Breeding ground banding of Atlantic Population Canada Geese in northern Québec – 2015

During the annual banding program in northern Quebec for Atlantic Population Canada Geese, small Richardson's (Cackling) geese—which nests in small numbers in the region—are occasionally captured and banded. In 2015, the Hudson Bay and Ungava Bay banding crews banded 3 of these small geese in addition to 3,165 Canada Geese and 4 Lesser Snow Geese (including one gosling).

A Progress Report Prepared for the Atlantic Flyway Council & Migratory Bird Technical Section

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INTRODUCTION

After a sharp decline in the size of the Atlantic Population of Canada Geese in the early 1990s, a program of breeding ground banding was initiated in 1997. Canada Geese were banded in the Ungava region of northern Québec in the 1960's (13,069) and late 1980's (5,662). Only about 200 of those banded in the 1980's, however, were banded in the Hudson Bay coastal zone which harbours over half of the entire Ungava Peninsula breeding population (Harvey, Rodrigue and Earsom 2015). The present program of breeding ground banding includes both the Hudson Bay and Ungava Bay portions of the breeding range. The objective of the banding program is to create a marked population of geese from representative portions of the breeding range for studies of adult and juvenile survival, harvest rate, timing and distribution of harvest, and population delineation.

SUMMARY OF WORK CONDUCTED IN 2015

We banded brood flocks of Canada Geese along the northern Hudson Bay coast (1 crew) and along the south and west coasts of Ungava Bay (1 crew) between 5 and 14 August. Helicopters were used to round up and help drive flightless geese toward funnel-shaped traps. When conditions were favourable, each crew conducted 5-6 catches per day. Banding operations went very well for both crews; one full day and 2 half days were lost for the Ungava Bay crew and Hudson Bay crew, respectively, due to inclement weather. In total, 1453 and 1712 Canada Geese were banded along Hudson Bay and Ungava Bay respectively. The immature:adult (I:A) ratio in 2015 for Hudson Bay was considerably lower than its long-term average (1.01 vs 1.34)—but equal or higher than the ratio for 3 of the past 4 years—while for Ungava Bay it was slightly above its long-term average (1.59 vs 1.52); in 2015 the I:A ratio was significantly higher ($P<0.01$) along Ungava Bay than along Hudson Bay. Combining both regions, in 2015 the ratio of goslings to adult females with brood patches (I:BP) per catch, a good productivity index, as well as the I:A ratio were below their long-term averages (I:BP: 3.21 vs 3.29; I:A: 1.23 vs 1.41). In conclusion, productivity of AP Canada Geese from the Ungava Peninsula in 2015 was average for Ungava Bay but below average for Hudson Bay.

RESULTS

Hudson Bay

From 7 to 14 August, 1453 Canada Geese were captured and banded along Hudson Bay (Table 1). Of this total, there were 721 adults and 732 goslings. The weather was good throughout the banding period with only 2 half days lost due to inclement weather. An additional 51 previously banded adults were recaptured, and all were originally banded in northern Quebec between 1997 and 2014. A total of 40 catches were made by the crew, with a mean of 36 geese per catch (range: 13–88 geese); this mean is very close to the mean for 2014 which was 35 geese. All captured flocks contained goslings and all catches were made in an area extending approximately 185 km along the Hudson Bay coast and extending 40 km inland, specifically from the Sorehead River in the north to the Mariet River in the south. Overall, in 2015 AP Canada Goose productivity along eastern Hudson Bay was, for the third consecutive year, below average.

Ungava Bay

From 5 to 10 August, 1712 geese were banded along Ungava Bay. Of this total, 593 were adults and 1119 were goslings (Table 2). An additional 56 previously banded adults were recaptured and all were originally banded in northern Quebec between 1997 and 2014. A total of 26 catches were made, with a mean of 66 geese per catch (range: 12–161 geese); this mean is lower the long-term average of 73 geese. All captured flocks contained goslings and all catches were made between Leaf River in the south to north of Virgin Lake (near Kangirsuk). Number of geese was relatively poor in the Aupaluk area but excellent further north (towards Payne Bay and Virgin Lake area). Overall, in 2015 AP Canada Goose productivity along Ungava Bay was average.

Table 1. Atlantic Population Canada Geese banded along Hudson Bay, Nunavik, 1997-2015.

Year	Adults	Young	Total	Imm: Ad[1, 2]	Imm: BP[2, 3]	Recap-tures[4]	Banding Dates	No. catches	Mean no. geese/ catch[2, 5]	Mean brood size (helico.)[2, 6]
1997	355	793	**1148**	1.94	4.14	5	28/07 - 09/08	32	37	3.14
1998	1360	2461	**3821**	1.72	4.17	69	29/07 - 08/08	63	62	3.62
1999	2018[7]	3314	**5332**	1.45	3.82	146	30/07 - 09/08	133	41	3.45
2000	1285	1334	**2619**	1.00	2.26	90	05/08 - 15/08	80	34	3.03
2001	1845	4103	**5948**	1.89	3.54	232	01/08 - 11/08	83	75	3.38
2002	2011	2547	**4560**[8]	1.21	2.89	141	07/08 - 18/08	110	43	3.17
2003	2092	3736	**5828**	1.71	3.80	283	02/08 - 11/08	88	69	3.27
2004	1226	1662	**2888**	1.23	3.83	139	06/08 - 15/08	68	45	2.93
2005	1209	2022	**3231**	1.34	3.23	76	01/08 - 11/08	91	36	3.28
2006	1675	3296	**4971**	1.66	4.03	123	31/07 - 13/08	96	53	3.10
2007	1043	1216	**2259**	1.14	2.76	82 (6)	06/08 - 14/08	82	29	2.54
2008	1169	2066	**3235**	1.67	3.77	98	02/08 - 09/08	67	50	3.17
2009	1113	1281	**2394**	1.09	2.53	61 (4)	05/08 - 13/08	78	32	2.58
2010	1015	1388	**2403**	1.22	2.82	82	06/08 - 14/08	84	30	2.66
2011	576	470	**1046**	0.84	1.95	32	05/08 - 18/08	42	26	2.57
2012	803	1344	**2147**	1.41	2.97	56 (6)	04/08 - 14/08	47	47	2.86
2013	839	801	**1640**	0.95	2.25	63	03/08 - 12/08	49	35	2.49
2014	710	710	**1420**	1.02	2.31	57	07/08 - 16/08	42	35	2.54
2015	721	732	**1453**	1.01	2.59	51	07/08 - 14/08	40	36	2.61
Total	23065	35276	**58343**[8]	1.34	3.14	1886 (16)	27/07 - 18/08	1375	43	2.97

[1] Immature (gosling) to adult ratio at time of banding drive (capture), including birds not banded.
[2] In the "Total" row, the average across years is presented.
[3] Immature (gosling) to adult female with brood patch ratio at time of banding drive (capture), including birds not banded.
[4] Includes birds fitted with a new band (i.e., old band replaced). Does not include the number of Cackling Goose (Richardson's) recaptures—these numbers are presented in parentheses.
[5] Includes newly banded geese, recaptures, and birds released unbanded but excludes repeats (i.e., individuals previously caught the same year).
[6] The mean brood size of individual family groups observed by the author during annual banding program (i.e., from helicopter in search of moulting family groups to capture and band).
[7] Includes 2 adult females captured in June on their nest.
[8] Includes 2 whose ages were not recorded.

Table 2. Atlantic Population Canada Geese banded along Ungava Bay, Nunavik, 1997-2015.

Year	Adults	Young	Total	Imm: Ad[1, 2]	Imm: BP[2, 3]	Recap-tures[4]	Banding Dates	No. catches	Mean no. geese/ catch[2, 5]
1997	917	1081	**1998**	1.17	2.56	44	30/07 - 05/08	22	99
1998	675	1332	**2007**	1.67	3.54	84	26/07 - 03/08	23	91
1999	1039	1200	**2239**	1.15	2.89	185	27/07 - 05/08	28	89
2000	1032	896	**1928**	1.16	2.76	67	28/07 - 05/08	37	55
2001	943	1568	**2511**	1.88	3.27	35	31/07 - 10/08	43	60
2002	1103	1541	**2644**	1.40	3.42	61	30/07 - 08/08	37	75
2003	1451	2713	**4164**	1.77	3.85	182	29/07 - 08/08	49	90
2004	928	766	**1694**	1.08	2.71	98	29/07 - 08/08	31	59
2005	1006	1888	**2894**	1.94	4.11	90	01/08 - 11/08	34	92
2006	1234	1377	**2611**	1.40	3.00	96	27/07 - 05/08	37	76
2007	1050	918	**1968**	1.46	2.83	101	31/07 - 10/08	27	86
2008	1011	2223	**3234**	2.39	5.15	106	01/08 - 08/08	41	83
2009	277	259	**536**	1.05	2.56	22	02/08 - 06/08	11	52
2010	809	1387	**2196**	1.90	3.92	46	01/08 - 07/08	32	75
2011	437	646	**1083**	1.45	3.57	42	01/08 - 07/08	22	51
2012	626	794	**1420**	1.38	2.68	81	02/08 - 07/08	26	58
2013	849	1251	**2100**	1.50	3.16	92	03/08 - 09/08	31	73
2014	1063	1635	**2698**	1.57	3.36	71	05/08 - 11/08	48	58
2015	593	1119	**1712**	1.59	3.60	56	05/08 - 10/08	26	66
Total	17043	24594	**41637**	1.52	3.31	1559	26/07 - 11/08	605	73

[1] Immature (gosling) to adult ratio at time of banding drive (capture), including birds not banded.
[2] In the "Total" row, the average across years is presented.
[3] Immature (gosling) to adult female with brood patch ratio at time of banding drive (capture), including birds not banded.
[4] Includes birds fitted with a new band (i.e., old band replaced).
[5] Includes newly banded geese, recaptures, and birds released unbanded but excludes repeats (i.e., individuals previously caught the same year).

Table 3. Total number of Atlantic Population Canada Geese banded in Nunavik (Hudson Bay and Ungava Bay regions combined), 1997-2015.

Year	Adults	Young	Total	Imm : Adult[1, 2] $\bar{x}$ ± SE (*n*)		Imm : Brood[2, 3] $\bar{x}$ ± SE (*n*)		Recap-tures[4]	No. catches
1997	1272	1874	**3146**	1.53	0.13 (42)	3.28	0.28 (31)	49	54
1998	2035	3793	**5828**	1.71	0.08 (81)	4.01	0.23 (77)	153	86
1999	3057[5]	4514	**7571**	1.40	0.05 (156)	3.66	0.17 (152)	331	161
2000	2317	2230	**4547**	1.05	0.05 (108)	2.70	0.21 (32)	157	117
2001	2788	5671	**8459**	1.89	0.09 (121)	3.43	0.22 (64)	267	126
2002	3114	4088	**7204**[6]	1.26	0.04 (142)	3.03	0.13 (142)	202	147
2003	3543	6449	**9992**	1.73	0.07 (129)	3.82	0.17 (136)	465	137
2004	2154	2428	**4582**	1.19	0.05 (97)	3.50	0.27 (96)	237	99
2005	2215	3910	**6125**	1.58	0.08 (80)	3.57	0.19 (80)	166	125
2006	2909	4673	**7582**	1.58	0.06 (125)	3.74	0.17 (126)	219	133
2007	2093	2134	**4227**	1.21	0.06 (104)	2.78	0.12 (105)	183	109
2008	2180	4289	**6469**	1.95	0.13 (106)	4.31	0.26 (106)	204	108
2009	1390	1540	**2930**	1.09	0.04 (85)	2.54	0.09 (79)	83	89
2010	1824	2775	**4599**	1.42	0.06 (106)	3.17	0.13 (101)	128	116
2011	1013	1116	**2129**	1.07	0.12 (56)	2.56	0.31 (56)	74	64
2012	1429	2138	**3567**	1.40	0.06 (63)	2.85	0.13 (63)	137	73
2013	1688	2052	**3740**	1.17	0.07 (73)	2.61	0.17 (73)	155	80
2014	1773	2345	**4118**	1.32	0.09 (78)	2.89	0.17 (78)	128	90
2015	1314	1851	**3165**	1.23	0.07 (56)	3.21	0.22 (57)	107	66
Total	40108	59870	**99980**[6]	1.41	0.06 (19)	3.29	0.11 (19)	3445	1980

[1] Mean immature (gosling) to adult ratio at time of banding drive (capture), including birds not banded (*n*=number of catches).
[2] In the "Total" row, the average across years is presented (*n*= number of years).
[3] Mean immature (gosling) to adult female with brood patch ratio at time of banding drive (capture), including birds not banded (*n*=number of catches).
[4] Includes birds fitted with a new band (i.e., old band replaced).
[5] Includes 2 adult females captured in June on their nest.
[6] Includes 2 whose age were not recorded.

PRODUCTIVITY

I examined the Immature:Adult (I:A) ratio in the flocks we captured to evaluate productivity. In several cases a few birds in a flock escaped capture. When the number of escaped adults and goslings were known, they were included in the totals for the catch; otherwise, these flocks were excluded from the analysis. Flocks containing no goslings (captures and escapees; there were none in 2015) were also excluded. The mean I:A ratio at the time of banding in 2015 was 1.01:1 for Hudson Bay flocks (n=35 catches) (Table 1) and 1.59:1 for Ungava Bay flocks (n=21 catches) (Table 2); the ratio was significantly different between the two regions (t=4.40, df=54, P<0.01). Although only flocks with goslings were captured, a number of non-breeding adult geese were included in many flocks. In order to correct for this potential source of bias, we differentiated between breeding and non-breeding females by the presence or absence of a brood patch (BP). By comparing the number of young to the number of BP-females (I:BP) we were able to obtain a relatively un-biased estimate of productivity at the time of banding. However, to do this, all of the adult females in a flock had to be examined. Thus, flocks in which any number of adult geese escaped capture (except those able to fly which were assumed to be sub-adults or moult-migrants) were excluded. The mean I:BP ratio at Hudson Bay was 2.59:1 (n=36) and at Ungava Bay this ratio was 3.60:1 (n=21) (Tables 1, 2); the ratio was significantly different between the two regions (t=2.61, df=55, P=0.012).

BAND RETURNS

From 1997 to 2015, 99,980 AP Canada Geese were captured and banded on the Ungava Peninsula breeding grounds in northern Québec. Of these, as of 7 January 2016, 15,444 geese, or 15.4%, had been shot and reported by hunters (Table 4). Regular hunting seasons were closed in 1995 in known migration corridors and wintering areas of migrant AP Canada Geese. From 1997 to 1999, some geese were harvested during early (September) Resident goose seasons or during regular and late seasons in areas not thought to be frequented by wintering migrant geese. A small number of banded birds were also shot and reported by Aboriginal subsistence hunters in northern Canada. Limited regular hunting seasons were re-instated in most Atlantic Flyway jurisdictions in 1999–2000 and in all jurisdictions in 2001–2002. Recoveries of hunter-shot birds have steadily increased as regular seasons have been re-instated and hunting regulations have been liberalised. Since 2001 direct recovery rates have been relatively stable, about 3–6% (for both adults and juveniles) in the United States and 1–2% in Canada (excluding aboriginal harvest; Table 4).

Table 4. Direct recoveries and direct recovery rate (%) of Canada Geese banded in northern Québec, 1997–2015[1] (recoveries as of 7 January 2016; from GameBird, BBL).

	ADULTS							JUVENILES						
		Direct Recoveries							Direct Recoveries					
	n	Canada		USA		Total		n	Canada		USA		Total	
Year	banded	n	(%)	n	(%)	n	(%)	banded	n	(%)	n	(%)	n	(%)
1997-1998	***1272***	0	0.00	3	0.24	3	0.24	***1874***	2	0.11	6	0.32	8	0.43
1998-1999	***2035***	1	0.05	9	0.44	10	0.49	***3793***	5	0.13	18	0.47	23	0.61
1999-2000	***3057***	10	0.33	21	0.69	31	1.01	***4514***	46	1.02	29	0.64	75	1.66
2000-2001	***2317***	12	0.52	19	0.82	31	1.34	***2230***	12	0.54	15	0.67	27	1.21
2001-2002	***2788***	10	0.36	67	2.40	77	2.76	***5671***	47	0.83	194	3.42	241	4.25
2002-2003	***3114***	29	0.93	103	3.31	132	4.24	***4088***	47	1.15	127	3.11	174	4.26
2003-2004	***3543***	46	1.30	115	3.25	161	4.54	***6449***	81	1.26	114	1.77	195	3.02
2004-2005	***2154***	38	1.76	98	4.55	136	6.31	***2428***	36	1.48	133	5.48	169	6.96
2005-2006	***2215***	31	1.40	92	4.15	123	5.55	***3910***	97	2.48	231	5.91	328	8.39
2006-2007	***2909***	35	1.20	82	2.82	117	4.02	***4673***	86	1.84	233	4.99	319	6.83
2007-2008	***2093***	24	1.15	69	3.30	93	4.44	***2134***	29	1.36	88	4.12	117	5.48
2008-2009	***2180***	28	1.28	84	3.85	112	5.14	***4289***	85	1.98	248	5.78	333	7.76
2009-2010	***1390***	17	1.22	44	3.17	61	4.39	***1540***	18	1.17	45	2.92	63	4.09
2010-2011	***1824***	11	0.60	83	4.55	94	5.15	***2775***	54	1.95	189	6.81	243	8.76
2011-2012	***1013***	12	1.18	31	3.06	43	4.24	***1116***	25	2.24	39	3.49	64	5.73
2012-2013	***1429***	15	1.05	51	3.57	66	4.62	***2138***	50	2.34	115	5.38	165	7.72
2013-2014	***1688***	26	1.54	71	4.21	97	5.75	***2052***	35	1.71	146	7.12	181	8.82
2014-2015	***1773***	23	1.30	67	3.78	90	5.08	***2345***	49	2.09	87	3.71	136	5.80
2015-2016[2]	***1314***	18	1.37	21	1.60	39	2.97	***1851***	41	2.22	31	1.67	72	3.89

[1] Table excludes native harvest from northern Québec, northern Ontario, Labrador, and Nunavut.

[2] Data for 2015/2016 hunting season are incomplete.

CONCLUSIONS AND PLANS FOR 2016

Our knowledge of this population has expanded dramatically since the start of the annual recruitment study in 1996 and of the banding program in 1997. The banding program has been very successful with almost 100,000 AP geese banded to date; in addition we participated in a band return-rate study for AP geese in 2003-2005. Our data from this year's banding program indicate that production, as measured by immature:adult ratio, was below average along Hudson Bay and average along Ungava Bay (Table 5).

Table 5. Summary of AP Canada Geese projects in northern Québec in 2015.

	Ungava Bay		Hudson Bay	
Variable	**2015**	**Long-term Average[1]**	**2015**	**Long-term Average[1]**
Banding Program (this report)				
number banded (adults+goslings)	1712	41,637[2]	1453	58,343[2]
immature:adult ratio	1.59	1.52	1.01	1.34
immature:brood patch female	3.60	3.31	2.59	3.14
mean no. geese per catch	66	73	36	43
Breeding Pair Survey				
number of breeding pairs on Ungava Peninsula (Harvey, Rodrigue & Earsom 2015)	161,302	189,727		

[1] Banding program: 1997–2015; breeding pair survey: 5-year running average (i.e., 2011–2015)
[2] Total number banded since 1997.

With the 2001 season, we completed the five years of intensive studies on reproductive success that were called for in the Atlantic Flyway Council's original Co-operative Research Program for Atlantic Population Canada Geese (Atlantic Flyway Council 1996). At the end of 2001, a new five-year research and monitoring program was approved by the Atlantic Flyway Council and called for continued full funding for the intensive recruitment study for two additional years (2002/03 and 2003/04) as well as funding for the following 3 years (2004 through to the 2006 field season) for the recruitment surveys and the banding program. The recruitment and banding programs were renewed in 2007 for an additional five years by the Atlantic Flyway Council (2007-2011). At the 2011 summer Atlantic Council Meeting the banding program was renewed for an additional five years (2012-2016), although at a smaller scale. Specifically, each year, including 2016, there will be one banding crew for Ungava Bay, with an objective of banding 800 adults, and one banding crew for Hudson Bay and with the same objective. Recruitment (nesting) site(s) will be visited in June if deemed necessary (season appears to be exceptionally early or late) and if funding and logistics permit.

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In 2015, banding along Hudson Bay was undertaken by a crew comprised of Richard Cotter (CWS), Shirley Orichefsky (CWS), Hutch Walbridge (MD), Susan Ingalls (MA), and Andrew Brunet, pilot (EC130 B4 helicopter) and Mike Frizell, flight engineer, of the Ontario Ministry of Natural Resources and Forestry (OMNRF). At Ungava Bay, the banding crew was comprised of Pierre Brousseau (CWS), Céline Maurice (CWS), Sandy Suppa (Makivik) and Jim Bennett (MD), along with Nunavik Rotors (A-Star) helicopter pilot Christophe Vani.

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