Wolverine (*Gulo gulo*) carcass collection and harvest monitoring in Nunavut

Summary report

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Introduction:

For thousands of years, Inuit have relied on the harvest of wildlife for food, clothing and trade. In Nunavut, furbearers harvest for clothing and for income is a seasonal and traditional activity, where opportunity for other employment is scarce. Under the Nunavut Land Claims Agreement (NLCA), furbearer harvest privileges are held by Inuit beneficiaries, non beneficiaries who harvested furbearers legally in Nunavut settlement area prior to 1981 and non beneficiaries whose application has been approved and recommended by local Hunters and Trappers Organizations (HTOs).

Wolverines (*Gulo gulo*) are important furbearer in Nunavut's culture and economy and have traditionally been considered a vital resource for hunters because of the beauty and frost resistant properties of wolverine fur which make it unique and quite valuable (Hash 1987). Wolverine fur is highly prized in local communities as ruffs or trims on parkas (Cardinal 2004). Unlike other provinces, hunters and trappers in the Nunavut do not have registered or traditionally exclusive family trap lines or hunting areas, so wolverines are generally harvested wherever people travel (Mulders 2001) or harvested while hunting other game.

In Nunavut, wolverines occupy almost all areas of the territory and are classified as both a fur bearer and a big game animal under the NLCA. The wolverine is generally described as a scavenger (Banci 1987) and opportunistic predator (Magoun 1985; Mattisson et al. 2011) throughout its range, and it is considered a wilderness species and potential indicator of ecosystem health (Carroll et al. 2001). Wolverines occur in low densities and have low birthing and recruitment rates. The Committee on the Status of Endangered Species in Canada (COSEWIC 2007) has listed the western Canada population, including Nunavut, as "Special Concern." Mulders (2001) suggest that arctic tundra contain large undisturbed tracts of habitat that may act as reservoirs to maintain harvestable populations of wolverines in Nunavut.

The harvest monitoring and carcass collection program was conducted primarily to assess the health of the wolverine populations in Nunavut, describe their geographic distribution, the age and sex structure of the population, and to describe the seasonal and regional variations in their diet. This report presents the results of the wolverine carcass collection conducted during the 2009-10, 2010-11 and 2011-2012 harvest seasons.

Methods:

We obtained skinned wolverine carcasses from hunters with the assistance of Hunters and Trappers Organizations (HTOs) and Conservation Officers (COs), during the 2009-10 (N = 61), 2010-11 (N = 94) and 2011-2012 (N = 124) hunting seasons (July 1st to June 30th). A fifty dollars subsidy was provided to hunters for each carcass brought back to their wildlife office to encourage the return of samples. Conservation officers filled carcass collection form with information from hunters about the date, location, method of harvest and their opinion about the current status of the local wolverine population. The skinned carcasses were stored frozen and thawed at room temperature for necropsy in early May each year. Partially thawed carcasses were sexed and weighed. Body length (nose to base of tail), neck circumference, chest girth, condylobasal length, zygomatic width, skull length and femur length were measured following Mulders (2001). Total body weight was taken to the nearest 0.1 kg. Estimated carcass weight was calculated by subtracting the stomach contents weight and adding 100 grams for each missing paw (often cut off by hunters). The estimated live weight was estimated by correcting for the absence of hide by adding 17% of the estimated carcass weight for females and 21% for males (Elliott and Dumond, in prep, n = 21 individuals weighted before and after skinning). The depth of the back fat was measured, and the omental, perirenal and sternal fat depots were removed and weighed to estimate the body condition of the individuals. A body fat index was developed following Lee (1994) as:

$$\text{Body fat index} = (\text{perirenal fat (g)} + \text{sternal fat (g)}) / \text{estimated live weight (kg)}$$

A tooth was removed and submitted for aging to Matson Laboratory (Montana, USA) using cementum annuli. Following Banci and Harestad (1988) and Vangen et al. (2001) individuals were then grouped into three age classes: juvenile (0-1 year, date of birth is set to March 1st), yearling (1-2 years) and adult (≥ 2 years). Age results from the 2011-2012 season have not been received yet and this season is therefore excluded from all analysis presented in this report which take in consideration the age of the individuals.

Stomachs were removed and sent for examination of their content to the Université du Québec à Rimouski. Stomach contents were weighted, washed out, and rinsed in water in 0.5-mm sieves. Both macroscopic and microscopic examination of the content was performed and identified items were divided into 10 categories: caribou, muskox, moose, ground squirrel, microtine, birds, large rodent, seal, carnivores and vegetation. Two indexes were use to describe wolverine's diet: mean prey contribution (total weight of items belonging to a prey type out of total content weight) and prey occurrence (number of stomach into which a prey type was detected at least one time).

Results:

According to our carcass collection program, wolverine harvest in Nunavut has been fluctuating since 2000 and the harvest/return rate of carcasses in the Kivalliq has been increasing since the beginning of the program (Fig 1).

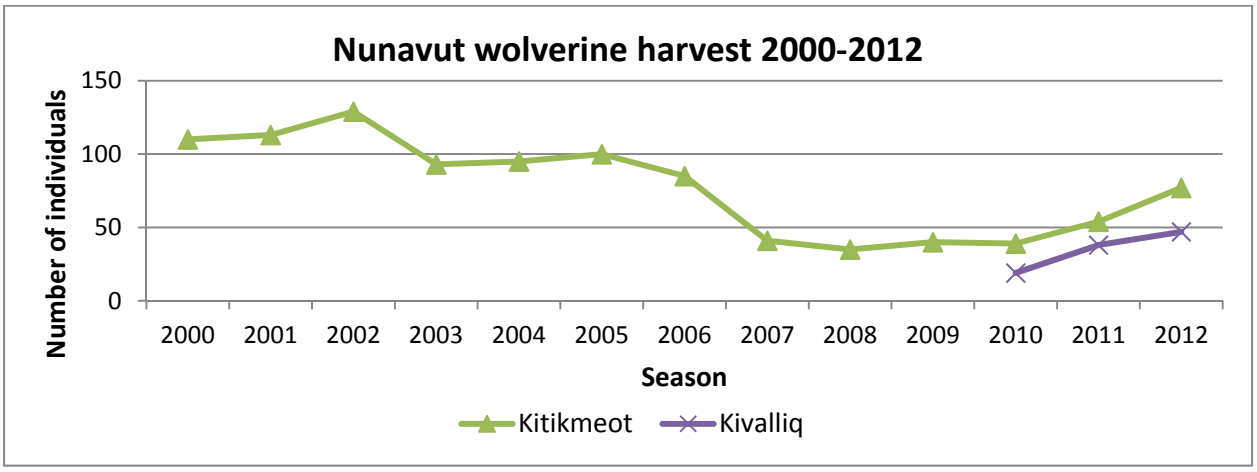

Figure 1: Number of wolverine carcasses collected from 2000 to 2012 in Nunavut

The harvest was unevenly distributed throughout the territory, with most wolverines taken in the western Kitikmeot, in the vicinity of Kugluktuk, and relatively fewer in the eastern communities (Fig 2). From July 1st 2009 to June 30th 2012, we collected 279 wolverine carcasses, 169 from the Kitikmeot, 104 from the Kivalliq and 6 from the Baffin region. All wolverines were harvested between November and May each year, when the fur is in prime condition, with the majority of the harvest occurring in March and April (Fig 3). Carcass collection data shows that approximately 5% animals were trapped (quick-kill trap or leg hold trap) and 90% were hunted with a rifle.

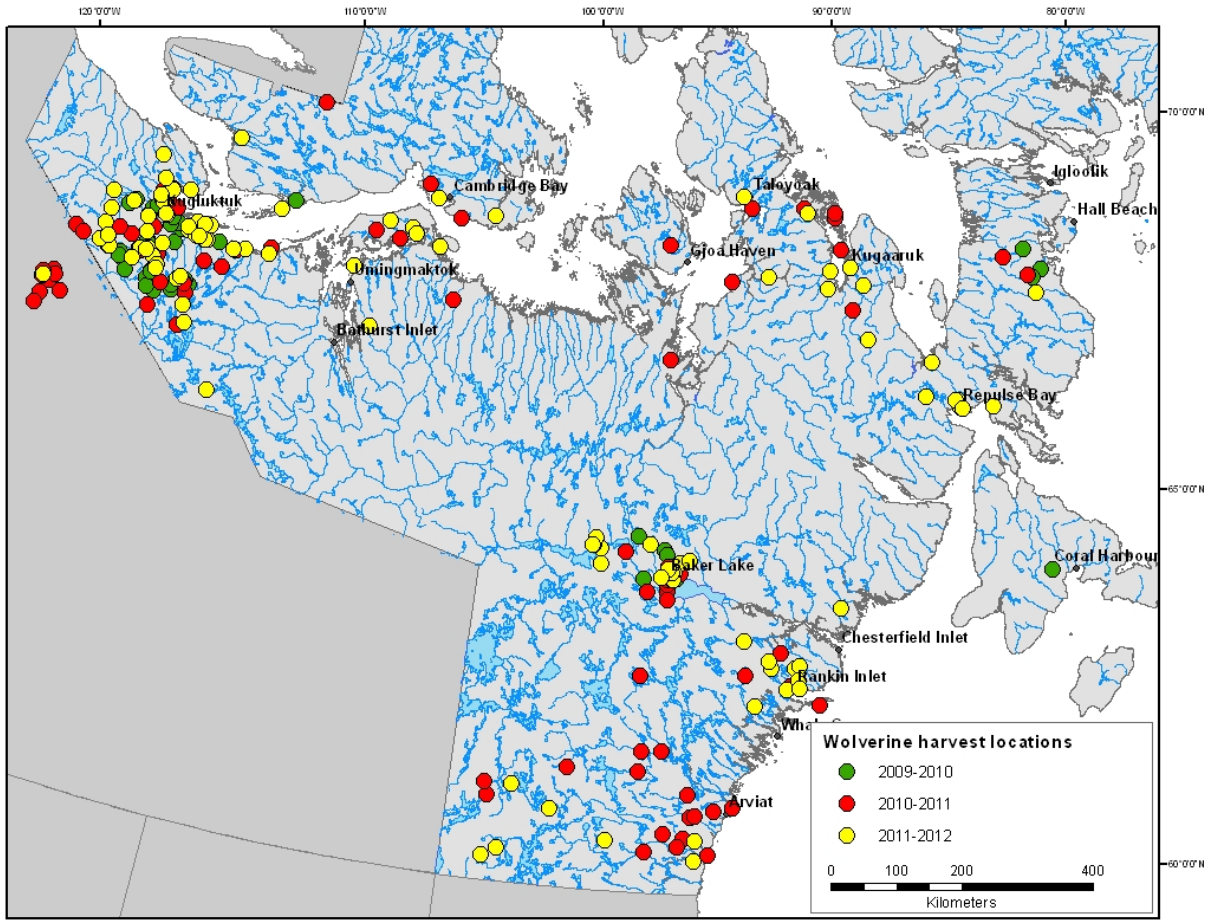

Figure 2: Distribution of reported wolverine harvest during 2009/10, 2010/11 and 2011/12 seasons.

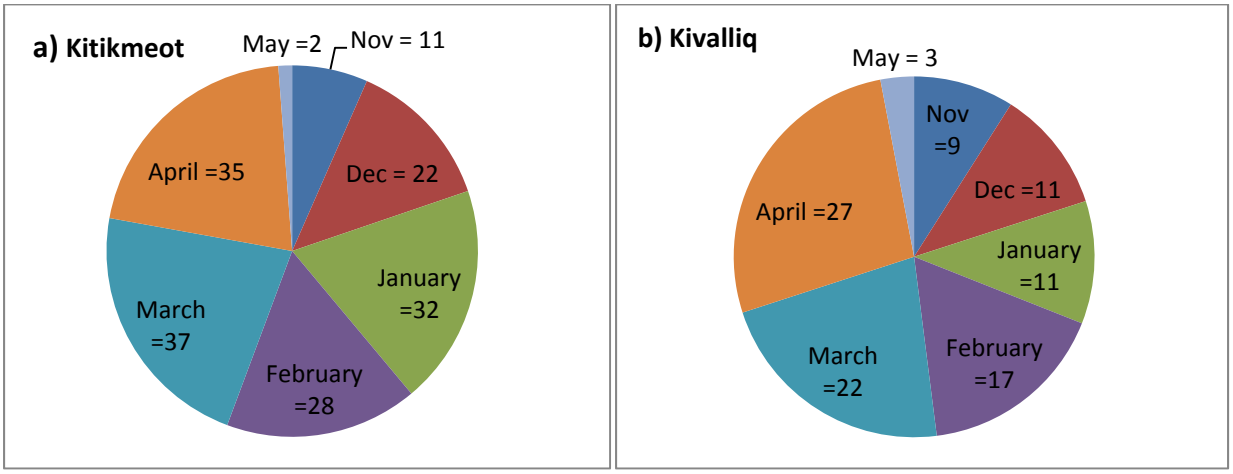

Figure 3: Wolverine reported monthly harvest 2009-12 in Kitikmeot (a) and Kivalliq (b) regions. Label indicates total number of wolverines harvested per month.

The male:female ratio of the harvest during the last three seasons was highly biased towards males in both regions with approximately twice more males harvested than females (ratio = 2.3 and 2.1 in the Kitikmeot and kivalliq respectively) (Fig 4).

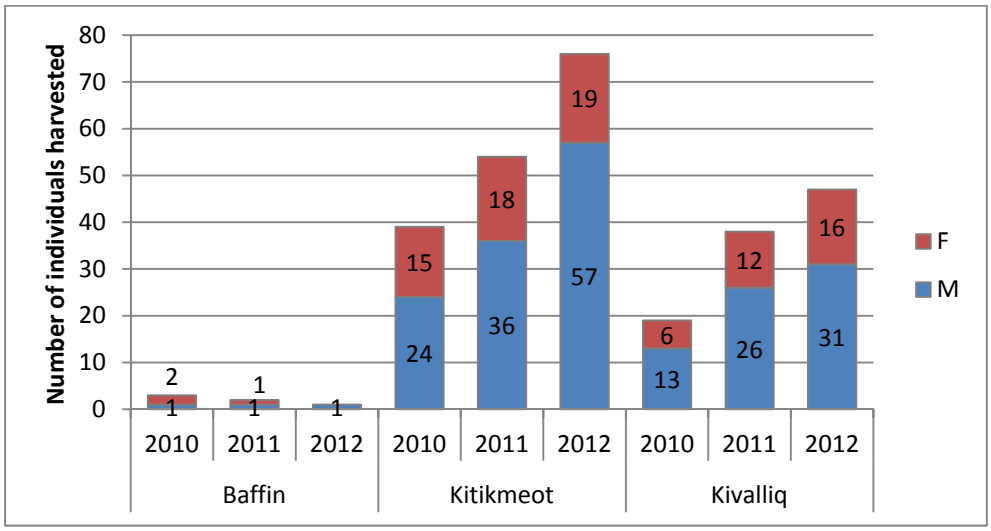

Figure 4: Sex ratio of the wolverine harvest in all regions for seasons 2009/10, 2010/11 and 2011/12

Age structure of the 2009-2010 and 2010-2011 harvest is presented in Fig 5. The oldest males (9 year) were killed in Kugluktuk (2) and Arviat (1), while the 2 oldest females (8 year) were killed in Arviat. About half of the harvest consisted of adult animals, yearlings represented 38% and juveniles 13% of the harvest (Table 1). Yearlings and juveniles contributed for only 47% of the known age male harvest, in contrast to 81% reported by Lee (1994) in the Kitikmeot region in the early 1990s, and by Rausch and Pearson (1972) who also reported wolverine harvest biased toward younger males in Alaska and Yukon.

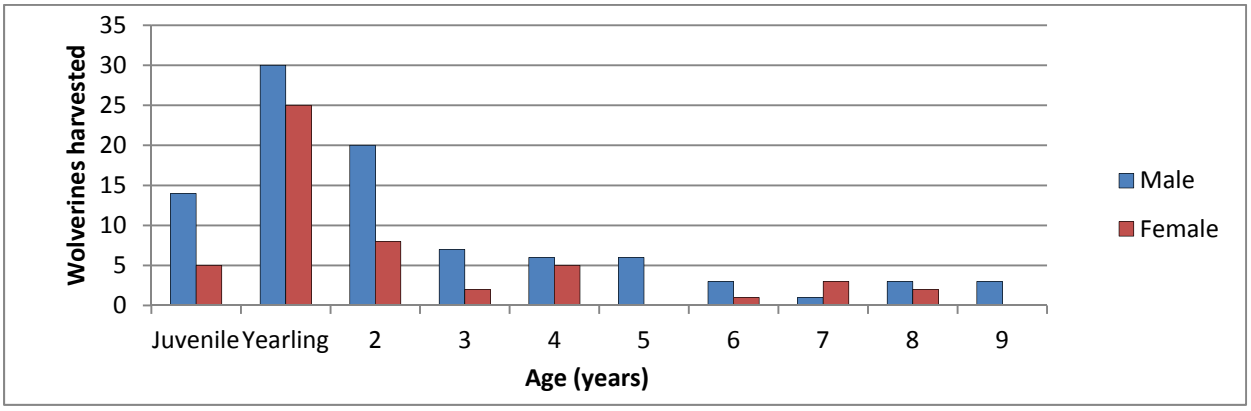

Figure 5: Age and sex structure of wolverine harvest for the 2009/10 and 2010/11 seasons in Nunavut.

Table 1: Age and sex distribution of reported wolverine harvest 2009-11.

Age Class	Sex		Total (% of total)
	Males (% of males)	Females (% of females)	
Adult (≥ 2 years)	49 (53%)	21 (41%)	70 (49%)
Yearling	30 (32%)	25 (49%)	55 (38%)
Juvenile (< 1 year)	14 (15%)	5 (10%)	19 (13%)
Unknown age	8	3	11
Total	101	54	155

Figure 6 illustrates the temporal variation in the harvest according to age class in each region. In both the Kitikmeot and Kivalliq, the harvest of adult individuals peaked in March and April. For males, this corresponds to the time when maximal size of testes and highest levels of testosterone are attained (Pasitschniak-Arts and Larivière 1995), probably marking the start of the breeding season and resulting in increased movements and increased chances of harvest.

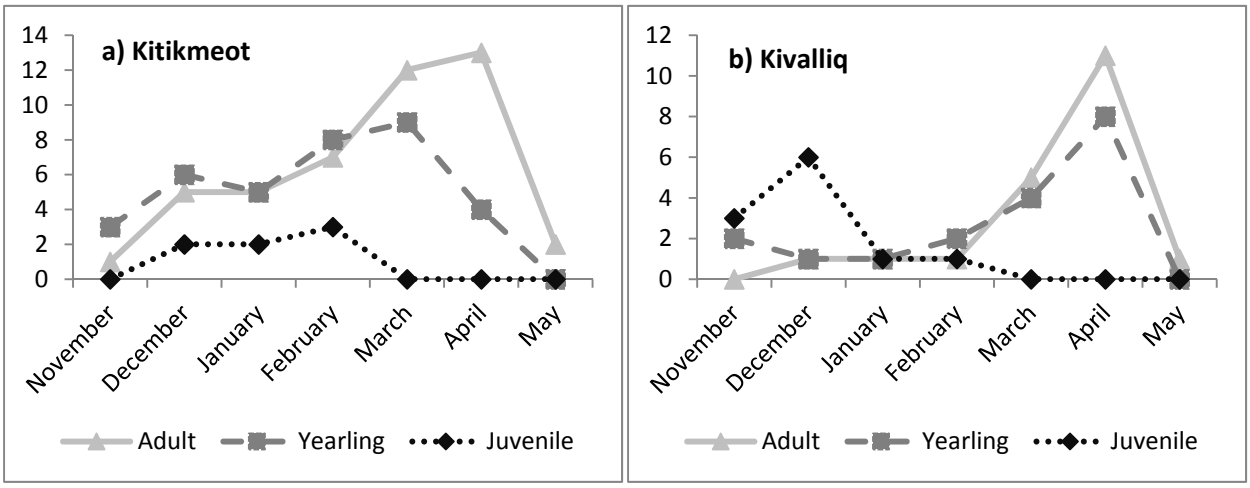

Figure 6: Monthly wolverine harvest per age class from 2009/10 and 2010/11 seasons, in Kitikmeot (a) and Kivalliq (b).

The average estimated live weight of males and females was 14.4 kg (n= 87, range= 10.3 to 19.6 kg) and 9.7 kg (n= 51, range = 7.5 to 12.2 kg) respectively. Males had larger fat depots than females (sternal, omental and perirenal fat depots, $p < 0.01$) except for back fat where no significant difference were found ($p = 0.694$). When taking into consideration individual body weight, our fat index did not differ significantly between both sexes ($p= 0.876$) and values were similar to those presented by Lee (1994) (Table-2).

Table 2: Mean measurements of fat depots on wolverines harvested in Nunavut from 2009 to 2011.

Males					
Age class	**Back fat (mm)**	**Sternal fat (g)**	**Omental fat (g)**	**Perirenal fat (g)**	**Fat index**
Adult	2.8 n= 46	27.4 n= 46	109.3 n= 35	33.1 n= 48	4.2 n= 42
Yearling	2.9 n= 29	34.8 n= 28	103.4 n= 25	38.9 n= 30	4.9 n= 26
Juvenile	3.7 n= 14	38.1 n= 14	113.7 n= 14	52.5 n= 14	6.5 n= 13
Females					
Age class	**Back fat (mm)**	**Sternal fat (g)**	**Omental fat (g)**	**Perirenal fat (g)**	**Fat index**
Adult	1.7 n= 21	18.8 n= 21	74.8 n= 20	28.1 n= 21	4.8 n= 20
Yearling	2 n= 23	21.9 n= 25	66.3 n= 23	23.0 n= 25	4.6 n= 24
Juvenile	1.8 n= 5	19.1 n= 5	59.1 n= 4	24.5 n= 5	4.6 n= 4

According to Robitaille et al. (2012), the sternal fat depot appears to be the most powerful index predicting wolverine fatness. Temporal variation in the weight of sternal fat depots is illustrated in figure 7. The weight of the sternal fat varied differently between age classes throughout the year. While juveniles and yearlings had high amount of fat in the winter (December-January), adults fat depot were at their lowest during that period and peaked in March. Lee (1994) also observed a peak in fat depot in February/March on wolverines of the western Kitikmeot in the early 1990s.

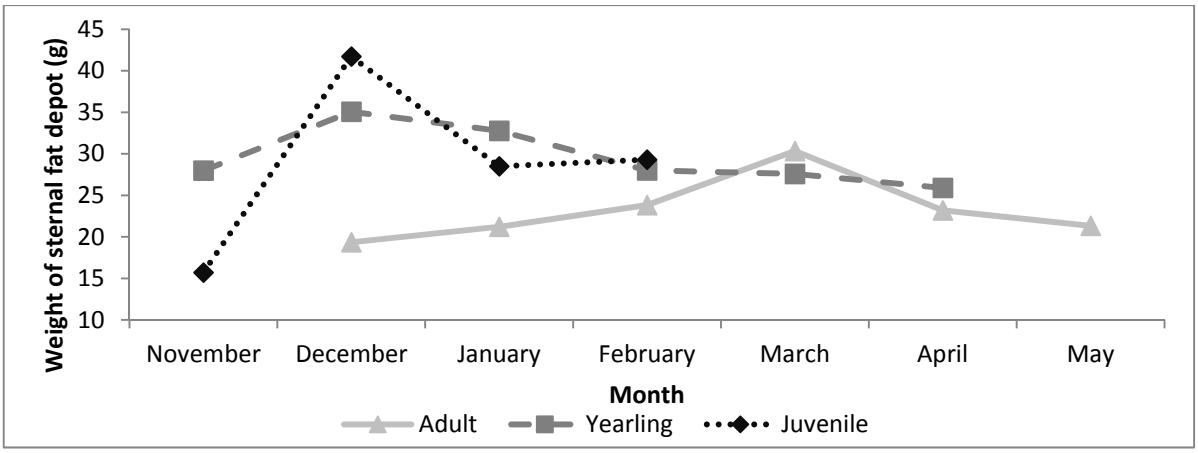

Figure 7: Variation of average weight of sternal fat in wolverines harvested in Nunavut during the 2009/10 and 2010/11 seasons.

Results from stomach contents revealed important regional variations in the diet of wolverines. Mean contribution of caribou to diet was the highest in Arviat, Baker Lake, and Kuglutkuk areas (Fig 8), as was the occurrence of caribou in stomachs (>75% of stomachs contained caribou prey in Arviat, Baker Lake and Kugluktuk compared with <30% of stomachs in Rankin Inlet, Cambridge and north-eastern mainland). The second most important prey item present in wolverine stomach was muskox, especially in Cambridge Bay and Rankin Inlet areas (occurrence of 100% in stomachs from both areas) compared with other areas where their occurrence did not exceed 40% of stomachs. Occurrences of other preys into stomachs ranged from 0 to 24% and were mostly present in Arviat, Kugluktuk, and North barren areas.

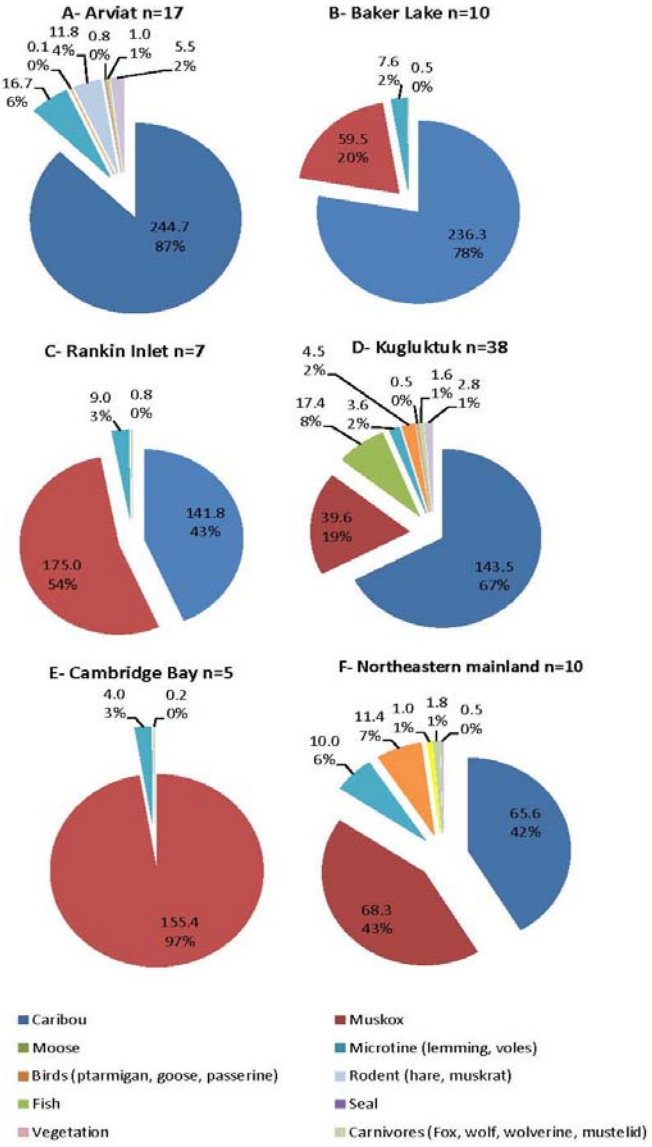

Figure 8: Mean contribution (grams) of prey species to stomach content of wolverine harvested in Arviat (A), Baker Lake (B), Rankin Inlet (C), Kugluktuk (D), Cambridge Bay (E) and north-eastern mainland (Gjoa Haven, Taloyoak, Kugaaruk, Igloolik and Hall Beach; F) areas during hunting season 2011.

Wolverine populations in Nunavut are considered to be healthy. This seems to be supported by the sex and age distribution of the harvest as well as the body condition indexes obtained through the carcass collection program. In an effort to obtain information on wolverine population relative abundance, wolverine harvesters were asked to answer a question when bringing back carcasses to their wildlife office: “Do you think wolverine population is decreasing, stable or increasing”. In the Kitikmeot (n=84), most respondents believed the population was stable (70% stable, 30% increasing) while most respondents of the Kivalliq (n= 92) believed their local population was increasing (63% increasing, 36% stable). However, over the long term, the increasing resource development on the tundra may adversely impact the species which suggests a need for continuous monitoring of the health of the wolverine population.

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