

# RESEARCH UPDATE TO THE DEPARTMENT OF ENVIRONMENT

## Interim Report

Prepared by: Department of Environment  
Kivalliq Region  
P.O. Box 120  
Arviat, NU. X0C 0E0

June, 2013

**Title:** Population Estimate of a Declining Population of Island Bound Barren-ground Caribou (*Rangifer tarandus groenlandicus*), Southampton Island NU.

**Project Leader:** Mitch Campbell  
Regional Wildlife Biologist  
Department of Environment  
Box 120  
Arviat, NU.  
X0C 0E0  
Ph: (867)857-2828  
Fax: (867)857-2986  
E-mail: mcampbell@gov.nu.ca

### Summary

The Southampton Island caribou population has declined from 30,381 +/- 3,982 in 1997 to 7,286 +/- 1045 in 2013. The estimated subsistence harvest on the Island is between 1,000 and 1,500 animals which is believed to be above the maximum sustainable yield of the caribou population. In light of 2011 survey results a TAH was established for the SHI caribou population through a ministerial management initiative for the 2012/13 harvesting season. The TAH was set at 1,000 caribou solely based on the 2011 survey results. The further declines detected in June 2013 led DoE to recommend a TAH reduction to 800 animals for the 2013/14 harvesting season. The Coral Harbour HTO is currently discussing the 2013 results and GN TAH recommendations. In the fall of 2012, the Community rejected any further reduction based on an incomplete survey flown in June of that year. The community requested the TAH not be adjusted until a complete survey was flown in 2013 to verify the continued decline. The June 2012 estimate was incomplete though indicated a continued decline.

Estimates of the Southampton Island Caribou population have been carried out every 2 years between 2003 and 2011 and annually since. Survey cycles were based on the large-scale commercial harvest occurring between 1993 and 2009, and an increased prevalence in the disease *Brucellosis suis* (Figure 1). Survey frequency stepped to annually following the populations decline below the estimated basic needs level of the community. Given the observed continued decline and associated drop in pregnancy rates from ninety percent in previous studies to sixty percent in February 2004 to twenty five percent in February 2005, and the harvest of over 4,000 animals in 2009 too 38% by March 2011, both the DoE and Coral Harbour HTO fears for the long term viability of this population if harvest rates are not brought under strict control quickly.

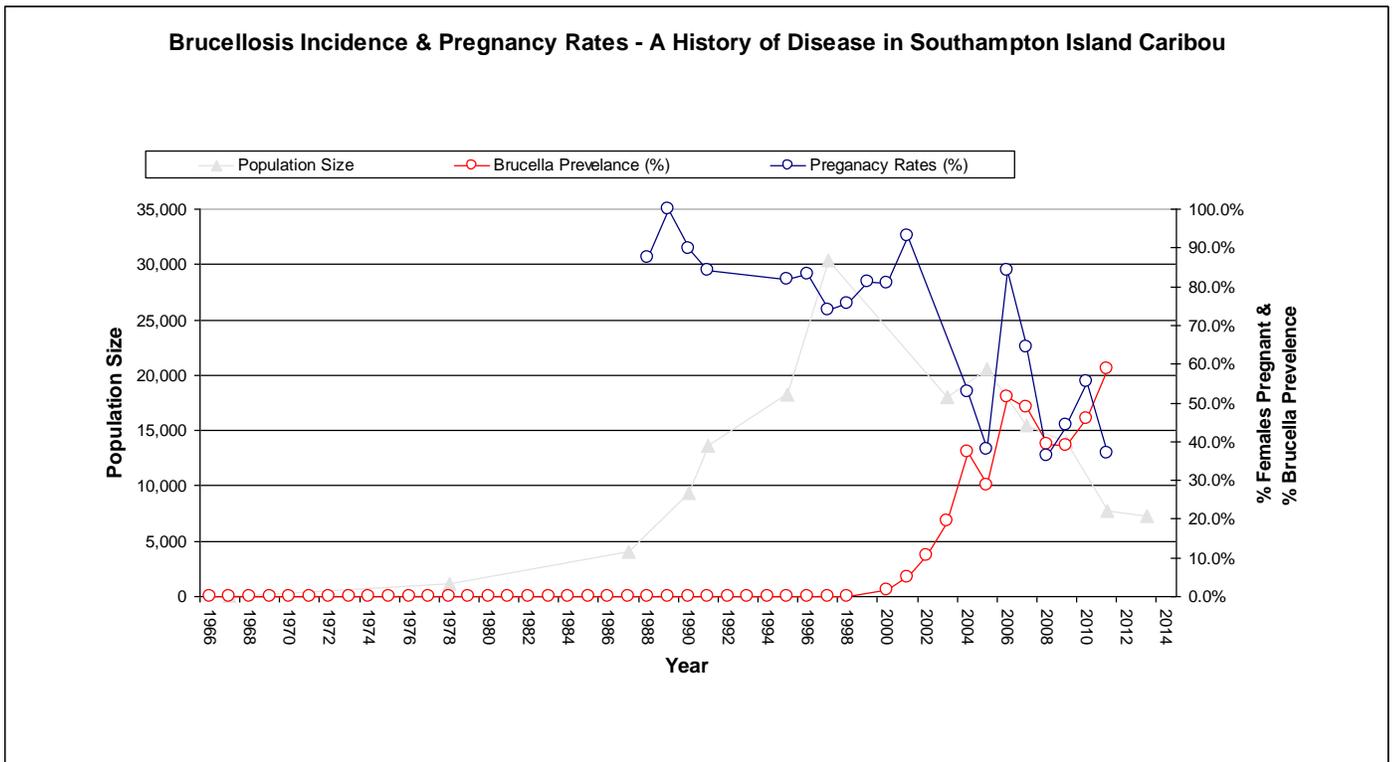


Figure 1: A history of population estimates, pregnancy rates and disease prevalence for Southampton Island.

## **Background:**

Wolves (*Canis lupus*) and barren-ground caribou (*Rangifer tarandus groenlandicus*) were a common component of Southampton Island ecology until the early 1900's. The decline of these animals became obvious by 1935 and was followed by the local extinction of wolves by 1937 (Parker, 1975). The extirpation of caribou from Southampton Island was complete by 1952, a result in part of over hunting. The absence of this resource was keenly felt by residents of Coral Harbor prompting both the local HTO and government to initiate the re-introduction of caribou onto the Island. In 1967, 14 years following their extirpation, 48 caribou from Coats Island were introduced onto Southampton Island. Caribou numbers have since increased rapidly which is in part due to exceptional range conditions resulting from the 14-year absence of caribou from the Island. The lack of predation and low initial harvest rates also played a role in the overwhelming success of the introduction which was first realized following a population survey in 1978, estimating 1,200 +/- 340 caribou (Heard and Ouellet, 1994). Since the 1978 survey the Southampton caribou population continued to grow rapidly to 5,400 +/- 1,130 in 1987, 9,000 +/- 3,200 in 1990, 13,700 +/- 1,600 in 1991, 18,275 +/- 1,390 in 1995 (Heard and Ouellet, 1994), 30,381 +/- 3,982 in 1997, 17,981 +/- 2,127 in June 2003 (Campbell in prep.), 20,582 +/- 3,065 in June 2005 (Campbell in prep), June 2007 estimated 15,452 +/- 1,858 estimated in June 2007, 13,957 +/- 1,803 estimated in June 2009, 7,762 +/- 1,259 in June 2011, and most recently 7,286 +/- 1,045 in May 2013. Between June 2003 and May 2013, 9,729 adult males and 13,021 adult females were harvested commercially and an estimated 10,750 males and 10,750 females were harvested domestically for an estimated total of 19,979 males and 23,771 females harvested for a total harvest of 43,750 caribou.

Over the 2005/2006 harvesting season the CFIA (Canadian Food Inspection Agency) received lab results from 400 randomly sampled caribou from the Southampton Island caribou commercial harvest. The results of these studies showed serum prevalence in excess of fifty percent for *Brucella suis*. This extremely high prevalence is troubling first and foremost as a human health issue but also as a herd management issue. This high prevalence potentially explains the low pregnancy rates observed over the 2002, 2003 and 2004 through 2011 harvesting seasons as *Brucella suis* causes miscarriage in breeding cows and possible sterility in bulls. *Brucella suis* is considered a density dependant disease where infection from caribou to caribou largely takes place on calving grounds during the calving season. The restricted Island range of this herd, coupled with recent distributional shifts placing higher densities of animals within more central portions of their range during the calving season, all serve to magnify the transmission of the disease. Increased vigilance in the monitoring of this disease on Southampton Island is required so that we may better understand its long and short-term implications on the population. The results of this research coupled with frequent estimates to monitor demographic impacts, has had influence on the way we manage barren-ground caribou populations.

With the commercial harvest shut down following the 2009 harvesting season only the subsistence harvest remains. The estimated subsistence harvest on the Island is 1,500 animals annually which based on current pregnancy rates and the 2013 population

estimate, is believed to be above the maximum sustainable yield of the caribou population. In light of 2011 survey results a TAH was established for the SHI caribou population through a ministerial management initiative for the 2012/13 harvesting season. The TAH was set at 1,000 caribou based on 2011 survey results. The continued decline detected in May 2013 led to recommendations to further reduce the TAH to 800 animals. The HTO is currently discussing DoE TAH recommendations based on the May 2013 survey results following an early June meeting with DoE regional management.

### **Objectives:**

The objectives of this survey were to determine if the Southampton Island caribou herd is increasing, stable or decreasing in light of a high incidence of the disease *Brucella suis* as well as a subsistence harvest believed above the calculated maximum sustainable yield of the population as of June 2011. A population estimate combined with caribou condition, disease prevalence and the condition of their habitat plays an essential role in steering management efforts in a direction that will provide sustainable harvests of caribou on Southampton Island over the long term. The May 2013 population survey addressed the following objectives: **1)** Determined population level and trend of the Southampton Island caribou herd; **2)** Utilized the results to recommend sustainable harvesting limits to foster herd recovery.

### **Study Area:**

At 43,000 Km<sup>2</sup> Southampton Island is the largest Island in Hudson Bay (Figure 1). The entire western and much of the Southeastern portions of the Island are dominated by low, flat often-exposed limestone plains sparsely to densely vegetated by *Dryas integrifolia* (Mountain avens) barrens and *Carex* spp. (Sedge) meadows. The remainder of the Island is shaped by an undulating Precambrian shield dominated by a lichen (*Allectorina* spp., *Cetraria* spp.) and heath tundra (Heard and Ouellet, 1994). The snow season persists from mid-September to mid-June and accumulates up to 133cm of snow (Parker, 1975).

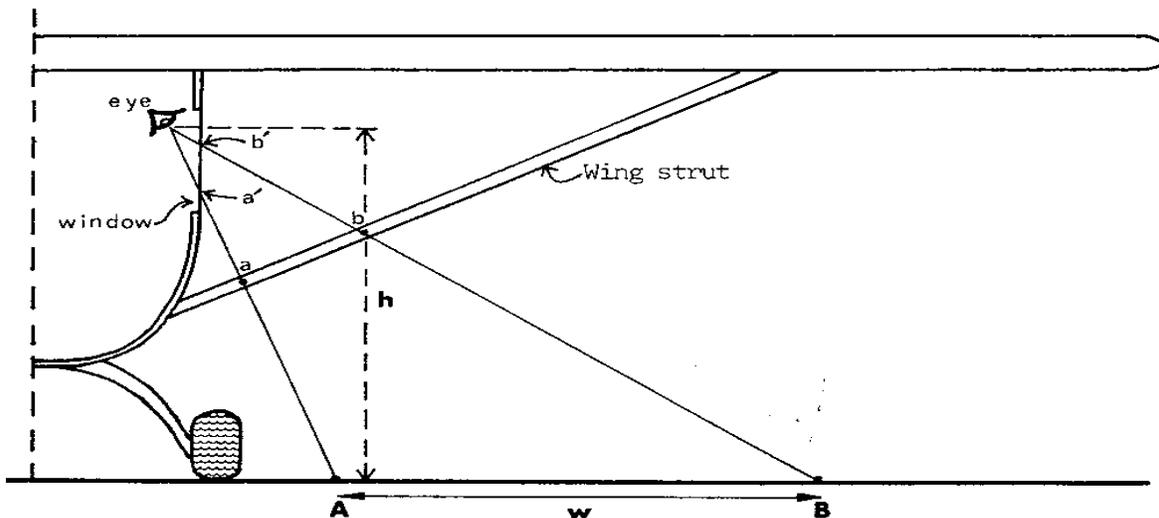


**Figure 1** The Southampton Island study area including White Island.

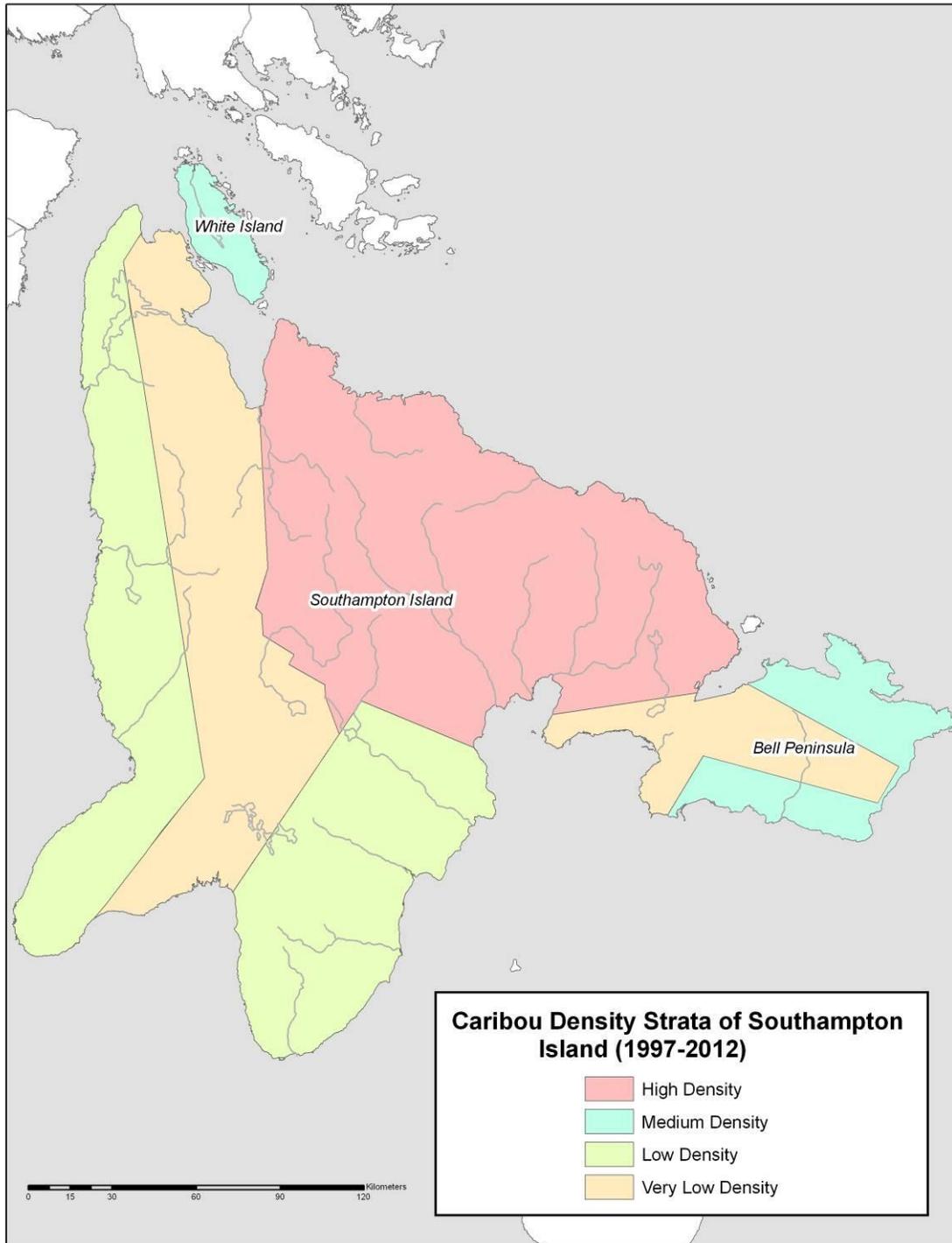
### Project Design:

The method used to estimate the SHI (Southampton Island) caribou population incorporated a stratified random transect aerial survey method while utilizing a double observer platform. The double observer platform utilized 4 rather than the conventional 2 observers, thus increasing the detection of caribou. The method was chosen for reasons of continuity as well as appropriateness. The stratified random transect aerial survey technique is widely accepted as being the most cost effective means of estimating wild populations of ungulates while providing a high level of precision. The use of a double observer platform improves survey accuracy and precision while increasing the number of community representatives involved in the field program.

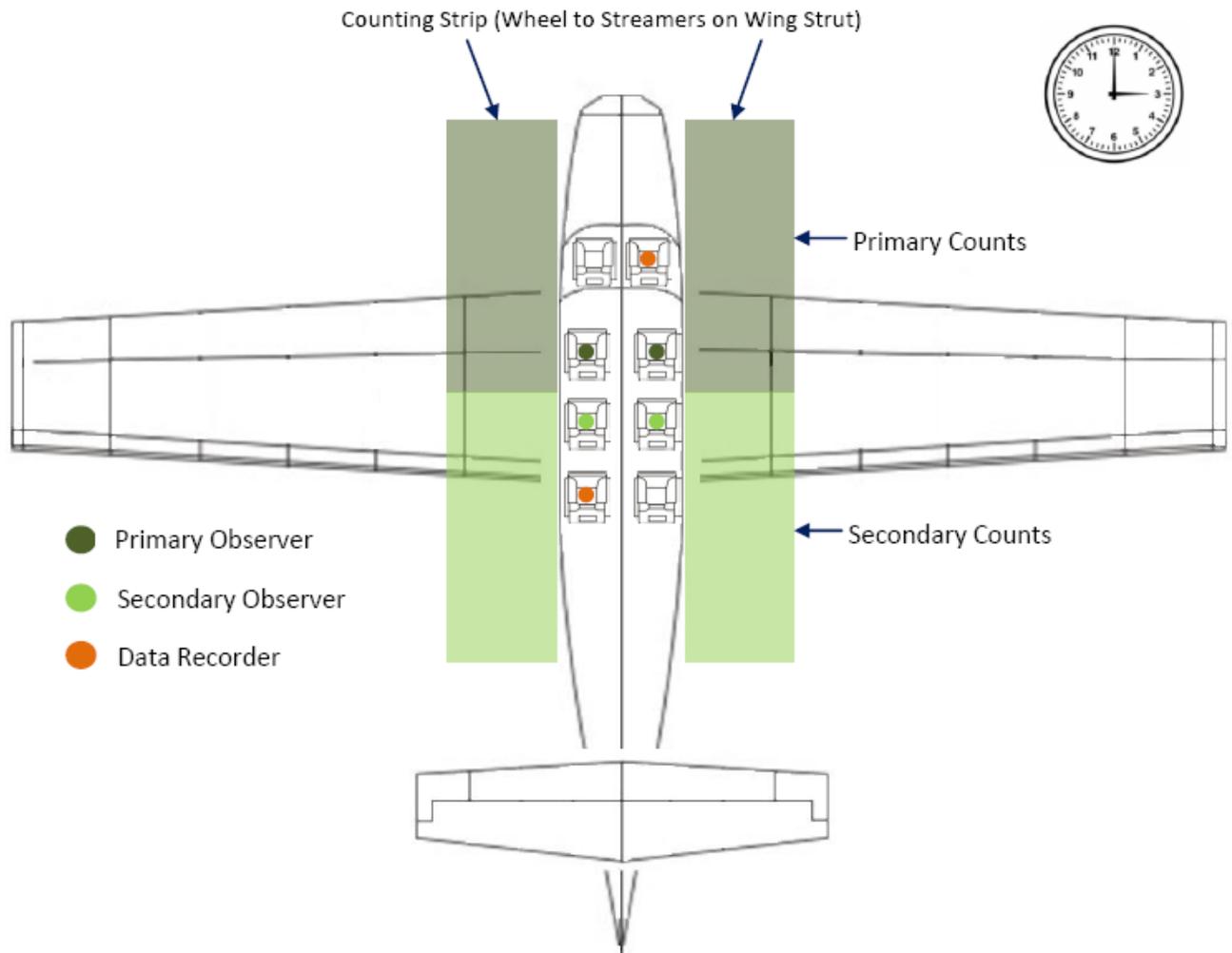
A high endurance high wing Cessna Grand Caravan was used as the survey vehicle. Survey coverage varied from 10 to 23 percent utilizing an 800 meter strip width (400 meters per side) while maintaining 400 foot elevation above the ground. Strip width calculations were confirmed by flying perpendicularly over runway distance markers or other fixed distance markers periodically throughout the survey. The strip width area for all abundance surveys was 400 meters per side (Figure 2). Actual survey effort was allocated proportionally to historic density in order to optimize the number of transects flown in each stratum (Figure 3). Survey data was analyzed using Jolly's method 2 for unequal sample sizes. The double observer platform utilized four independent, dedicated observers, two on the left side of the aircraft and two on the right. Two data recorders, one for the left and one for the right, recorded all observations as primary (front) secondary (rear) or both (front and rear) for each of the left side and right side (Figure 4).



**Figure 2** Schematic diagram of aircraft configuration for strip width sampling (Norton-Griffiths, 1978).  $w$  is marked out on the tarmac, and the two lines of sight  $a' - a - A$  and  $b' - b - B$  established. The dowels/streamers are attached to the struts at  $a$  and  $b$ .  $a'$  and  $b'$  are the window marks.



**Figure 3** Caribou density strata of Southampton Island including White Island. Strata used for surveys flown between June 1997 and May 2013.

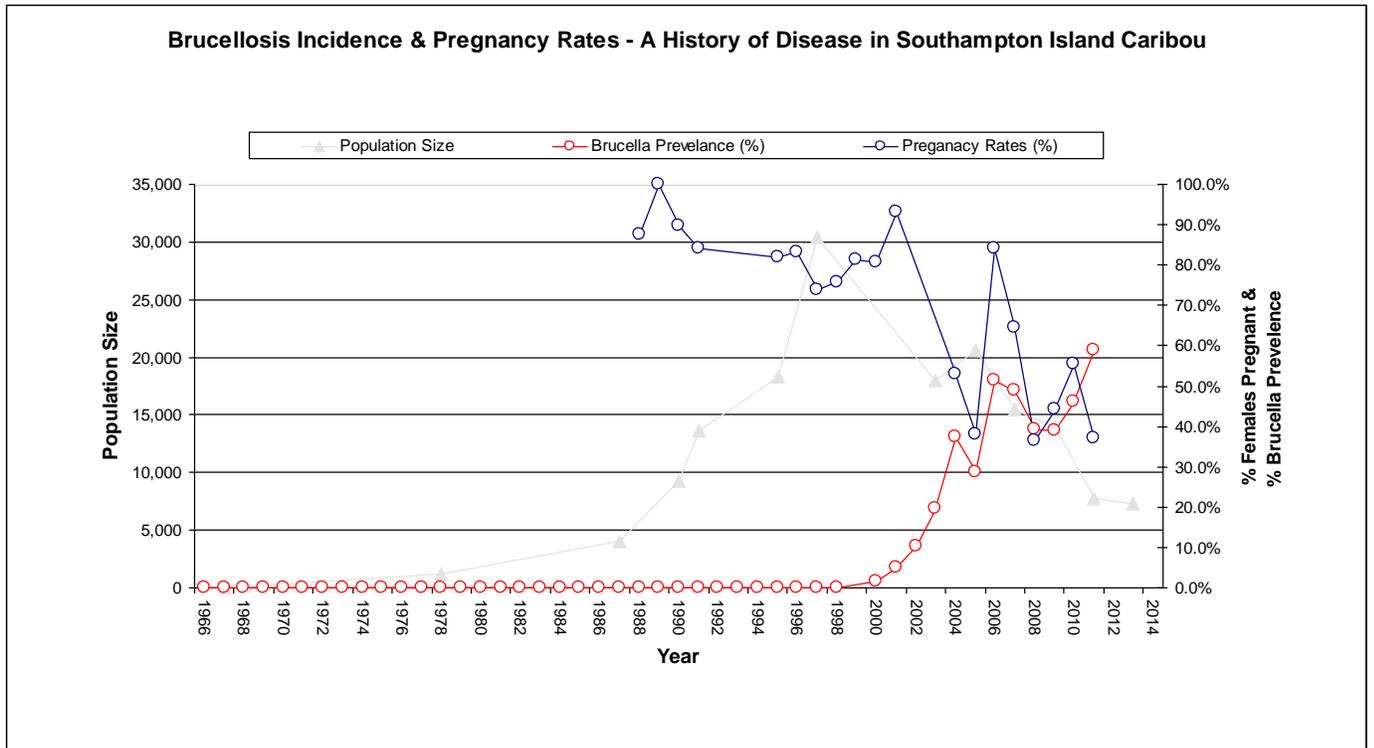


**Figure 4** Observer position for the double observer method employed on this survey. The secondary observer calls caribou not seen by the primary observer after the caribou have passed the main field of vision of the primary observer. The small hand on a clock is used to reference relative locations of caribou groups (e.g. “Caribou group at 3 o’clock” would suggest a caribou group  $90^\circ$  to the right of the aircrafts longitudinal axis.).

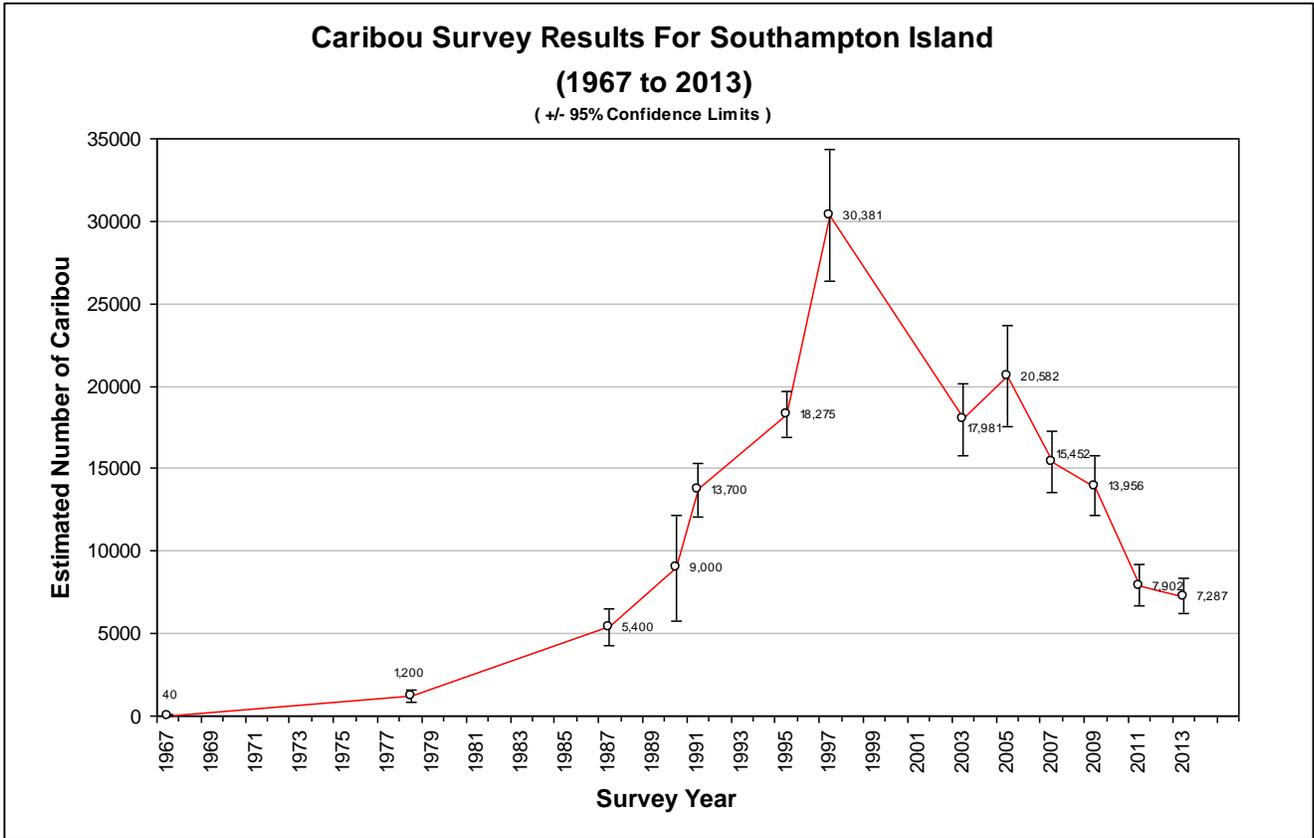
**Results:**

Susceptibility to disease and parasites due to low genetic heterogeneity has always been a concern since the herds introduction, and was a likely catalyst to the wide spread infection of caribou with *Brucellosis suis* first detected in the population February 2000. Prevalence rates climbing from 1.7% in February 2000 to 58.8% in March 2011 are thought to be responsible for a corresponding drop in pregnancy rates over the same period (Figure 5). Pregnancy rates dropped from a high of 93.1% in February 2001 to a low of 37% in March 2011. Herd trend has followed suit with pregnancy rates dropping from the 30,381 estimate in June 1997 to 17,981 +/- 2,127 (95% CI) in June 2003, 20,582 +/- 3,056 (95% CI) in June 2005, 15,452 +/- 1,858 (95% CI) June 2007, 13,953 +/- 1,790 (95% CI) June 2009, 7,903 +/- 1,261 (95% CI) and finally 7,286 +/- 1,045 95% CI) in May 2013.

The Southampton Island caribou population has declined from 30,381 +/- 3,982 in 1997 to 7,286 +/- 1,045 in 2013 (Figure 6). The estimated subsistence harvest on the Island is 1,500 animals which is believed to be above the maximum sustainable yield of the caribou population. In light of 2011 survey results a TAH was established for the SHI caribou population through a ministerial management initiative for the 2012/13 harvesting season. The TAH was set at 1,000 caribou solely based on the 2011 survey results. The further declines detected in May 2013 led DoE to recommend a TAH reduction to 800 animals. The Coral Harbour HTO is currently discussing this recommendation with a final decision expected before the end of June 2013.



**Figure 5** A history of abundance, pregnancy rates and *Brucellosis suis* prevalence for the Southampton Island caribou Herd originally introduced onto the island from Coates Island in 1968.



**Figure 6** Survey History of the Southampton Island (SHI) caribou population.

### ***Harvest History***

Throughout the introduction of caribou onto SHI, wildlife managers and HTOs of the time have proven to have been vigilant in their on-going management of the herd. Management recommendations were largely based on research results particularly population estimates. Despite the continued increases in allowable quota in an attempt to stem the herds rapid rate of increase, in the end the community was simply unable to meet the recommended harvest rates either by subsistence or commercial means. The history of the management of the SHI caribou population reveals a series of responsible research and monitoring with proactive management recommendations being made. The basic needs of the community were simply too small to keep up with the quickly growing caribou population.

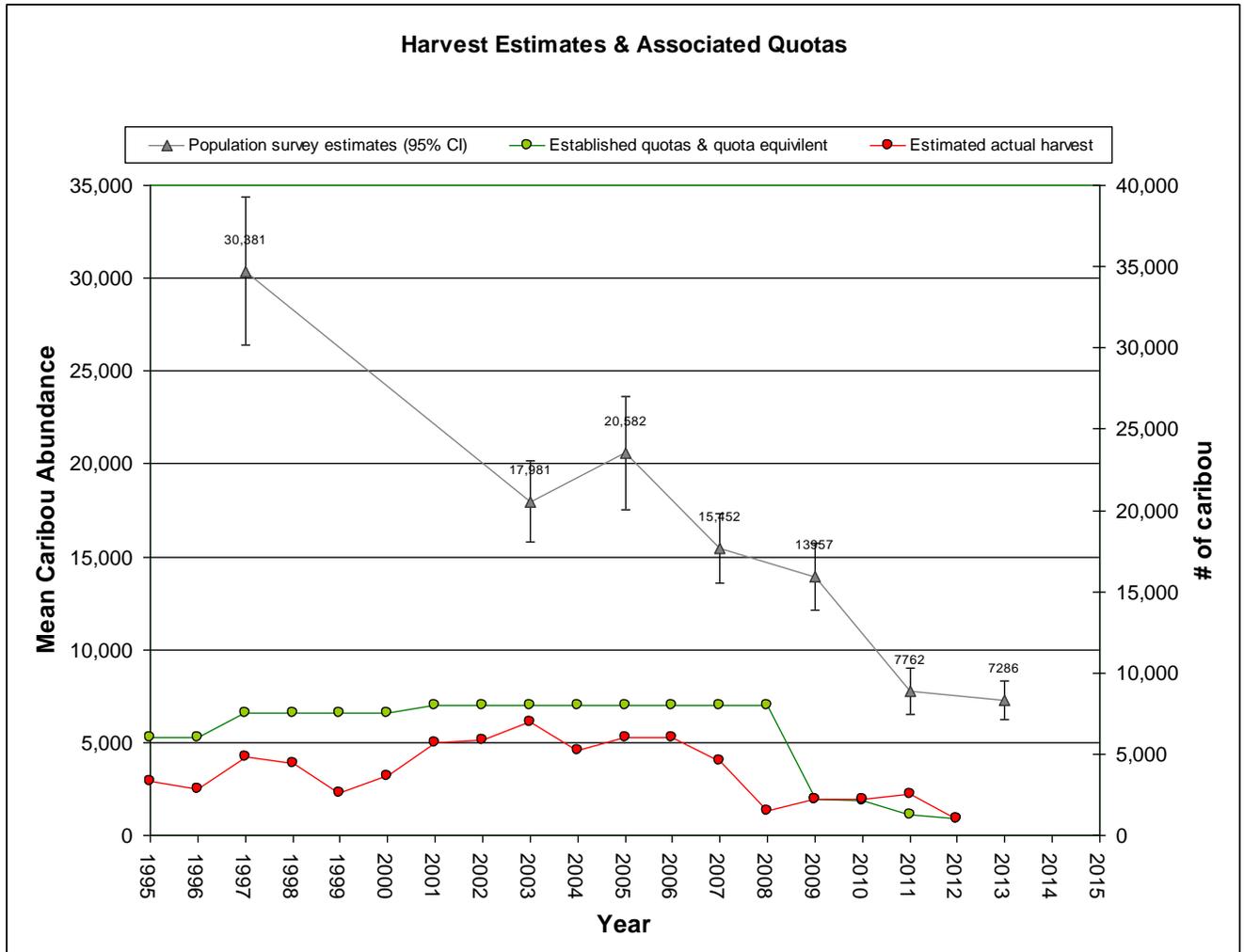
In February 1978 the first caribou hunt since the 1968 introduction was carried out on Southampton Island. The quota was set at 25 bulls and was based on observations during a reconnaissance survey flown in 1977 that sighted a total of 172 caribou 79 of which were adult males, 54 adult females and 39 yearlings providing evidence of a sex ratio skewed towards males (Kraft, 1978 "The status of barren ground caribou on Southampton island, N.W.T."). In August 1979 the quota for bulls was increased to 50 largely based on the findings of the November 1978 population survey. Early in 1983 the first cow harvest was approved with the quota set at 20. Regulations were developed along with this new quota stipulating that 10 cows be harvested in the spring and the remaining 10 in the fall. The harvest quota was raised from 50 to 250 bulls and from 20 to 50 cows based on recommendations following the 1987 population estimate (Heard and Grey, 1987).

Concerns regarding the accidental harvesting of females seem to have led to the removal of the female quota and an increase in the male quota to 300 animals sometime in 1988 when it was clearly indicated in the regulations that; "hunting zone J/2 was restricted to 300 male caribou." In 1989 recommendations to increase the harvest to 400 caribou of which 100 would be female were made. These recommendations were supported by Doug Heard who indicated the proposed increases were based on sound ecological principles (Renewable Resources Official Correspondence 140 007 005 & 150 001 005, October, 1989). Seasons for this new quota were recommended as being October 1<sup>st</sup> to October 31<sup>st</sup> for males and April 1<sup>st</sup> to May 31<sup>st</sup> for females. Subsistence harvesting quotas were dropped in 1993 in response to the continued rapid growth of the population reported by Oullett in June 1991.

Interestingly a non sex selective subsistence quota of 1,000 animals was re-instated in 1994 seemingly to offset an increase in the commercial quota from 1,000 to 5,000 over the same period (Junkin, 2003). By 1997, in response to survey results indicating the continued rapid growth of the population to 30,381 +/- 3,982 (95%CI)(Mulders, 1997), concerns about the caribou population exceeding the Islands hypothesized carrying capacity were being realized (Oullett et al 1994, Oullett et al 1993). In response to these concerns the wildlife regulations were once again amended to allow an unlimited non sex selective subsistence harvest and a non sex selective commercial quota of 6,000 caribou.

The first commercial quotas were established in 1992 and were set at 250 animals (gender breakdown unknown) (Junkin, 2003). It was not until 1993 that five caribou (of unknown gender) were harvested commercially representing the first commercial harvest since the herd's reintroduction from Coats to Southampton Island. Commercial quotas continued to rise to 1,000 animals in 1993, 5,000 in 1994 and 6,000 by 1997 (Junkin, 2003). Since 1993 there has been annual commercial harvests up to and including the 2007 harvesting season and in 2009. These regulated quotas remained in effect until the 2009 harvesting season at which time the Coral Harbour HTO voluntarily reduced the commercial harvest. By 2010 the Coral Harbour HTO restricted all commercial harvesting of SHI caribou, and by the 2012 harvesting season recommended the establishment of a TAH (Total Allowable Harvest) of 1,000 caribou (Figure 5).

The actual harvest of caribou on the Island since their introduction has and continues to be difficult to ascertain. The Nunavut Wildlife Management Board (NWMB) is tasked with the collection of this data through the Nunavut Harvest Study. Unfortunately the collection of subsistence harvest data for this study is based on a voluntary reporting system and as a result yields unreliable estimates. Despite this knowledge gap, and as only one community harvests from this population, subsistence harvest estimates can be made as long as they are treated with caution. In total from 1978 to 2007, an estimated 67,632 caribou have been harvested from Southampton Island, 41,157 or 61% of which were taken for commercial purposes.



**Figure 5** Estimated harvest rates compared to population estimates and estimated harvest rates.

### **Community Consultation:**

The May 2013 population estimate is an important component of a larger management plan drafted by the Coral Harbour HTO and the Department of Environment in the fall of 2011. The goals of the management plan are to provide a long term management framework that will focus on maintaining caribou numbers at or above levels necessary to 1) sustain current and future domestic harvesting needs (primary objective), and, 2) sustain commercial sport hunting needs (secondary objective) and 3) sustain commercial meat sales needs. Meetings were held following each of the 1997, 2003, 2005, 2007, 2009, 2011, 2012 and 2013 surveys. During the meetings all aspects of the surveys and their estimates were discussed within the framework of the management plan. The Coral Harbour HTO and their members strongly request annual population estimates until the sustainability of the harvest has been verified.

### **Literature Cited:**

- Adamczewski, J.Z., Gates, C.C., Soutar, B.M. and Hudson, R.J. 1988. Limiting effects of snow on seasonal habitat use and diets of caribou (*Rangifer tarandus groenlandicus*) on an Arctic island with limited winter resources. *Can. J. Zool.* 66: 1986-1996.
- Adamczewski, J.Z., Hudson, R.J. and Gates, C.C. 1993. Winter energy balance and activity of female caribou on Coats Island, Northwest Territories: the relative importance of foraging and body reserves. *Can. J. Zool.* 71: 1221-1229.
- Dasmann, R.F. 1981. *Wildlife Biology*. 2<sup>nd</sup> Edition. John Wiley & Sons, Inc. 212pp.
- Donihee, J. and P.A. Gray. 1982. Critical habitat in the Northwest Territories. *Can. Comm. Ecol. Land. Classif. Newsletter*, No. 12:13-15.
- Gates, C.C., Adamczewski, J.Z. and Mulders, R. 1986. Population dynamics, winter ecology and social Organization of Coats Island caribou. *Arctic.* 39(4): 216-222.
- Heard, C.D. and Ouellet, J.P. 1994. Dynamics of an introduced caribou population. *Arctic.* 47(1): 88-95.
- Klein, D.R. 1968. The introduction, increase and crash of reindeer on St. Mathew Island. *J. of Wildl. Manage.* 32(2): 350-367.
- Leader-Williams, N. 1988. *Reindeer on South Georgia: the ecology of an introduced population*. Cambridge Univ. Press, Cambridge.
- Ouellet, J.P. 1992. *Ecology of an introduced caribou population on Southampton Island, N.W.T., Canada*. Ph. D. thesis, University of Alberta, Edmonton. 123pp.

- Ouellet, J.P., Heard, D.C. and Boutin, S. 1993. Range impacts following the introduction of caribou on Southampton Island, Northwest Territories, Canada. *Arctic and Alpine Research*. 25(2): 136-141.
- Ouellet, J.P., Boutin, S. and Heard, D.C. 1994. Responses to simulated grazing and browsing of vegetation available to caribou in the Arctic. *Can. J. Zool.* 72: 1426-1435.
- Ouellet, J.P., Heard, D.C. and Mulders, R. 1996. Population ecology of caribou populations without predators: Southampton and Coats Island herds. *Rangifer Spec. Issue*. No. 9. 17-25.
- Parker, G.R. 1975. An investigation of caribou range on Southampton Island, N.W.T. *Can. Wildl. Serv. Rep. Ser. No.* 33: 83 pp.
- Reimers, E. 1982. Winter mortality and population trends of reindeer on Svalbard, Norway. *Arctic and Alpine Research*. 14(4): 295-300.
- Scheffer, V.B. 1951. The rise and fall of a reindeer herd. *Sci. Monthly*. 73: 356-362.
- Scotter, G.W. 1980. Management of wild ungulate habitat in the Western United States and Canada: A Review. *Journal of Range Management*. 33(1):16-24.
- Thompson, D.C., G.H. Klassen, and J Cihlar. 1980. Caribou habitat mapping in the Southern District of Keewatin, N.W.T.: An application of digital Landsat data. *Journal of Applied Ecology*. 17:125-138.

**Personnel:**

- 1- Mitch Campbell, Regional Wildlife Biologist, DoE, Arviat, NU. Project design and implementation.
  
- 2 The Coral Harbour Hunters and Trappers Organization, Coral Harbour, Nunavut. Project advisors and logistic support.

**Partners:**

The proposed studies would be a cooperative effort between the Department of Environment and the Coral Harbour Hunters and Trappers Organization.