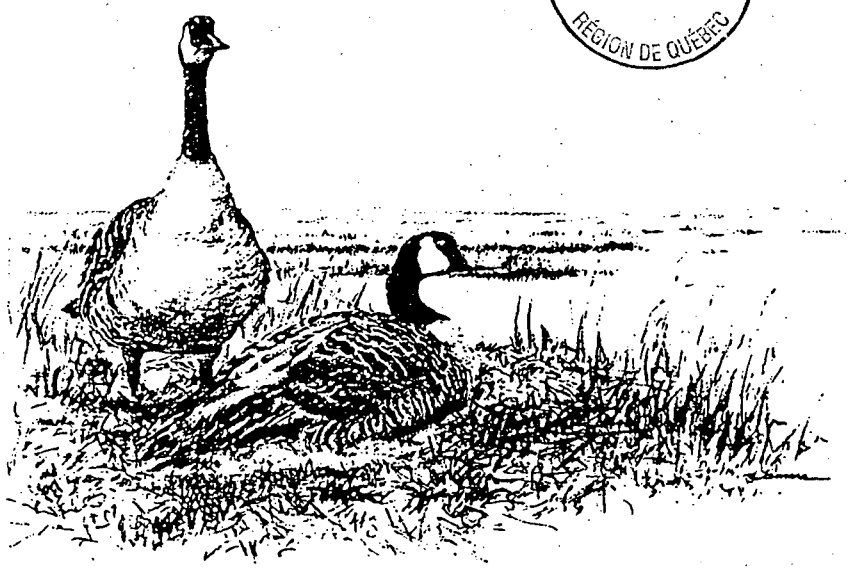
A BREEDING PAIR SURVEY OF CANADA GEESE IN NORTHERN QUEBEC - 1995



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INTRODUCTION

Population status of Canada geese (Branta canadensis) in the Atlantic flyway is monitored mainly by trends in mid-winter surveys (Hindman and Ferrigno 1990). These surveys include both resident and migratory Canada geese since they are not possible to differentiate at this time of year. Mid-winter estimates of Canada geese in the Atlantic flyway peaked during the early 1980's, but have since declined to about 60% of their former levels. Resident (i.e., non-migratory) Canada geese are believed to have increased dramatically during this period. Breeding pair surveys in mid-Atlantic and northeast states suggest that resident Canada goose numbers nearly doubled between 1990 and 1994 (Heusman, pers. commun.). Therefore, increasing resident goose numbers may be masking a more serious decline in the migrant population than indicated by mid-winter surveys. Concern for the migrant population has increased the need for breeding grounds surveys where estimates are not confounded by the presence of resident geese.

During the 1960's, aerial surveys identified the Ungava peninsula in northern Quebec as the primary nesting area for Atlantic flyway Canada geese (Kaczynski and Chamberlain 1968). Malecki and Trost (1990) used a more quantitative approach to estimate the number of breeding pairs throughout the boreal forest region and Ungava peninsula of northern Quebec in 1988. Their findings confirmed that the highest densities were located along the coastal areas of Ungava Bay and Hudson Bay. In 1993, an annual survey was begun in northern Quebec using methods similar to Malecki and Trost (1990) (Bordage and Plante 1993). The objective of this survey was to monitor the status of the migrant population by

estimating the number of breeding pairs. This report presents the results of the 1995 breeding grounds survey.

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STUDY AREA

The 1995 survey was conducted in northern Quebec, approximately north of 57° latitude (Figure 1). The survey sampled 3 regions based on Malecki and Trost's (1990) modification of northern Quebec's ecoregions (Gilbert et al. 1985). A fourth region, approximately bounded by 51° and 57° latitude, was included in the 1988 and 1993 surveys but was excluded thereafter. This boreal forest region has relatively low densities of nesting

geese (Malecki and Trost 1990, Bordage and Plante 1993) and little annual variation in goose density (Reed 1994).

The regions sampled in 1995 have been described by both Malecki and Trost (1990) and Bordage and Plante (1993). Briefly, region 1 included the inland tundra, region 2 consisted mainly of flat coastal tundra, and region 3 is a transition zone between boreal forest and tundra (Figure 1). The northern tip of the coastal zone from Ivujivik, southeast to about 150 km north of Kangirsuk, was excluded (Figure 1). Exploratory transects flown in 1993 indicated that this high elevation, mountainous area, had few geese.

METHODS

The 1995 survey followed the methodology of Malecki and Trost (1990). Aerial transects were flown in a Partenavia twin engine at an altitude of 30 m and a ground speed of approximately 140 km/h. Observers recorded the number of geese observed as singles, pairs, or in groups (3 or more geese) within 200 m of each side of the plane. In addition to geese, observers also recorded similar information for other waterfowl species. Transect width was calibrated before the survey began. Transects were flown using a global positioning system (GPS) to assist with navigation.

In past years, new transects were selected each year. In 1995, we surveyed the same transects used in 1994 and we plan to continue using these transects in the future. Using the same transects will allow us to better detect differences between years and to plan in advance for our aviation gas needs. The availability of aviation gas continues to be a problem that

greatly increases the cost and difficulty of survey logistics. The total length of transects to be sampled in each region was determined using variance estimates from the 1993 survey and a target of 10% coefficient of variation (Bordage and Plante 1994). Transects were randomly located within regions until the total length desired was reached. All transects were orientated along east-west lines.

The number of indicated breeding pairs on a given transect was the sum of the singles and pairs observed by both observers over the length of the transect. Density of breeding pairs within regions was estimated using quotient estimators while the total population density was estimated using a separate stratified quotient estimator (Cochran 1977). Variances were estimated using the jack-knife procedure (Cochran 1977).

RESULTS

Habitat Conditions

Transects were sampled from June 18-24, about 1 week earlier than in 1994. In general, the spring thaw was advanced relative to 1994. Discussions with local residents indicated that the Koksoak River at Kuujjuaq opened earlier than it had in many years and several weeks earlier than in 1994. Most snow and ice was gone by late-May. Habitat conditions observed during the survey supported this assessment. Along Ungava Bay, snow occurred only in drift areas and only large lakes were still ice-covered. Leaves on deciduous shrubs had emerged and new growth was visible in grasses and sedges. The spring thaw along the Hudson Bay coast seemed to be slightly later than the Ungava coast. Ice was still

present on large and medium sized lakes and patches of snow were more common. However, in general, this area also experienced a relatively early thaw.

Number of Breeding Pairs

The estimated number of breeding pairs for regions 1,2, and 3 combined was lower in 1995 (29,302 pairs) than in 1994 (40,086 pairs) ($P = 0.043$), 1993 (91,307 pairs) ($P < 0.001$), or 1988 (118,031 pairs) ($P < 0.001$) (Table 1). In region 1 (inland tundra), the number of breeding pairs was lower in 1995 than in 1988 ($P = 0.007$) but similar to 1993 ($P = 0.177$) and 1994 ($P = 0.401$) (Table 1). Breeding pair estimates for region 2 (coastal tundra) were lower in 1995 than in either 1988 ($P < 0.001$) or 1993 ($P < 0.001$) but were similar to 1994 ($P = 0.107$) (Table 1). No difference in the number of breeding pairs was detected in region 3 (transition zone) between 1995 and 1994 ($P = 0.373$), 1993 ($P = 0.126$) or 1988 ($P = 0.190$) (Table 1). On the 36 transects surveyed in both 1994 and 1995, the number of indicated pairs recorded in 1995 decreased on 22 transects and increased or remained the same on 14 transects compared to 1994.

Total Population Estimate

The total population estimate (breeding pairs + non-breeders) was similar between 1995 (238,706 individuals; SE = 30,568) and 1994 (258,332 individuals; SE = 48,504) ($P = 0.734$) and 1993 (241,407 individuals; SE = 30,599) ($P = 0.952$).

DISCUSSION

The number of breeding pairs decreased almost 27% between 1995 and 1994. The decrease occurred despite an early spring thaw and excellent habitat conditions. The smaller breeding population probably reflects the poor production that has occurred in previous years, particularly 1992. Age ratios in the 1992-93 harvest were the lowest recorded. Canada geese generally do not join the breeding segment until they are about 3 years old (Raveling 1981, Hardy and Tacha 1989). Therefore, few breeding pairs would be expected to be recruited into the breeding population in 1995 because of poor production in 1992.

Despite the reduced breeding population, the total population estimate indicated no change between 1995 and 1993 or 1994. This estimate includes breeding pairs, non-breeders (i.e., those not of breeding age), failed breeders, and molt migrants from other areas. Flightless geese banded on the Ungava peninsula are frequently recovered in the Mississippi flyway (Malecki and Trost 1990). Interpreting the results of the total population estimate is difficult without knowing the number, timing, and annual variation of molt migrants from other populations entering the surveyed area. For example, slight differences in survey timing may result in large variation in the number of molt migrants counted. In all years of this survey, flocks of nonbreeding geese were observed flying north along the Hudson Bay coast and then following rivers inland, presumably to molting areas.

In 1994, several broods were observed during June 30-July 2. Generally, the spring thaw occurred much later in 1994 than in 1995. Habitat conditions (i.e., presence of snow-free areas) in 1995 should have allowed geese to begin nesting 2-3 weeks earlier than in

1994. However, no Canada goose broods were observed during the 1995 survey. The ability of geese to begin nesting sooner in years of early thaws may be limited by factors such as their arrival date, physiological condition, or reproductive condition.

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Table 1. Number of Canada goose breeding pairs estimated for the Ungava Peninsula of northern Quebec.

REGION[a]	YEAR[b]	TOTAL AREA (KM^2)	AREA SAMPLED (KM^2)	n[c]	PAIRS /KM^2 (SE)	TOTAL PAIRS (SE)
1	1988	116,000	285	6	0.30 (0.084)	35,016 (9,744)
	1993	116,000	242	4	0.16 (0.063)	18,185 (7,308)
	1994	116,000	458	11	0.09 (0.022)	10,633 (2,542)
	1995	116,000	458	11	0.07 (0.014)	8,101(1,635)
2	1988	43,500	119	7	1.63 (0.245)	70,833(10,658)
	1993	43,500	420	25	1.31 (0.166)	57,122 (7,221)
	1994	43,500	491	21	0.48 (0.062)	20,917 (2,692)
	1995	43,500	488	21	0.36 (0.041)	15,705 (1,799)
3	1988	63,200	171	3	0.18 (0.067)	11,491 (4,253)
	1993	63,200	176	6	0.26 (0.110)	16,432 (6,952)
	1994	63,200	265	4	0.13 (0.038)	8,124 (2,421)
	1995	63,200	265	4	0.09 (0.027)	5,496 (1,702)
1,2,3	1988	222,700	575	16	0.53 (0.068)	118,031(15,144)
	1993	222,700	838	35	0.41 (0.056)	91,307(12,471)
	1994	222,700	1,214	36	0.18 (0.020)	40,086 (4,454)
	1995	222,700	1,211	36	0.13 (0.013)	29,302 (2,967)

[a] Region 1 - inland tundra; Region 2 - coastal tundra; Region 3 - transition zone between boreal forest and tundra.

[b] 1988 (Malecki and Trost 1990); 1993 (Bordage and Plante 1993); 1994 (Harvey 1994); 1995, this report.

[c] Number of transects.

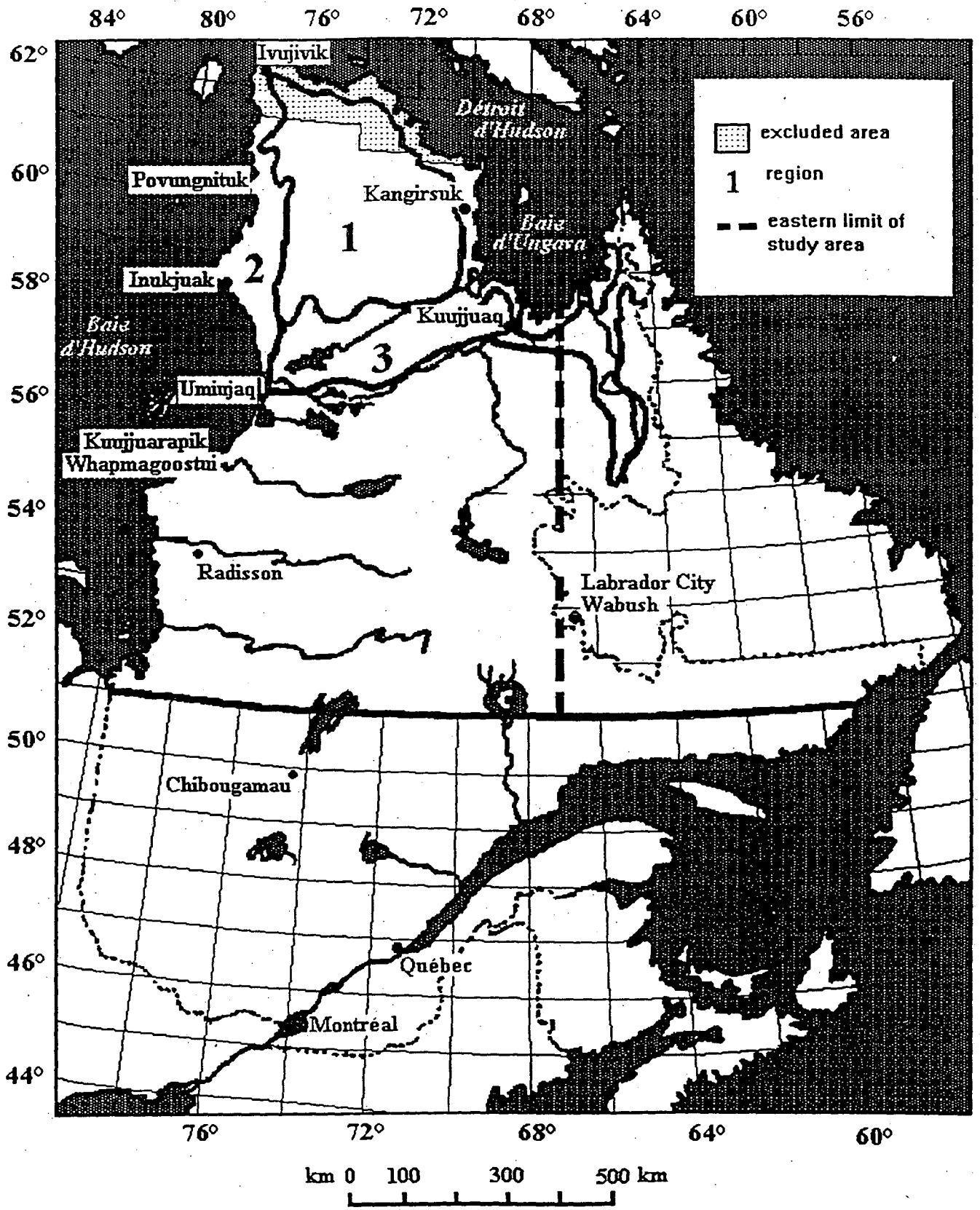

Figure 1. Study area for 1995 breeding pair survey in northern Quebec.