PRODUCTION OF EPP CANADA GEESE NEAR CAPE CHURCHILL IN 2006

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Abstract:--Nest searching for Eastern Prairie Population (EPP) Canada geese was conducted on the Nestor One Study Area near Cape Churchill, Manitoba from 25 May - 2 June 2006. A total of 70 Canada goose nests was found in initial searches of 732 ha of wetlands in 14 primary sample areas, 52 nests were located in initial searches of 6 coastal sample areas, and 45 nests were located during initial searches of 3 additional sample units south and east of primary units. Eleven nests were located subsequent to initial nest searches for a total of 178 nests located on the Nestor One study area in 2006. Nest density (unadjusted for observability) in the primary sample areas was 9.56 nests per 100 ha of wetland— the highest nest density recorded on the Nestor One study site since 1990, similar to that observed in 2005, and >10 times higher than that estimated in 2004, a year of record low nesting density. Clutch size in 158 nests with eggs

present when located averaged 4.07—greater than the long-term mean of 3.87 (1976-2005) and near the clutch size expected based on the established relationship between mean clutch size and median hatch date. Estimated median hatch date was 17 June, and ranged from 9 - 23 June 2006, with 98.7% (n = 154) of nests initiated on or before 23 May 2006 (the date used to define "bust" production). Nest success calculated as the average apparent success rate of nests active when first located during initial nest searching (0.76) and the 28-day survival of nests based on exposure days through nest location (0.72) was 0.74—higher than the average estimated nest success of 0.63 observed during the 1990s. Based on these estimates of nest density, clutch size, and nest success, gosling production at Nestor One was approximately 28.01 per 100 ha of wetland—productivity similar to that observed in the early 2000s and mid-1990s, and slightly below the average of 33.40 goslings per 100 ha of wetlands observed during the period 1976-2005. In 2006, we conducted supplemental field investigations near the mouth of the Broad River as part of an ongoing research project, and data resulting from these efforts provide additional information about EPP Canada goose production.

In 2006, data on nest density and reproduction of Eastern Prairie Population (EPP) Canada geese were collected near Cape Churchill to:

1) obtain production indices for regulatory purposes;
2) aid in relating density, clutch size, and nest success of geese to long-term variation in weather, predation, and competition from snow geese, and
3) locate nesting Canada and snow geese as part of a study of factors affecting nest depredation.

We also collected nest data near the mouth of the Broad River—an area where nest data have been collected in the past.

Methods

Data on numbers of nesting Canada geese, clutch sizes, and nest success were collected in 14 primary and 9 supplemental sample areas near Nestor One, 8 km south of Cape Churchill, Manitoba. Detailed methods and study areas were described by Didiuk (1980) and Walter (1999). Two survey crews searched sample areas for nesting birds and subsequently assessed nest fate of Canada goose nests located during surveys. The first crew conducted systematic searches of primary and supplemental sample areas from 25 May - 2 June 2006. The second crew monitored nests located by the first crew and assisted in data collection related to assessing historic collared lemming (*Dicrostonyx richardsoni*) abundance, current arctic fox (*Alopex lagopus*) abundance, and anuran distribution and relative abundance. In addition, systematic nest searches were conducted near the mouth of the Broad River (24 - 30 May 2006) as part of ongoing research and monitoring efforts.

Results and Discussion

At Churchill, there were 532 heating degree-days in May 2006, lower than the 593 heating

degree-days recorded in May 2005, and near the long-term average for May (584, 1972-2004). Low snow accumulation and higher than average temperatures in April contributed to early to average spring phenology at the Nestor One study area, with approximately 25% snow cover in early June. Field activities were planned to coincide with an average hatch at Cape Churchill— the first crew arrived in Camp beginning 23 May 2006, during early incubation. The estimated date of the earliest Canada goose egg laid on the study area in 2006 was 6 May, over 3 weeks earlier than in 2004 and 10 days earlier than 2005.

Density of Nests:--A total of 70 nests was found in 2006 during initial searches of 732 ha of wetlands in 14 primary sample areas near Nestor One. Fifty-two nests were located in searches of 6 coastal sample areas and 45 nests were located in 3 additional sample units (units 14E, 14S, and 8S) south and east of the 14 primary units. Eleven nests were located subsequent to initial surveys for a total of 178 Canada goose nests located on the Nestor One study area in 2006. Nest density (unadjusted for observability) in the primary sample areas was 9.56 nests per 100 ha of wetland— the highest nest density recorded on the Nestor One study site since 1990, and >10 times higher than that estimated in 2004 (Table 1). Nest density estimated in 2006 was higher than that expected based on the long-term trend in nest density at Nestor One (Fig. 1).

Clutch Size:--Mean clutch size (n = 158 nests with eggs present when located) of Canada geese was 4.07 in nests located during initial nest searches at Nestor One (Table 2) in 2006; greater than the mean clutch size observed at Nestor One during the period from 1976-2005 (Table 1) and near that expected from the established relationship between clutch size and median hatch date (Fig. 2).

Hatch Dates and Nest Success:--Ages of eggs were determined by flotation and candling in 158 Canada goose nests located during initial nest searching at Nestor One in 2006. Mean stage of incubation at the time of first visit was 9 days and median hatch date predicted from ages of eggs in the nest was 17 June, ranging from 9 - 23 June, with 98.7% (n = 154) of nests initiated on or before 23 May 2006 (the date used to define "bust" production). Predicted hatch date for 92.9% (n = 145) of nests was within 5 days of the predicted median hatch date. Of nests found during initial nest searching (n = 167), 9 (5.4%) had been destroyed prior to being located. Nest success (28-day survival) calculated from the first day of incubation to the first nest visit was 0.723. This estimate is corrected for differences in the probability of discovery of active and depredated or abandoned nests (0.77 and 0.39, respectively; Walter 1996). Apparent nest success, calculated from termination visits (visits to the nest after eggs had hatched or the nest had been destroyed or abandoned) to nests that were active when first located, was 0.764 compared to 0.85 in 2001, 0.36 in 2002, 0.68 in 2003, 0.15 in 2004, and 0.81 in 2005. Nest success calculated as the average of apparent success of nests active when first located during initial nest searching (0.76) and the 28-day survival of nests based on exposure days (0.72) was 0.74—higher than the average nest success of 0.63 observed during the 1990s (Table 1).

Production Forecast for 2006:-- Early to average spring phenology at Cape Churchill apparently resulted in average productivity of Canada geese at Nestor One in 2006. The median estimated hatch date of Canada geese at Nestor One in 2006 was 17 June—slightly earlier than the average hatch date during the period 1976-2005 (Table 1). The mean clutch size of 4.07 was above that

predicted from the established relationship between breeding phenology and clutch size at Cape Churchill (Fig. 2). Nest density was 9.56 nests per 100 ha of wetland in the 14 primary survey areas at Nestor One—the highest recorded since 1990 (Fig. 1). Nest success was higher than the average nest success observed during the 1990s (Table 1). Based on these estimates of nest density, clutch size, and nest success, gosling production at Nestor One was approximately 28.01 per 100 ha of wetland—production similar to that observed at Cape Churchill in the early 2000s and mid-1990s. Ninety-seven percent of nests were initiated on or prior to 23 May, the date used in the EPP plan as indicative of a reproductive "bust."

Fox density on the study area appeared to be relatively high, based on observations of foxes during field activities and indications of activity at dens. Only 6 (28.6%) of 21 dens visited exhibited evidence of fox occupation, and 12 (57.1%) dens exhibited evidence of intermittent fox use. Foxes were observed on the study area frequently during nest searching. Lemming density appeared to be medium to high on the study site, with burrows, winter nests, droppings, and lemmings observed during nest searching.

Nineteen snow goose nests were located on the study area in 2006 (10 in the core study area). In 2001, 55 snow goose nests (32 in the core study area) were located during nest searching. In 2002, 6 snow goose nests were located in the core study area, and 8 snow goose nests were located in total. In 2003, 94 snow goose nests were located at Nestor One, in 2004, no snow goose nests were located on the study area, and in 2005, 69 snow goose nest were located on the study area. The number of snow geese nesting on the study area appears to be increasing, perhaps as a result of birds produced on the study area in 2001 returning as breeders in 2003, but a late year in 2004 with high snow cover through mid-June apparently resulted in reduced nesting or relocation by nesting snow geese away from Nestor One. In 2005, snow geese nested at densities similar to those observed in 2001 and 2003, however in 2006 snow goose nest density was lower than expected based on recent trends.

Broad River:--In 2006, we searched for nests near the mouth of the Broad River, in part to repeat surveys that had been conducted in the early 1990s and late 1980s. At the Broad River, we located 414 Canada goose nests, 361 of which were active when found. Apparent nest success was 0.80, and Mayfield nest success based on the period from discovery to fate, was 0.65. Clutch size averaged 4.41 (n = 359), with estimated median hatch of 11 June 2006. Canada goose nest density was 58.89 nests/100 ha. This was higher than the average nest density of 24.97 nests/100 ha calculated from searches of the same units from 1987 to 1989 and again in 1994 and 1995, and higher than the 55.90 nests/100 ha of nesting habitat observed in 2005. In the surveyed area, we also located 283 lesser snow goose nests—more than the 150 snow goose nests found in 2005. Of 4 fox dens checked for occupancy, 2 exhibited evidence of fox occupation, and 1 was occupied by a wolf (*Canis lupus*).

Literature Cited

Didiuk, A.B. 1980. Summer movements and distribution of Canada geese near Cape Churchill, Manitoba. M.S. Thesis, Univ. of Wisconsin, Madison. 44pp.

Walter, S.E. 1996. Aspects of Canada goose nesting ecology in northern Manitoba: Age, visibility, and Arctic fox predation. M.S. Thesis, Univ. of Wisconsin, Madison. 63pp.

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Table 1. Indices to production of Canada geese at Nestor One near Cape Churchill, Manitoba, 1976-2006.

Year	Median Hatch Date	Nests per 100 ha[a]	Mean Clutch	% Nest Success[b]	Goslings per km^2
1976	21 June	37	4.2	87	135
1977	15 June	33	4.3	97	137
1978	1 July	20	3.2	76	49
1979	30 June	26	4.3	85	95
1980	9 June	27	4.6	65	81
1981	23 June	21	4.1	57	49
1982	14 June	23	4.4	60	61
1983	10 July	4	3.2	51	7
1984	26 June	13	3.7	46	22
1985	21 June	16	3.4	45	24
1986	23 June	14	4.2	52	30
1987	30 June	5	3.4	62	11
1988	28 June	13	3.7	65	31
1989	29 June	10	3.5	42	15
1990	29 June	12	4.0	47	22
1991	23 June	9	4.1	69	24
1992	1 July	5	3.5	40	7
1993	16 June	8	4.0	42	14
1994	28 June	6	3.9	79	17
1995	30 June	5	3.9	63	18
1996	29 June	6	4.0	63	15
1997	28 June	6	4.2	87	20
1998	13 June	6	4.6	67	19
1999	15 June	3	3.9	72	9.3
2000	29 June	3	3.2	19	1.9
2001	18 June	8	4.5	83	30.2
2002	4 July	6	3.6	57	11.9
2003	25 June	8	4.5	63	22.2
2004	11 July	<1	2.2	24	0.4
2005	28 June	9.42	3.79	66	22.95
2006	17 June	9.56	4.07	74	28.01
Mean $\pm$ SD	23 June $\pm$ 8	12.0 $\pm$ 9.2	3.87 $\pm$ 0.52	61.5 $\pm$ 18.2	33.2 $\pm$ 34.7

[a]Calculated as the number of nests per 100 ha of wetland habitat in the 14 primary sample areas on the Nestor One study area.

[b]Calculated as the average of 1) the probability of nest survival from the onset of incubation to the first visit (adjusted for visibility bias) and 2) apparent nest success from the first visit to final nest fate.

Table 2. Clutch size of Canada geese at Nestor One, Broad River and, Churchill, 2006.

Clutch Size									
1	2	3	4	5	6	7	No. Destroyed Clutches[a]	Total No. Nests	Mean Clutch Size[b]
[c]4	11	29	52	50	12	0	9	167	4.07
[d]3	26	53	82	133	57	5	53	412	4.41

[a]The number of nests that had been destroyed when they were first located.
[b]Calculated from the number of eggs in nests that survived the interval between onset of incubation and our first visit.
[c]Nestor One clutch size distribution
[d]Broad River clutch size distribution

Figure 1. Canada goose nest density estimated for the core Nestor One study area near Cape Churchill from 1976 through 2006. Nest density is reported as the $\log_{10}$ of nests per 100 ha of wetland in the 14 primary nest areas searched at Nestor One. (Regression equation: LOG NEST DENSITY = 56.08 – 0.02769(YEAR); $r^2 = 0.5239$, $F_{1,29} = 31.91$, $P < 0.0001$).

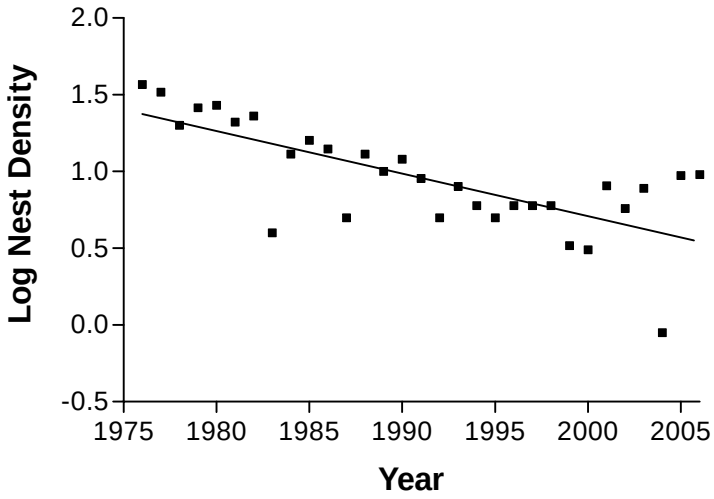

Figure 2. Relationship between mean clutch size and median hatch date for Canada geese nesting near Cape Churchill from 1976 through 2005. (Regression equation: MEAN CLUTCH SIZE = 12.51 – 0.04927(MEDIAN HATCH DATE [Julian date]); $r^2 = 0.547$, $F_{1,29} = 34.98$, $P < 0.0001$).