COMPARISON OF RESULTS FROM TWO WATERFOWL HARVEST STUDIES IN THREE INUVIALUIT COMMUNITIES, NORTHWEST TERRITORIES, 1988-1990

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ABSTRACT

Results of two waterfowl harvest studies conducted in 3 Inuvialuit communities in the Western Arctic from 1988 to 1990 were compared to assess reliability of data, explain inconsistencies and make recommendations for methodological improvements if needed. One study, the Inuvialuit Harvest Study (IHS), relied on interviews of hunters conducted in communities at monthly or longer intervals, whereas the Northwest Territories Department of Renewable Resources (DRR) study relied on a combination of hunter interviews conducted on the hunting grounds during the hunt and at intervals of 2 weeks or less, and on direct observations. Hunter population size, and total harvest estimates were considerably greater for the DRR study for Tuktoyaktuk and Sachs Harbour; however, results were very similar for Paulatuk. In the latter case, both studies achieved 100% coverage of the hunter population. Trends in harvest patterns between years were similar between the two studies for all communities. The IHS estimate of hunter population size and proportion of hunters that was active was unrealistically low in Tuktoyaktuk and Sachs Harbour and needs to be improved. Harvest studies in small communities with complete and frequent coverage of all hunters can yield consistent and reliable data; however, studies in large communities will require a more complex design involving stratification of hunters on some meaningful basis to reflect their different levels of activity.

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INTRODUCTION

In 1987, the Wildlife Management Division of the NWT Department of Renewable Resources (DRR), in consultation with the Inuvialuit Game Council and funded by Inuvialuit Implementation Funds, initiated field research on the biological implications of spring waterfowl harvests in selected Inuvialuit communities. These studies focused on the species, sex and age composition, and breeding status of waterfowl harvested, but also included numbers of birds taken (Bromley and Croft 1992). About the same time, the Inuvialuit initiated a study on the size of harvest of all wildlife, including waterfowl, by hunters in the Inuvialuit Settlement Area. In June 1992, the Wildlife Management Advisory Council (NWT) for the Inuvialuit Settlement Region requested that the DRR compare the results of the DRR study with those of the Inuvialuit Harvest Study (IHS), to assess the validity of the studies. This report is in response to that request.

The DRR study was conducted during 3 consecutive years in 3 communities. Research occurred in Tuktoyaktuk from 1987 to 1989, and in Paulatuk and Sachs Harbour from 1988 through 1990. Beginning in 1988, the IHS yielded data on numbers of birds shot that could be compared with DRR data; thus comparison between DRR data and that of the Inuvialuit Harvest Study, provided by Inuvialuit Harvest Study Coordinator Michael Fabijan (Fabijan 1991a, 1991b and 1991c), is possible for all three communities for 1988 and 1989, and for Paulatuk and Sachs Harbour in 1990. Comparable harvest results are available for Lesser Snow Geese

(LSG), White-fronted Geese (WFG), Canada Geese (CAN), Brant (BRT) and Tundra Swans (TSW).

Objectives of this report are:

1. to assess the consistency across studies, as a measure of reliability, of spring waterfowl harvest survey results for species, communities, and years where comparable data exist;

2. to explain inconsistencies between the results of the two studies; and

3. to make recommendations for methodological changes to the ongoing harvest studies if warranted.

METHODS

The methodology of data collection for reported harvest in the IHS has been reported in detail by Fabijan (op cit.). In brief, community workers were hired to interview hunters in each community about the number of each species of wildlife harvested each month. An attempt was made to interview hunters on a monthly basis; however, the interval between interviews was often much longer. The number of hunters interviewed, the number of hunters who reported harvesting each species, and the numbers of each species were summarized on a monthly basis. The community workers were responsible for maintaining a list of all hunters in the community. For comparison with DRR harvest data, only reported harvest in the IHS for the months of the spring hunt, May and June, were used each year.

The DRR study employed an ethnographic approach, where biologists, accompanied by local guides hired in each community, lived and travelled on the land with hunters to learn harvest characteristics within a cultural context. Effort was made to travel throughout much of the hunting region of each community, contacting as many hunters as possible as frequently as possible. Biologists were present for the May and early June harvest (Table 1), but departed from all communities in all years by 11 June when local travel conditions became quite difficult. Harvested birds were examined to determine the biological characteristics of the

Table 1. Dates of observations in each community for the Department of Renewable Resources spring waterfowl harvest study in Tuktoyaktuk, Paulatuk and Sachs Harbour, NWT, 1988-1990.

Community	Year	Dates
Tuktoyaktuk	1988	21 May - 7 June
	1989	13 May - 2 June
Paulatuk	1988	16 May - 10 June
	1989	15 May - 7 June
	1990	18 May - 8 June
Sachs Harbour	1988	27 May - 5 June
	1989	27 May - 5 June
	1990	28 May - 11 June

kill (sex and age composition, breeding status); however, this report draws only upon interviews conducted to determine where, when and how many birds were shot. Because hunters were interviewed throughout their spring hunts, often while on the land and living in hunting camps, the time between interviews, and the time between harvest activity and interviews, rarely exceeded two weeks and was usually much less. Although most interviews were conducted while on the land, some hunters were interviewed in the communities, especially towards the end of the spring hunt. The hunter population was taken as the number of registered male General Hunting License (GHL) holders in the community aged 16 years or older. To estimate the proportion of hunters who were active, a 15% random sample of the community hunter population was contacted in 1987 and 1988 for Tuktoyaktuk (the mean of these two

was used in 1989), and in 1988 for Sachs Harbour (used in all 3 years). Hunters were asked "did you hunt waterfowl this year?". In Paulatuk, interviews of all male, potential hunters were conducted each year.

Waterfowl shot in May and June each year are reported here as spring totals. However, since the DRR study did not extend beyond 11 June in any year, data from that study are not completely equivalent to IHS data, which extended to the end of June. However, hunters indicated that for most species the majority of the spring waterfowl hunt was concluded by early to mid-June. In this report, data presented include: a) the mean number of each species shot by those hunters who reported harvesting one or more of that species, b) mean harvest per active hunter (in the case of the IHS, active hunters were those harvesting any species of wildlife, whereas in the DRR study they were those harvesting waterfowl), and c) total reported harvest by those hunters interviewed. These data were used to estimate total harvests for the IHS (harvest = (mean harvest per active hunter/number of hunters interviewed) * hunter population). In the DRR study, methods of estimation varied for each community. In Paulatuk, the reported harvest was assumed to be the total harvest. In Tuktoyaktuk and Sachs Harbour, a phone interview of a 15% sample of male GHL holders was used to determine the proportion of hunters that hunted waterfowl. Discussions with hunters suggested that of the proportion that hunted, 67% shot the average number of birds recorded in interviews, and the remaining third of active hunters

shot only 33% of the average number of birds bagged by those hunters interviewed. Thus, the total harvest = (mean harvest per active hunter interviewed) (two thirds of the active hunter population) + (one third of the mean harvest per hunter interviewed) (one third of the active hunter population). In Sachs Harbour, we believed all of the active hunters were equally active and successful to those we interviewed, so total harvest = (mean harvest per hunter interviewed) (number of active hunters).

Numbers of birds shot and reported by hunters were those recalled from memory. Because there was likely wide variation between individuals in the accuracy of recall, and because elapsed time between interviews in the IHS data was large relative to DRR data, statistical analysis did not seem appropriate. Further, standard deviations in numbers reported were not available from the IHS reports. Therefore, conclusions about consistency or lack of it were drawn on a subjective basis. Usher and Wenzel (1987) considered the usefulness of subjective analyses for harvest data, and concluded that when presented with informed contextual statements from observers who collected the data, valid results can be obtained.

RESULTS DISCUSSION

Hunter Population Size

The estimated number of hunters in each community was similar between the two studies, with one major exception (Table 2). In Tuktoyaktuk, the IHS estimated 119 and 118 hunters, compared to the DRR estimate of 240 and 252 hunters for 1988 and 1989, respectively.

The IHS estimate of the hunter population (118 and 119) seemed unrealistically low for Tuktoyaktuk. Evidence for this can be taken from the greater number of hunters (123) who, over the course of the DRR study, were actually encountered on the land, without complete coverage of the hunting range of the community, and without having door to door contact within the community.

The DRR estimates of hunter populations for Tuktoyaktuk (240 and 252) may have been too high. They were based on a list of registered GHLs for this community, updated by Renewable Resource Officers bi-annually. If this list was not completely updated, the estimates would be incorrect. However, because it is more likely that updates would slowly increase the number of GHLs in the community each year, it would be surprising if the list yielded an overestimate of the hunter population. Similarly, it is possible that many GHLs registered in Tuktoyaktuk had moved away; again, this tendency would tend to be balanced by GHLs from other communities moving to Tuktoyaktuk.

The estimated proportion of hunters who actively hunted each spring (number who harvested / number who harvested + number who did not hunt, my calculations from Fabijan op. cit.) was dissimilar between the two projects, with the IHS estimates lower by 9.5 to 48.0 % (Table 2). That the IHS estimate was unrealistically low is demonstrated by applying the IHS estimate to the IHS population of hunters, and comparing this to the actual number of active hunters interviewed in the DRR study. For example, in 1989 in Tuktoyaktuk, the IHS used a population of 118 hunters, of which 116 were interviewed and 36 (31.0%) of those hunted. Applying the proportion which hunted (31%) to the total population (118), an estimate of 37 active hunters is derived. In comparison, the DRR study, without full coverage, included interviews of 61 active hunters in Tuktoyaktuk that year. In almost every case, more successful hunters were interviewed (i.e., a known minimum) in each community each year of the DRR study than were estimated in total by the IHS study.

It is possible that the DRR estimate of the proportion of hunters that were active was too high, but because this was based on a random sample (i.e., an unbiased estimator) of GHLs registered in the communities of Tuktoyaktuk and Sachs Harbour, confidence in the estimates is high. In the IHS, active hunters are those that were active hunting any wildlife that month, whereas in the DRR study, active hunters were those specifically hunting waterfowl. A bias towards underestimating the per hunter take from the IHS would be introduced in this case; however, comparisons between

successful hunters hunting each species do not suffer from this factor, yielding confidence in the validity of the comparisons.

Table 2. Comparison of the hunter population, and proportion of hunters harvesting in the Inuvialuit Harvest Study (IHS) and the Department of Renewable Resources (DRR) study for Tuktoyaktuk, Paulatuk and Sachs Harbour, NWT, 1988-1990. [IHS data are given in, or derived from, Fabijan (1991a, 1991b, 1991c).]

		IHS			DRR			DIFFERENCE IN PROPORTION HUNTED
Community	Year	Hunter Pop.	Hunted[a]/ Did not Hunt	Proportion Hunted	Hunter Pop.	Hunted/ Did not hunt	Proportion Hunted	DRR estimate over IHS Estimate
Tuktoyaktuk	88	119	59/36	0.621	240	30/6	0.837	0.216
	89	118	36/80	0.310	252	30/8	0.790 [b]	0.480
Paulatuk	88	62	52/10	0.839	61	57/4	0.934	0.095
	89	61	51/10	0.836	62	60/2	0.968	0.132
	90	65	51/14	0.785	55	52/3	0.945	0.160
Sachs Harbour	88	52	30/17	0.638	53	22/6	0.786 [c]	0.148
	89	52	23/28	0.450	57	22/6	0.786	0.336
	90	49	31/15	0.670	57	22/6	0.786	0.116

[a] Maximum number possible for May

[b] Average of 1987 and 1988

[c] 1988 figure used for all years

Average Reported Harvest per Hunter

The average reported harvest of each species per hunter successful at harvesting each species was fairly similar between studies for all communities and years, particularly when sample sizes were reasonably large in both studies (Table 3); the mean harvest of each species per active hunter (i.e., those not necessarily successful at taking every species) was even more similar (Table 4). In Tuktoyaktuk and Paulatuk, there was a general trend for the IHS to report a higher average (my calculations from Fabijan op. cit.) than the DRR study, but this was not unexpected for several reasons. First, because the DRR study was terminated each year in early June, the entire harvest for June was necessarily underestimated. This was particularly true for BRT which, as a late arriving species each spring, were mostly harvested throughout June. Second, because many hunters were not contacted at the end of the spring hunt specifically for their total harvest, the DRR results would again be underestimates. The substantially higher IHS reported per hunter take of LSG in Tuktoyaktuk in 1989 and of WFG in Paulatuk in 1988 (Table 3) cannot be explained. Perhaps there was a tendency in the IHS to interview the most active or successful hunters more often than others; or possibly hunters interviewed in the DRR work did not report their full take, or final interviews took place before much of the harvest occurred. In Sachs Harbour, there was a consistent trend for average DRR reports of LSG harvests to be higher than IHS

reports. It is unknown why this should be so, but sample sizes in the DRR study, 20 to 54 % higher than the IHS, indicate that the difference was real.

Table 3. Comparison of spring waterfowl take per hunter successful[a] in taking each species, in the Inuvialuit Harvest Study (IHS) versus that of the Department of Renewable Resources (DRR) for Tuktoyaktuk, Paulatuk and Sachs Harbour, NWT, 1988-1990. [IHS data are given in, or derived from, Fabijan (1991a, 1991b, 1991c).]

Community	Year	Source	LSG $\bar{x}$ (# of hunters)	WFG	TSW	CAN	BRT
Tuktoyaktuk	1988	IHS	31.5 (49)	27.8 (49)	3.0 (4)	6.5 (6)	34.3 (21)
		DRR	29.1 (68)	18.3 (66)	2.0 (33)	3.2 (25)	10.6 (29)
	1989	IHS	27.3 (26)	21.8 (24)	0.5 (1)	-- (0)	16.0 (10)
		DRR	20.5 (54)	18.5 (53)	2.5 (26)	2.9 (14)	5.6 (18)
Paulatuk	1988	IHS	29.5 (50)	8.4 (45)	2.1 (13)	6.9 (47)	7.7 (3)
		DRR	22.5 (54)	6.8 (43)	1.6 (17)	6.2 (52)	3.0 (2)
	1989	IHS	17.5 (48)	7.3 (44)	2.1 (17)	4.6 (44)	4.3 (4)
		DRR	15.4 (56)	6.7 (47)	2.0 (18)	3.7 (50)	4.7 (3)
	1990	IHS	19.2 (46)	10.3 (42)	2.1 (19)	7.9 (39)	9.0 (2)
		DRR	16.5 (48)	8.8 (43)	1.9 (24)	6.5 (46)	1.5 (2)
Sachs Harbour	1988	IHS	58.1 (24)	1.0 (1)	-- (0)	1.0 (1)	25.3 (3)
		DRR	61.7 (37)	1.0 (2)	1.7 (3)	1.3 (4)	5.6 (14)
	1989	IHS	63.9 (25)	1.0 (1)	-- (0)	1.0 (1)	5.5 (4)
		DRR	70.8 (36)	1.0 (2)	1.0 (2)	1.7 (3)	3.5 (17)
	1990	IHS	49.2 (30)	-- (0)	3.0 (1)	1.0 (1)	14.8 (4)
		DRR	61.8 (36)	1.0 (1)	-- (0)	1.3 (4)	3.6 (20)

[a] See methods for determining the number of hunters from the IHS data.

Table 4. Comparison of reported spring harvest per active waterfowl hunter in the Inuvialuit Harvest Study (IHS) versus that of the Department of Renewable Resources (DRR) in Tuktoyaktuk, Paulatuk and Sachs Harbour, NWT, 1988-1990. IHS data are given in, or derived from, Fabijan (1991a, 1991b, 1991c).

Community	Year	# of Hunters	LSG	WFG	TSW	CAN	BRT
Tuktoyaktuk	1988	IHS 59	26.2	23.1	0.20	0.66	12.2
		DRR 72	27.5	16.7	0.93	1.10	4.3
	1989	IHS 36	19.8	14.5	0.06	0	4.4
		DRR 61	18.2	16.0	1.05	0.67	1.6
Paulatuk	1988	IHS 52	28.4	7.2	0.52	6.3	0.44
		DRR 57	21.3	5.1	0.47	5.6	0.11
	1989	IHS 51	16.5	6.3	0.69	4.0	0.33
		DRR 60	14.4	5.2	0.60	3.1	0.23
	1990	IHS 51	17.3	8.5	0.76	6.1	0.35
		DRR 52	15.3	7.3	0.87	6.0	0.06
Sachs Harbour	1988	IHS 30	46.5	--	0	0	2.5
		DRR 37	61.7	--	0.14	0.14	2.1
	1989	IHS 28	57.1	--	--	0	0.79
		DRR 36	70.8	--	--	0.14	2.1
	1990	IHS 31	47.6	--	0.10	0	1.9
		DRR 36	61.8	--	0	0.14	1.9

Harvest Estimates

As a result of differences in population size of hunters for each community, and in proportions of the hunter populations which were active each spring, total harvest derived from the IHS is seriously underestimated in comparison to DRR estimates for Tuktoyaktuk and Sachs Harbour (Table 5). In some cases, the total estimated harvest from the IHS is less than the reported harvest for the sample of hunters interviewed in the DRR study. In

contrast, the two studies presented very similar total reported harvests in Paulatuk, where 100% coverage of the hunter population was achieved in both studies (Table 6). Data from Paulatuk were strikingly similar except for BRT. The difference for BRT was expected, because as noted above, this species was largely harvested after the DRR study was concluded each spring, resulting in higher estimates by the IHS.

Table 5. Comparison of total reported and total estimated spring take of waterfowl from Inuvialuit Harvest Study (IHS) and Department of Renewable Resources (DRR) study data, for Tuktoyaktuk and Sachs Harbour, NWT, 1988-1990. [IHS data are given in, or derived from, Fabijan (1991a, 1991b, 1991c).]

Community	Year	Source	LSG	WFG	TSW	CAN	BRT [a]
Tuktoyaktuk	1988	IHS-rept.	1545	1364	12	39	721
		IHS-est.	1939	1709	15	49	903
		DRR-rept.	1980	1205	67	79	308
		DRR-est.	4299	2617	149	172	669
	1989	IHS-rept.	711	522	2	0	160
		IHS-est.	733	537	2	--	163
		DRR-rept.	1109	979	64	41	100
		DRR-est.	2818	2488	163	104	254
Sachs Harbour	1988	IHS-rept.	1395	1	0	1	76
		IHS-est.	1535	1	--	1	83
		DRR-rept.	2284	2	5	5	78
		DRR-est.	2593	2	6	6	89
	1989	IHS-rept.[b]	1598	1	0	1	22
		DRR-rept.	2547	2	2	5	60
		DRR-est.	3184	3	3	6	75
	1990	IHS-rept.	1477	0	3	1	59
		IHS-est.	1571	--	3	1	63
		DRR-rept.	2225	2	2	5	70
		DRR-est.	2694	2	3	6	85

[a] Incomplete data for DRR study.
[b] IHS data for Sachs Harbour in 1989 is from 100% coverage of hunters.

Table 6. Total reported spring waterfowl harvest for Paulatuk, NWT, 1988-1990 in the Inuvialuit Harvest Study (IHS), from Fabijan (1991a, 1991b, and 1991c) and the Department of Renewable Resources study.

		SPECIES				
Year	Source	LSG	WFG	TSW	CAN	BRT [a]
1988	IHS	1477	376	27	325	23
	DRR	1216	291	27	322	6
1989	IHS	839	322	35	203	17
	DRR	861	313	36	184	14
1990	IHS	882	431	39	310	18
	DRR	794	380	45	297	3

[a] Incomplete data for DRR study.

DRR total harvests for Tuktoyaktuk may have been over estimated for one other reason. Hunters spending most of the spring on the land hunting were those most likely to be interviewed. It is probable that these hunters harvested more birds than did people hunting irregularly or rarely, thereby yielding a per hunter harvest that would not be typical (i.e., was an over-estimate) of hunters not interviewed. On the other hand, this potential bias was anticipated and at least partially addressed in several ways. The DRR estimate assumed that one third of hunters not represented in interviews would harvest only one third that of hunters encountered during the study (i.e., the reason they were missed on the land was that they were less active

and, therefore, had smaller harvests); the sample of hunters interviewed did include some hunters who harvested only lightly; a large sample (31 to 36%) of the estimated number of active hunters was interviewed each year; because estimating total harvest was not a primary objective of the study, the DRR estimates did not include final interviews for every hunter at the end of each spring study and thus were probably underestimates; and finally, the DRR survey ended in early to mid-June each spring, before the harvest was complete. One additional factor is that, for whatever reason, it is known from observations in the field that a few very successful hunters considerably under-reported their seasonal take.

In the DRR study, one to several non-native, non-GHLs were included in interviews in each community each year. It is likely that any bias introduced here would be small, and swamped by the bulk of the data on GHLs. In all cases, the non-GHL harvest was similar to, or smaller than the harvest of waterfowl reported by GHLs.

CONCLUSIONS AND RECOMMENDATIONS

1. Harvest data for Paulatuk, based on 100% coverage of hunters in both studies, were strikingly similar between studies, indicating that the IHS methodology has the potential to provide consistent (across two independent studies), and therefore likely reliable, data.

2. Harvest data on a per active hunter basis for Tuktoyaktuk seem fairly consistent, and therefore fairly reliable.

3. The IHS waterfowl harvest data for active hunters in Sachs Harbour are consistently under reported by 24 to 36%.

4. Trends in harvest between years were similarly and consistently reflected in both the IHS and the DRR study.

5. The IHS hunter population for Tuktoyaktuk was unrealistically low, and needs to be examined and revised. Perhaps it reflects only those hunters who are seasonally or self-employed (on the land), without incorporating many of those who have permanent, wage employment.

6. The proportion of the hunter population which hunted was unrealistically low in the IHS; this parameter is extremely important in estimating total harvests by communities. This needs

to be addressed.

7. Harvest data are likely to be more reliable in small communities where it is collected on a regular and timely basis, and with full coverage of all of the hunter population, and where the hunter population has a more traditional lifestyle (that is, where a large proportion of hunters are active each month). Deriving reliable data from large communities will be much more difficult, and will require a more complex design involving stratification of hunters on some meaningful basis to reflect their different levels of activity.

8. The future determination of subsistence game quotas for Inuvialuit may be developed in reference to current levels of harvest and usage patterns (see Section 14 (36) (c) (ii) (B), Canada, Indian and Northern Affairs Canada 1985). If so, it will be important to be able to evaluate harvest estimates for each community. This report provides some basis for such an evaluation.

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