

Waterfowl Kill by Cree Hunters of the Hudson Bay Lowland, Ontario¹

J.P. PREVETT², H.G. LUMSDEN³ and F.C. JOHNSON²

ABSTRACT: From 1974 to 1976 annual interviews were conducted with 97% of male Indian potential hunters at James Bay and Hudson Bay coastal villages to determine waterfowl kill. Sample interviews were conducted at inland villages. Of those interviewed at coastal communities, 87% hunted waterfowl. The mean yearly take of all species ranged from 55 to 145 birds per hunter. Lesser Snow Geese and large Canada Geese were the main prey, averaging 38 350 and 23 152 birds shot per year, respectively. Small numbers of other goose species were taken. The duck kill averaged 22 715. Eighty percent of the large Canada Goose kill occurred in spring; 76% of Snow Geese were taken in fall. Considerable inter-year variation in total kill occurred. The take for the highest kill year (1975-76) exceeded that for the lowest (1976-77) by 61% for Snow Geese and 34% for large Canada Geese; the spring kill was particularly variable. The kill of Snow Geese has apparently increased by a factor of 2, and that of large Canada Geese by a factor of 3, since the mid-1950s. Through analysis of band recoveries, the kill was determined to have been apportioned among separately managed stocks. The Indian kill made up approximately 13% of the total hunting kill of the Tennessee Valley Population, 9% of the Mississippi Valley Population, and 7% of Hudson Bay Lesser Snow Geese.

Key words: Indian wildlife kill, waterfowl harvest, Hudson Bay Lowland, Cree

RÉSUMÉ: De 1974 à 1976, nous avons interviewé chaque année 97% des chasseurs indiens mâles possibles dans les villages côtiers de la baie d'Hudson et de la baie James, en Ontario, ainsi que dans villages intérieurs servant d'échantillons, afin de déterminer le nombre d'oiseaux marins tués. Quarante-vingt-sept pour cent des hommes interviewés dans les communautés côtières faisaient la chasse aux oiseaux marins. Le nombre annuel moyen de proies comptant toutes les espèces variait entre 55 et 145 oiseaux par chasseur dans divers villages. Les oies blanches de taille inférieure et les bernaches canadiennes de grosse taille étaient les proies principales, moyennant 38 350 et 23 152 oiseaux tirés par année, respectivement. D'autres espèces d'oies étaient prises en petites quantités. Une moyenne de 22 715 canards furent aussi tués. Quarante-vingt pour cent de la prise de grosses bernaches canadiennes s'effectuait au printemps et 76% des oies blanches étaient tuées en automne. Le nombre total d'oiseaux tués variait de façon considérable d'année. Le plus haut pourcentage (1975-76) excédait le pourcentage le moins élevé (1976-77) de 61% pour l'oie blanche et de 34% pour les grosses bernaches, les variations printanières étant particulièrement marquées. Les prises d'oies blanches semblent avoir doublé, et celles de bernaches semblent avoir triplé, depuis le milieu des années '50. Au moyen de l'analyse du retour de bagues, les prises ont été réparties parmi des groupes séparément contrôlés. Les prises indiennes formaient environ 13% de la chasse totale de la population de la vallée du Tennessee, 9% de la population de la vallée du Mississippi, et 7% des oies blanches de taille inférieure dans la baie d'Hudson.

Mots clés: prises de chasse d'animaux sauvages par les Indiens, prises de chasse parmi les oiseaux marins, terres basses de la baie d'Hudson

Traduit pour le journal par Maurice Guibord.

INTRODUCTION

Quantitative knowledge of the kill of game animals by Canadian Native people has been scarce despite the often substantial numbers taken and the consequent importance for effective management of wildlife populations. The Cree of northern Ontario are not sampled in government surveys of licensed hunters (Boyd, 1977; Finney, 1979), and because they live in scattered villages in the remote Hudson Bay Lowland, it is hard to collect data.

Since at least 1800, waterfowl have been of prime importance to the Cree Indians living in coastal areas of James Bay and Hudson Bay in Ontario (Rogers, 1966). Wild game continues to provide a significant part of the Cree diet, and waterfowl form the largest component (Hanson and Gagnon, 1964; J.P. Prevett, pers. obs.). Hanson and Currie (1957) described the pattern of Indian waterfowl hunting in the Lowland giving numbers and species of geese involved; much of their description remains accurate today.

Large numbers of large Canada Geese (*Branta canadensis interior*), Lesser Snow Geese (*Anser caerulescens*

caerulescens) and various species of ducks are killed annually during spring and fall migrations. Lesser numbers of small Canada Geese (*Branta canadensis hutchinsii*), Atlantic Brant (*Branta bernicla hrota*), and Ross's Geese (*Anser rossii*) are taken. The large Canadas come principally from the Mississippi Flyway and represent three separately managed stocks — the Tennessee Valley Population (TVP), the Mississippi Valley Population (MVP), and the Eastern Prairie Population (EPP). Small numbers also come from the Atlantic Flyway. The Snow Geese are from the Hudson Bay population, and ducks use the Atlantic and Mississippi Flyways. (See Bellrose, 1976 for ranges of these populations.)

The most recently published estimates of waterfowl kill in the region are more than 20 years old (Hanson and Currie, 1957). Because of continuing changes in numbers and patterns of Cree hunting and trapping, and because the relevant stocks are now being managed more intensively, it is prudent to re-examine their kill of waterfowl. Our objectives were to determine the current magnitude and species composition of the kill, to apportion the Canada Goose kill among the populations involved, and to assess the impact on these stocks.

¹Ontario Ministry of Natural Resources, Wildlife Research Contribution No. 81-20

²Ontario Ministry of Natural Resources, Box 190, Moosonee, Ontario, Canada P0L 1Y0. Present addresses: (JPP) Ontario Ministry of Natural Resources, 1106 Dearness Drive, London, Ontario, Canada N6E 1N9; (FCJ) Ontario Ministry of Natural Resources, 435 Grand Avenue West, Chatham, Ontario, Canada N7M 5L8

³Ontario Ministry of Natural Resources, Wildlife Research, Box 50, Maple, Ontario, Canada L0J 1E0

METHODS

We attempted to interview every male 15 years of age or older living in the coastal villages on the James and Hudson Bay coasts of Ontario, where most of the waterfowl hunting in the Lowland takes place (Fig. 1). We drew up lists of names of hunters from a variety of sources, no single one of which listed all inhabitants of a village, and consulted long-time residents to complete the lists. With hired interpreters we systematically canvassed each community until all individuals on the list had been contacted or we learned that someone had not hunted. The initial interview period was mid-June (1975 to 1977) but follow-up visits, usually in July or August, were needed to complete the interviews. We asked each hunter how many of each species he killed that spring and the preceding fall, as well as the number of days he hunted in each period.

Because of the large heterogeneous populations of Moosonee and Moose Factory, it was particularly difficult to compile lists of potential hunters. The fall kill was determined from results of the Moose River check stations which contacted all hunters from the two villages during the legal hunting season. Estimates of the spring kill were obtained by hiring local interpreter-interviewers to contact as many hunters as possible. Results were extrapolated for spring hunters not interviewed, based on check station data on the number of Treaty Indians hunting in fall. The fall kill also was adjusted upward

to account for the pre-season kill by Treaty Indians, using figures for each species calculated from the interview sample in June (who were also asked about their fall kill).

Interviews were not possible at Ft. Severn in 1976, and only a sample of hunters was interviewed in 1975. The 1975 results were extrapolated for hunters not interviewed, and estimates for 1976 were calculated by applying the ratio of kill of each species between Winisk and Ft. Severn for 1975 and 1977. The numbers of hunters and pattern of kill are very similar at these two villages on the Hudson Bay coast.

The waterfowl kill on the coasts is far higher than inland (Hanson and Currie, 1957). Nonetheless, although kills at individual communities are usually not large, considerable numbers of ducks and large Canada Geese are shot at interior villages. All of these villages are located south of the Lowland's boundary (i.e. the limit of marine submergence). We include their kill estimates here because they harvest from the same waterfowl stocks taken by hunters from Lowland communities.

Up to 1974-75 a sample of hunters at most inland communities reported on by Hanson and Currie (1957) was interviewed by Ontario Ministry of Natural Resources (OMNR) personnel. However, the number of active hunters not interviewed was not determined. Following the procedure of Hanson and Currie (1957) we extrapolated the total kill by multi-

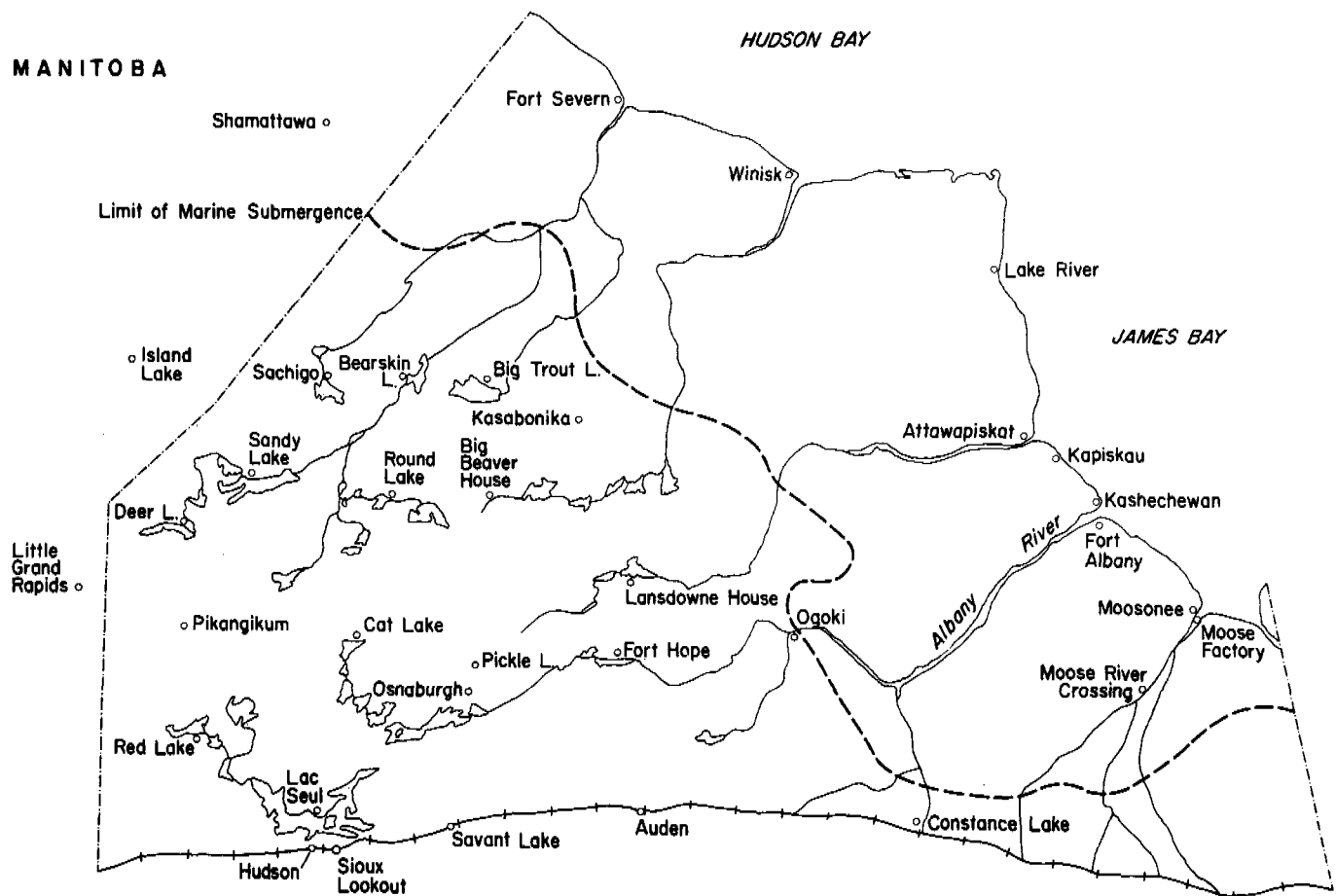


FIG. 1. Map of the study area.

plying the mean reported kill for 1970-75 at each village by the proportion of active *trappers* (Carlson, 1979) not interviewed. Most able-bodied men in these communities hold trapping licenses (M. Eliuk, pers. comm. 1980), so although a few non-trappers may have hunted waterfowl, the effect on kill estimates is minimal. In the few cases where numbers interviewed also were not recorded, we used the average correction factor for all inland villages.

The proportions of Canada Geese killed in spring and summer assignable to each goose population were estimated by analyzing band recoveries from the villages. Bands applied at winter refuges were weighted according to winter inventory figures for these locations. Only direct recoveries from post-hunting season bandings recovered from April to August were used. Fall recoveries from sport hunters and Indians are difficult to distinguish. We have assumed that the percents assignable to each population are similar in spring and fall. Weighted recoveries from each goose population were summed for each village or group of villages, and the percent of the total kill originating from each population were calculated. Details and data used in the procedure can be obtained directly from Lumsden.

Although no bands have been collected at Ft. Severn since 1966, and few in the interior villages in the 1970s, EPP geese were taken by Indians in western Ontario for many years and there is no reason to believe that changes in the distribution of this population have occurred since the late 1960s. Therefore we used figures from the banding period 1962-63 to 1966-67.

Canada Geese from unexpected locations or belonging to populations which are not banded are also killed in northern Ontario. Their presence in the kill makes it impossible to derive an estimate of total harvest from band recoveries alone, and slightly inflates the portion of the kill assigned to each banded population.

To assess the significance of the Indian kill to the various stocks, where possible we examined the kills with respect to numbers of geese and the magnitude of the total kill. However,

relevant figures were not available for all populations. The TVP mean harvest estimates for 1974-76 were compiled by adding to the mean Indian kill the Canadian Wildlife Service kill estimates for Zone 1 and that part of Zone 2 lying west of 79°W in Ontario. To this we have added the U.S. Fish and Wildlife Service kill estimates for the relevant states according to the following formula: Pennsylvania — 4500 per year (Hartman, pers. comm. 1981); 62% of the Michigan Canada Goose kill (Martz, pers. comm. 1981); Ohio — 66% (Bednarik, pers. comm. 1981); Indiana — 50%; Alabama — 100%; and Tennessee — 50% for 1974 and 1975. In 1976 harsh weather forced large numbers of MVP geese south into western Tennessee, almost quadrupling the normal kill of this population (Fox, pers. comm. 1981). There is no evidence that the TVP kill was higher than normal in 1976. Therefore, in 1976 we used the average kill of TVP geese for 1974 and 1975 and assigned the remainder to the MVP kill. A few TVP geese are taken in Kentucky, Wisconsin, and Illinois, but the number is small and has been ignored.

On migration, the MVP now largely by-passes southwestern Ontario. Band recoveries suggest that often less than 1000 geese are now being taken by sport hunters in Ontario. To estimate the Flyway harvest, we used 1000 for the Ontario sport hunter kill and added the U.S. Fish and Wildlife Service harvest estimates with the following formula: 100% for Wisconsin, Illinois and Kentucky as compiled by Rusch *et al.* (1981); 50% for Indiana; 22% for Michigan; and 50% for Tennessee, adjusted for the exceptional kill of 1976 as indicated above.

RESULTS

Participation in Hunting

We were successful in interviewing 97% of potential hunters each year in the coastal communities (Table 1). The proportion which actually hunted waterfowl was high at each village. In each village more hunters were active in spring than

TABLE 1. Participation in waterfowl hunting by male Cree at coastal villages in Hudson Bay Lowlands of Ontario, 1974-1976¹

Village	Potential Hunters ²	% Interviewed	% Active	% Active Hunting		Mean No. Days ³		
				Spring	Fall	Spring	Fall	Total
Ft. Severn ⁴	50	100	100	100	90	8	9	17
Winisk	50	98	95	95	94	11	13	24
Attawapiskat	196	98	85	98	86	9	10	19
Kashechewan	140	96	87	95	84	13	15	28
Ft. Albany	134	94	81	94	76	11	13	24
TOTAL	570	97	87	96	85	10	12	22

¹Mean of 3 yr. Figures for Moosonee-Moose Factory are not included since only a sample of known active hunters were interviewed.

²Defined as all males 15 yr old or older, except sick or disabled persons, people away during the hunting season, and men over 65 yr of age who no longer hunted.

³Includes some hunters < 15 yr old.

⁴Data available only for 1977.

in fall. Altogether, an average of 87% of potential hunters took part in the hunt.

The amount of time spent hunting varied widely among hunters, ranging at most localities from one day to two months or more for both spring and fall. Longer periods represent hunters based at family camps on the coast, and are approximate since hunting probably did not occur every day. The average time spent hunting was similar in spring and fall (10 days in spring, 12 in fall) and the mean number of days reported hunting was roughly similar at the different villages. There were no important inter-year differences in times or seasonal patterns among villages.

Composition, Size, and Seasonal Patterns of Kill

Table 2 shows the average seasonal kill of each species at each coastal community, and all inland locations together, for the three years of study. On the coast geese made up 77% of the total waterfowl bag. Just over half of the total kill was Snow Geese, averaging over 38 000 birds taken per year. Large Canada Geese were next in importance, the average of 23 000 comprising 30% of the total kill by numbers. However, sharp seasonal differences were apparent in kill composition of these two species. Eighty percent of the large

relative sizes of spring and fall kills — 72% of the total inland waterfowl kill occurred in spring, compared to 41% on the coast.

Other species of geese were minor components of the kill. Small Canada Geese made up about 3% of all waterfowl taken, varying from <1% at Moosonee-Moose Factory to 5% at Ft. Severn. The kill pattern for small Canadas was more like that for Snow Geese (57% shot in fall) than for large Canadas. It is likely that most small Canadas are shot incidentally while hunters are concentrating on the more abundant Snow Geese, since the two species share similar habitats and migration patterns through the region. The Cree also took a few Brant (mean 198, Table 2), Ross's Geese (8 reported in 1976-77), and White-fronted Geese (*Anser albifrons*) (one in each of the three years).

In contrast to coastal localities, ducks were far more important than geese at inland villages (83% of total kill). The seasonal pattern was also different between the two areas; 71% of the inland duck kill occurred in spring compared to 33% on the coast. Snow Geese were rarely taken inland. The largest inland kill area of Canada Geese was Lansdowne House, with an average kill of about 950. Apparently no other inland village killed as many as 300 Canada Geese.

TABLE 2. Average waterfowl kill from 1974 to 1976 by Native hunters in Hudson Bay Lowland, Ontario

Village	Snow Goose			Large Canada			Small Canadas			Brant			Ducks		
	Fall	Spring	Total	Fall	Spring	Total	Fall	Spring	Total	Fall	Spring	Total	Fall	Spring	Total
Ft. Severn	1381	1256	2637	319	1040	1359	114	202	316	0	12	12	227	111	338
Winisk	2444	1395	3839	242	1389	1631	131	159	290	14	0	14	845	159	1004
Attawapiskat	6280	2924	9204	914	5456	6370	576	329	905	9	96	105	2315	872	3187
Kashechewan	5615	1768	7383	1799	3516	5315	232	69	301	28	20	48	2026	1086	3112
Ft. Albany	5011	1367	6378	977	2299	3276	240	92	332	2	13	15	1434	721	2155
Moosonee-Moose Factory	8208	438	8646	251	2333	2584	6	49	55	1	3	4	1612	1225	2837
Inland Villages ¹	101	149	267	441	2026	2617	34	121	155	0	0	0	2542	7151	10082
Total	29040	9297	38354	4943	18059	23152	1333	1021	2354	54	144	198	11001	11325	22715

¹Kill estimates were available for Bearskin Lake, Big Beaver House, Big Trout Lake, Cat Lake, Constance Lake, Deer Lake, Fort Hope, Hudson, Kasabonika, Lac Saul, Lansdowne House, Moose River, Osnaburgh, Pickle Lake, Pikangikum, Round Lake, Sachigo, Savant, Sandy Lake, and Sioux Lookout. Only figures for men trapping in Ontario were available for Island Lake, Little Grand Rapids, and Shamattawa. No estimates were available for Auden and Ogoki, listed by Hanson and Currie (1957). For locations of all Indian villages in the area discussed see Figure 1.

Canada Goose kill took place in spring, forming 55% of that kill. In contrast, the majority (76%) of Snow Geese were taken in fall, when they comprised 67% of the kill.

The species and seasonal trends described above were broadly similar for all coastal villages. Minor variations occurred at the two Hudson Bay communities, Ft. Severn and Winisk, where a higher proportion of the spring kill was composed of Snow Geese (46%) than at James Bay localities (~25%), and correspondingly fewer large Canadas (43% vs. 54%) were taken. Ft. Severn was the only place where the spring kill exceeded the fall kill (56% of all waterfowl taken in spring). At Moosonee-Moose Factory just 29% of the total kill took place in spring, reflecting low numbers of Snow Geese taken. Coastal and interior areas contrasted strongly in the

Pintails (*Anas acuta*) and Mallards (*Anas platyrhynchos*) were the most commonly taken species in both spring and fall at coastal locations (Table 3). Pintails were relatively more common in the kill at the two Hudson Bay villages than elsewhere, and Mallards formed a relatively higher proportion at James Bay villages. Sea ducks and diving ducks never formed more than 13% of the spring duck kill at any village; Oldsquaws (*Clangula hyemalis*) and scoters (*Melanitta* spp.) were the main prey. Most ducks are taken opportunistically by coastal hunters while hunting geese, although seaducks are sometimes specifically hunted along rivers during their spring migration. Occasionally, flightless ducks are hunted during the summer molt. The Attawapiskat Indians take flightless geese annually.

TABLE 3. Composition of duck kill by Native hunters from James and Hudson Bay coastal villages, Ontario, 1976-1977

Species	James Bay Villages (%) ¹			Hudson Bay Villages (%) ²		
	Fall	Spring	Total	Fall	Spring	Total
Pintail	49	47	48	73	51	67
Mallard	35	33	34	13	28	17
Black	12	12	12	8	12	9
Green-winged Teal	3	3	3	5	2	4
Sea and Diving ducks	1	5	3	1	7	2

¹Attawapiskat, Kashechewan, Ft. Albany, Moosonee-Moose Factory. Total ducks classified: 3944 in fall; 3218 in spring.

²Ft. Severn and Winisk. Total ducks classified: 833 in fall; 295 in spring.

Variation between Years

There were substantial year-to-year fluctuations in the kill at coastal locations (Table 4). 1975-76 was the year of the highest kill for all waterfowl, exceeding 1974-75 by 36% and 1976-77 by 43%. The takes of Snow Geese and small Canada Geese were most variable (1975-76 kill exceeding the year of lowest kill by 61% and 67%, respectively), that of large Canada Geese was intermediate (34%) and that of ducks, lowest (18%). The spring kill was particularly variable for snow geese (115% difference between highest and lowest years).

Average Kill per Hunter

The mean yearly kill of waterfowl per hunter at coastal villages was more than 100 birds, ranging among communities from 145 at Winisk and Kashechewan to 55 at Moosonee-Moose Factory (Table 5). Variation among hunters was extremely high. Some hunters shot but a single bird while the most active and successful hunters killed in excess of 500.

Snow Goose bags were highest, particularly in fall when they averaged 37 per hunter over the whole coast. The spring kill of large Canada Geese averaged 26 per hunter. Average bags at Ft. Severn and Moosonee-Moose Factory were lower than at the other communities for most waterfowl groups.

Origins of Geese

A kill estimate of geese taken by Indians in northern Ontario is not useful in itself for management purposes. It only becomes useful when it can be assigned to the relevant goose populations. Through analyses of band recoveries, the kill at each location was apportioned among the various goose stocks involved (Table 6). Geese from the MVP and TVP together made up 98% of the large Canada Goose kill (65% and 33%, respectively). Mid-Atlantic and EPP birds each constituted 1% of the kill. Sizeable numbers of Mid-Atlantic birds were taken only at Moosonee-Moose Factory in the southeast, and of EPP birds only at Ft. Severn and interior villages in the western portion of the study area.

TABLE 4. Yearly and seasonal variation in waterfowl kill by Native hunters at James and Hudson Bay coastal villages, Ontario

Kind of Waterfowl	1974-75			1975-76			1976-77		
	Fall	Spring	Total	Fall	Spring	Total	Fall	Spring	Total
Snow Goose	26091	6555	32646	36262	14072	50334	24464	6820	31284
Large Canada	4293	16230	20523	4999	18509	23508	4215	13362	17577
Small Canada	1111	636	1747	1696	1224	2920	1087	839	1926
Brant	61	126	187	58	158	216	44	144	188
Ducks	7863	3678	11541	9181	4430	13611	7771	4412	12183

TABLE 5. Mean bags of waterfowl by Cree hunters at James and Hudson Bay (Ontario) coastal villages, 1975 to 1977

Village	Snow Goose			Large Canada			Small Canada			Ducks			All Waterfowl		
	Spring	Fall	Total	Spring	Fall	Total	Spring	Fall	Total	Spring	Fall	Total	Spring	Fall	Total
Ft. Severn ¹	25.5	28.1	53.6	18.9	6.4	25.3	3.4	3.2	6.6	2.3	5.5	7.8	50.1	43.2	93.3
Winisk	30.2	52.8	83.0	30.1	5.2	35.3	3.4	1.7	5.1	3.5	18.3	21.8	67.2	78.0	145.2
Attawapiskat	18.1	43.5	61.6	33.2	6.3	39.5	2.0	4.0	6.0	5.3	16.0	21.3	58.6	69.8	128.4
Kashechewan	14.6	52.9	67.5	29.2	17.2	46.4	0.6	2.2	2.8	9.1	19.1	28.2	53.5	91.4	144.9
Moosonee-Moose Factory ²	13.6	59.7	73.3	22.1	11.6	33.7	0.9	2.8	3.7	6.9	17.2	24.1	43.5	91.3	134.8
	3.1	22.4	25.5	16.4	0.5	16.9	0.4	0.1	0.5	8.6	3.9	12.5	28.5	26.9	55.4

¹Data for 1974-75 and 1976-77.

²Fall data for legal hunting season only.

TABLE 6. Derivation of Indian goose kill in northern Ontario among separate subpopulations, based on analyses of weighted band recoveries

	Large Canada Geese					Small Canada Geese			Snow Geese		
	Total Kill	Mid-Atl. Pop. (%)	TVP (%)	MVP (%)	EPP (%)	Total Kill	Tall Grass Prairie (%)	Baffin Island (%)	Total Kill	Eastern Segment ¹ (%)	Western Segment ² (%)
Moosonee-Moose Factory	2584	13	81	6	0	55	0	100	8646	92	8
Ft. Albany-Kashechewan											
Attawapiskat	14691	0	35	65	0	1538	0	100	22965	83	17
Winisk	1631	0	0	100	0	290	100	0	3839	49	51
Ft. Severn	1359	0	0	87	13	316	100	0	2637	13	87
Interior Villages	2617	0	1	93	6	155	100	0	267	15	85
Total	23152	1	32	65	1	2354	32	68	38354	76	24

¹Eastern segment is Baffin Island and Cape Henrietta Maria colonies.

²Western segment is from colonies on Southampton Island and the west coast of Hudson Bay, after Boyd (1976).

Substantial numbers of Giant Canada Geese (*B.c.maxima*) from breeding areas in the Great Lakes region now make molt migrations to the Lowland in summer. While most arrive after the spring hunt and leave before the fall hunt, a few are taken by the Cree. In time, the *maxima* component in the kill is likely to grow to measurable numbers. A small number of atypical recoveries of Canada Geese banded in nearly all states between Maine and Texas, as well as Nebraska, Utah, and Montana, have been recorded in the Lowland. Other populations that have declined in numbers, or that have not been banded in recent years, were formerly taken by the Lowland Cree (e.g. from the St. Marks-Tallahassee area of Florida).

Small Canada Geese taken by hunters from Ft. Severn and Winisk come from the breeding areas of the Tall Grass Prairie Population at Southampton Island and the McConnell River area of western Hudson Bay. Those taken along James Bay originate predominantly from the Foxe Basin area of Baffin Island and probably constitute a population which should be considered separate from the Tall Grass birds for management purposes.

Band recoveries of Snow Geese show that the kill on James Bay originates primarily from colonies on Baffin Island and Cape Henrietta Maria, Ontario, while on the Hudson Bay coast Snow Geese are mainly from Southampton Island, McConnell River and Cape Henrietta Maria. In this analysis, band recoveries up to 1971 were used (Dzubin *et al.*, 1975), and we assumed that there were no differences in the origin of geese between Indian and sport-hunter kills.

DISCUSSION

Participation in the Hunt

There is no existing information on the proportion of Indians who hunt waterfowl in the Hudson Bay Lowland. Since waterfowl traditionally have been among the most important bush foods in this area (e.g. Barnston, 1862; Rogers, 1966), it is safe to assume that participation in waterfowl hunting has always been high. The proportion of potential hunters who take part in the hunt remains high today. C. Currie (pers.

comm. 1976) stated that participation in the spring hunt had religious significance for the Cree. Interestingly, it is still the spring hunt of Canada Geese that involves the highest proportion of hunters at each coastal community. Eighty-four percent of potential hunters took part in the spring hunt as compared to 74% in fall. Although the time spent hunting and number of geese bagged per hunter varied widely in each village, 93% of all active hunters shot at least one Canada Goose in spring. It is perhaps significant that fewer hunters were active in the fall, even though travel was easier and geese were more abundant. Only 80% of active hunters shot Lesser Snow Geese in fall. There no doubt remains a strong psychological pull to hunt the first arriving Canada Geese after the long winter, whether or not physical need for the fresh meat is still of paramount importance. Barnston (1862), Hanson and Smith (1950), Hanson and Currie (1957), and Hanson and Gagnon (1964) have provided interesting accounts of the significance of waterfowl to the Cree of Hudson Bay and James Bay.

Size of the Kill

The most complete documentation of the native waterfowl kill in the Ontario Hudson Bay Lowland was provided by Hanson and Currie (1957). By almost all of the earlier measures, the kill of both Snow Geese and Canada Geese seems to have increased substantially in the past two decades (Table 7).

Many of the early figures seem to have been "guesstimates"; however, figures compiled by Hanson and Currie (1957) were based on interviews with trappers, extrapolated to account for licensed trappers not interviewed. Even though, as those authors state, some non-trappers in each village probably hunted waterfowl, the markedly higher estimates at most localities for the mid-1970s suggest that the kill has increased by a factor of about two for Snow Geese and perhaps three times for large Canada Geese. Although Barnston's (1862) estimates for all geese combined were closest to ours, at that time Indians were employed to hunt geese to provision Hudson's Bay Company posts, so Barnston's estimates did not refer solely to personal consumption.

TABLE 7. Comparison of previously published estimates of Native waterfowl kill in study area with those from this study

Source	Location	Year	Kill Estimate	Mean for this study
<i>Lesser Snow Goose</i>				
Honigmann ¹	Attawapiskat	1947-48	6280	9204
Gagnon ²	Winisk	1947	1000	3839
Cooch ²	Ft. Severn, Winisk	1954	3000	6476
Morin ²	Ft. Severn	1955	3000	2637
Hanson and Currie (1957)				
	Ft. Albany	1946-47	4000	13761
	Attawapiskat	1955-56	6653	9204
	Ft. Albany	1955-56	5974	13761
	Moosonee	1955-56	2110	8646
	Total		14737	31611
Hanson and Gagnon ⁴ (1964)	Whole coast	1964	30-3800	38087
<i>Large Canada Goose</i>				
Hanson and Currie (1957)				
	Ft. Severn, Winisk	1945-46	4005	2990
	Attawapiskat	1946-47	4737	6370
	Ft. Albany ³	1953-54	5099	8591
		1954-55	3859	
		1955-56	4258	
Honigmann ¹	Attawapiskat	1947-48	1720	6370
<i>All Geese</i>				
Barnston (1862) ⁵				
	Ft. Severn, Winisk	1860	10000	10098
	Attawapiskat, Ft. Albany ³		30000	39632
	Moosonee-Moose Factory		10000	11289

¹From Rogers (1966).

²From Hanson and Currie (1957).

³Ft. Albany in early papers is referable to both Ft. Albany and Kashechewan.

⁴No figures for specific settlements given, nor was the source of data used.

⁵Incorrectly cited as lesser snow geese only by Hanson and Currie (1957). Barnston (1892:7836) referred to the kill of "various species of geese".

The apparent increase seems to be a function of an increased number of hunters, and in the case of large Canada Geese, of increased mean kills per hunter. Our estimate of 495 hunters was just over twice that of Hanson and Currie (1957) (241 licensed trappers). Although the actual increase is probably less than the numbers suggest (because some non-trappers hunted waterfowl and because we included many hunters who shot only one or two geese), it presumably accounts, in part, for the increased Snow Goose kill. The average bag of Snow Geese reported by Hanson and Currie for Attawapiskat, Ft. Albany and Moosonee (49) was very similar to that found in this study (51). In contrast, Canada Goose bags appear to have doubled. For the same villages reported on by Hanson and Currie for 1954-56 (Ft. Severn, Winisk, Attawapiskat, and Ft. Albany), we found a mean kill per hunter of 38, compared to 18 in their study.

In the twenty years separating the two studies, the sizes of

both Canada Goose and Lesser Snow Goose populations exploited by the Lowland Cree have roughly doubled (Reeves *et al.*, 1968; Kerbes, 1975; Gamble, 1978; Boyd, *et al.*, 1982). These increases have evidently also contributed to higher kills, which differs from Hanson and Currie's (1957) conclusion that the Canada Goose kill at Ft. Severn and Winisk did not rise between 1947 and 1955 despite a 335% increase in size of the MVP.

Factors Affecting the Kill

There are many factors other than the overall supply of geese and the number of hunters that influence the size of the kill in any given year (Hanson and Currie, 1957). Weather is probably most important since it affects migration patterns, and thereby the time and numbers of geese available to hunters. In general, a fast breakup in spring reduces the kill because Canada Geese are able to disperse quickly to nesting areas, and Snow Geese do not linger long at James Bay en route to more northerly breeding grounds. A late and prolonged spring thaw, on the other hand, delays nest initiation by Canada Geese, which are extremely vulnerable to hunters during local flights near the coast and along rivers. Snow Geese also spend longer periods on the coast in a late spring. Sometimes both species make more than one north-south-north movement in response to changes in weather. An early freeze-up in fall affects the kill of Snow Geese more than that of Canada Geese, since the majority of the latter normally depart the area before the end of September regardless of the weather.

Changes in lifestyle in the coastal villages in the past several years have also had an effect on the size of the waterfowl kill. Far fewer families travel to interior traplines in autumn and stay until after breakup in spring. Hence, more hunters are on the coast at both seasons, leading to an increased kill. Although more men now are regular wage earners, keeping them more or less tied to the villages, improvements in "bush" transportation in the form of snowmobiles and modern outboard motors make prime hunting areas readily accessible within a few hours. High Canada Goose kills are made in this manner in spring by weekend hunters. Community and personal freezers also enable larger quantities of geese to be quickly preserved.

Seasonal Kill Patterns

As Hanson and Currie (1957) also reported, most large Canada Geese were shot in spring (78% in this study) and the majority of Snow Geese during the fall hunt (76%). A minor change in kill pattern at Ft. Severn and Winisk is that about 42% of the Snow Goose kill now occurs in spring, compared to 6% given by Hanson and Currie (1957). This is considerably higher than at other localities where proportions have remained virtually the same. In Québec the Cree take a much larger proportion (48%) of their Canada Geese in fall, compared to 22% in Ontario (Boyd, 1977).

Accuracy of Kill Figures

We have no direct way of measuring the accuracy of hunters' estimates of kill. While stating that we believe most hunters honestly tried to recall the size and composition of their kill to the best of their ability, we can point to several internal consistencies in the data. Similar conclusions were made by the James Bay and Northern Québec Native Harvesting Research Committee (1976) during studies in Québec. Among the kill patterns that agreed with our expectations based on knowledge of the geese are the relative size and makeup of the kill among the various villages, seasonal trends in numbers for different species, and differences in reported kill between years.

Obviously, many hunters could not remember their exact kill and tended to round off to the nearest five or ten birds. However, we were impressed with the number who reported apparently exact kill figures. We conclude that estimates given in this paper are sufficiently accurate for purposes of management of the waterfowl populations involved.

Significance of Kill for Management

The northern Ontario Indian kill of large Canada Geese assumed a substantial portion of the Flyway harvest only for MVP and TVP flocks. For the MVP, the Indian kill of 15 127 was 9% of the Flyway total and 4% of the mean winter population, in the three years. The Indian kill of TVP geese was about 7358, 13% of the total kill and 6% of the average winter population. In Ontario the native kill of EPP and Mid-Atlantic geese (335 each) was an insignificant component of the total kill.

The three-year average of 38 354 birds taken by Indians constituted 7% of the total harvest of mid-continent Lesser Snow Geese. Large numbers are also taken in Québec by Cree and Inuit hunters (James Bay and Northern Québec Native Harvesting Research Committee, 1976; Boyd, 1977). Adding Boyd's figure of 31 000 for 1973-75, Native hunters in the two provinces accounted for 12% of the total kill of the Hudson Bay population. Inventories of Lesser Snow Geese carried out in winter consistently underestimate the true population by a wide margin (e.g. Boyd *et al.*, 1982), and breeding ground inventories (Kerbes, 1975), although more accurate, are not done every year and do not take into account variations in production of young. Using the population estimates in Boyd *et al.* (1982:13), the kill by Ontario Indians was about 1.6% of the estimated fall flight. When the Québec Native kill is added, the figure becomes 2.9%.

Estimating kill and numbers of small Canada Goose stocks is difficult because of mixing that takes place among different populations. The reported average kill of 2354 small Canadas is roughly 5% of the total kill and 2% of total numbers of Tall Grass Prairie Canada Geese. Very few Brant are taken by Ontario Indians as compared to Québec (James Bay and Northern Québec Native Harvesting Research Committee, 1976), and this kill is of negligible importance. Similarly, although an average of 22 715 ducks were killed, this number is insignificant on a Flyway basis.

ACKNOWLEDGEMENTS

We are grateful for the help of L. Wight and S. Wendt, Canadian Wildlife Service, in providing printouts of band recoveries. We thank the following people who supplied information and assisted in gathering data: the late C. Currie, G. Eason, P. Edwards, M. Eliuk, D. Ferguson, J. Gow, H.C. Hanson, R. Landry, and S. St. Jules. Thanks also go to all the people of the communities who willingly supplied the data, and the many interpreters who assisted greatly in interviewing hunters.

REFERENCES

- BARNSTON, G. 1862. Recollections of the swans and geese of Hudson Bay. *Zoologist* 20:7831-7837.
- BELLROSE, F.C. 1976. Ducks, geese and swans of North America. Harrisburg, PA: Stackpole Books. 544 p.
- BOYD, H. 1976. Mortality rates of Hudson Bay snow geese, 1967-74. Canadian Wildlife Service Progress Note No. 61. 4 p.
- . 1977. Waterfowl hunting by Native people in Canada: the case of James Bay and northern Québec. XIII International Congress of Game Biologists, Atlanta, GA. 463-473.
- , SMITH, G.E.J. and COOCH, F.G. 1982. The Lesser Snow Geese of the eastern Canadian Arctic: their status during 1964-79 and their management from 1981 to 1990. Canadian Wildlife Service Occasional Paper No. 46. 25 p.
- CARLSON, E. 1979. The commercial fur industry in the West Patricia Planning Area. West Patricia Land Use Plan Wildlife Technical Report No. 1, Ontario Ministry of Natural Resources, Toronto. 48 p.
- DZUBIN, A., BOYD, H. and STEPHEN, W.J.D. 1975. Blue and snow goose distribution in the Mississippi and Central Flyways, 1951-1971. Canadian Wildlife Service Progress Note No. 54. 34 p.
- FINNEY, G.H. 1979. Some aspects of the Native harvest of wildlife in Canada. Transactions of North American Wildlife and Natural Resources Conference 44:573-582.
- GAMBLE, K.E. 1978. December 1977 Canada Goose survey in the Mississippi Flyway. U.S. Fish and Wildlife Service unpublished report. 10 p. [Federal Bldg., Room B22, 608 E. Cherry St., Columbia, MO. 65201.]
- HANSON, H.C. and CURRIE, C. 1957. The kill of wild geese by the natives of the Hudson Bay - James Bay region. *Arctic* 10(4):211-229.
- HANSON, H.C. and GAGNON, A. 1964. The hunting and utilization of wild geese by Indians of Hudson Bay Lowlands of northern Ontario. *Ontario Fish and Wildlife Review* 3(2):2-11.
- HANSON, H.C. and SMITH, R.H. 1950. Canada Geese of the Mississippi Flyway, with special reference to an Illinois flock. *Illinois Natural History Survey Bulletin* 25:67-210.
- JAMES BAY AND NORTHERN QUEBEC NATIVE HARVESTING RESEARCH COMMITTEE. 1976. Research to establish present levels of harvesting by native peoples of northern Québec. Part I. A report on the harvests by the James Bay Cree. Montreal. 2 Volumes.
- KERBES, R.H. 1975. Lesser Snow Geese in the eastern Canadian Arctic. Canadian Wildlife Service Report Series No. 35. 47 p.
- REEVES, H.M., DILL, H.H. and HAWKINS, A.S. 1968. A case study in Canada Goose management — the Mississippi Valley Population. In: Hine, R.L. and Schoenfeld, C. (eds.). Canada Goose Management. Madison, WI: Dembar Educational Research Inc. 150-165.
- ROGERS, E.S. 1966. Subsistence areas of the Cree-Ojibwa of the eastern Subarctic: a preliminary study. *National Museum of Canada Bulletin* No. 204:87-118.
- RUSCH, D.H., CRAVEN, S.R. and TROST, R.E. 1981. Distribution, migration and survival of MVP Canada Geese associated with east-central Wisconsin. Progress Report, January 1981. Unpublished. [Cooperative Wildlife Unit, School of Natural Resources, Univ. of Wisconsin, Madison, WI 53706.]
- VAUGHT, R.W. and KIRSH, L.M. 1966. Canada Geese of the Eastern Prairie Population, with special reference to the Swan Lake flock. *Missouri Department of Conservation Technical Bulletin* No. 3. 91 p.