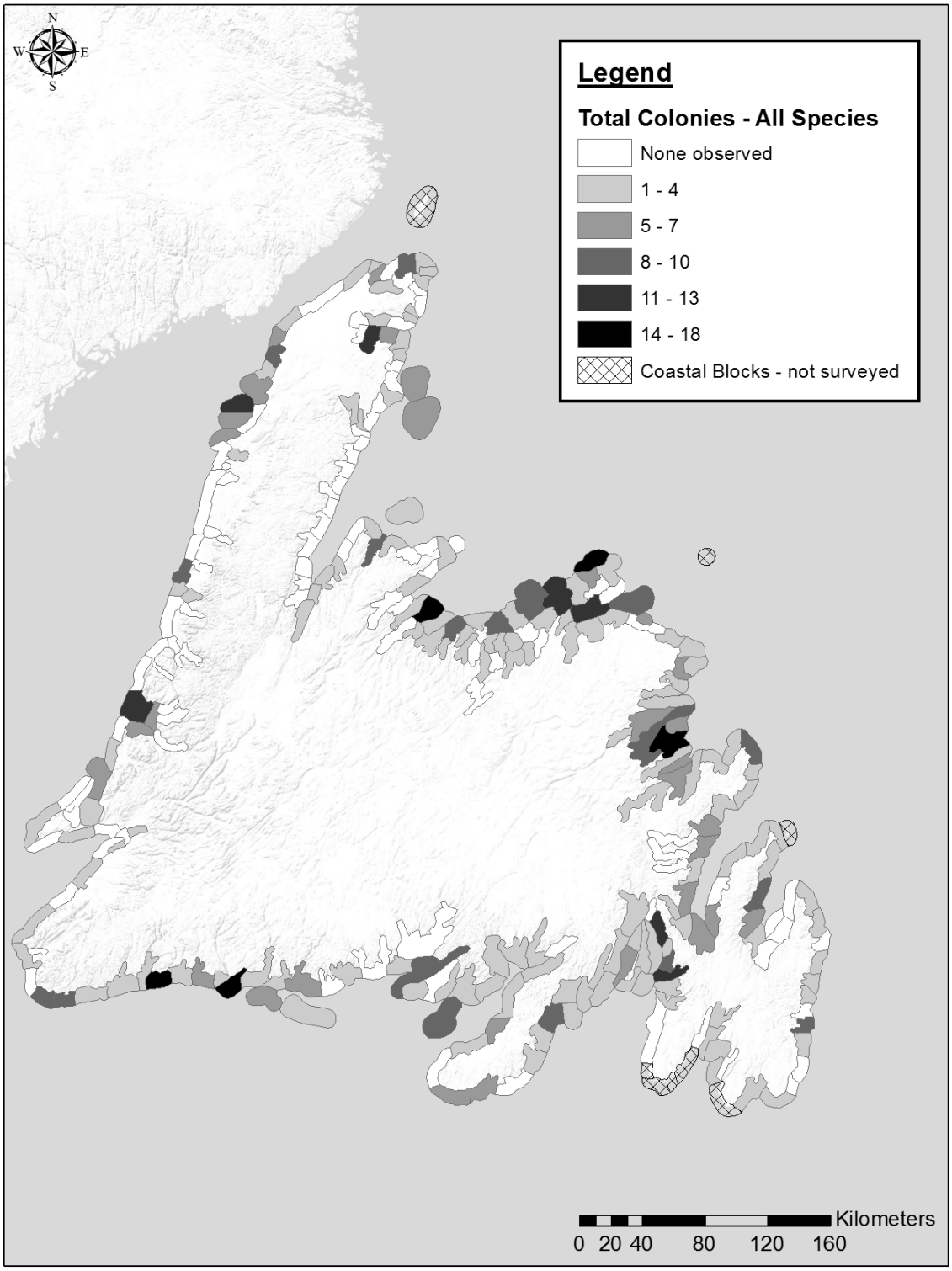


Figure 8. Total colonies identified from aerial surveys for all species combined, indicating coastal "colony hotspots".

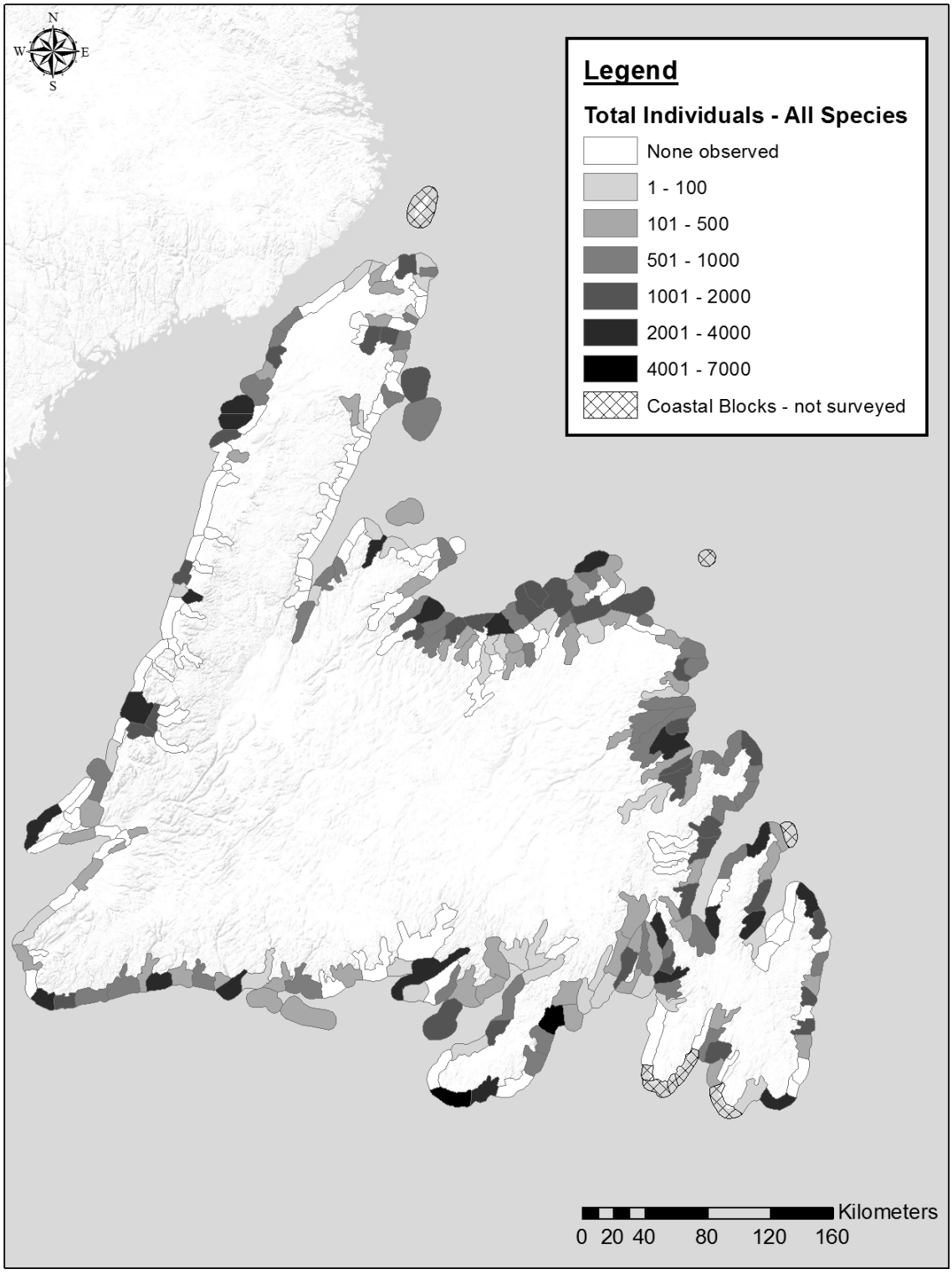
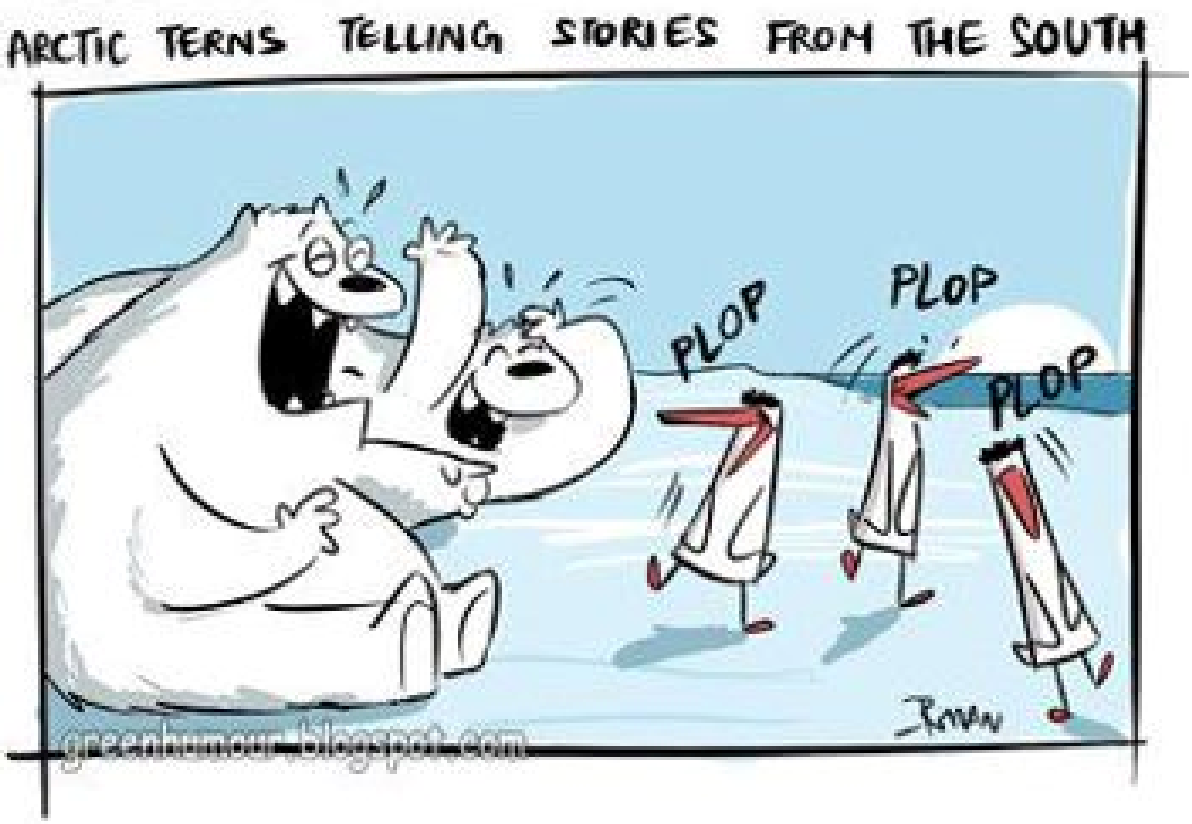


Figure 9. Total individuals counted from aerial surveys for all species combined, indicating overall "hotspots" of bird abundance.


ARCTIC TERNS TELLING STORIES FROM THE NORTH
GROWL!!
GRRR...


ARCTIC TERNS TELLING STORIES FROM THE SOUTH
PLOP
PLOP
PLOP