ESTIMATING THE ABUNDANCE OF THE M'CLINTOCK CHANNEL POLAR BEAR SUB-POPULATION BY GENETIC MARK-RECAPTURE

INTERIM REPORT TO THE NUNAVUT WILDLIFE RESEARCH TRUST

28 August 2015

NWRT PROJECT NUMBER: 2-15-05
PCSP PROJECT NUMBER: 302-15

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SUMMARY

M’Clintock Channel (MC) is a smaller polar bear sub-population managed entirely by Nunavut. An initial mark-recapture study (1973-1978) estimated that the population size of both MC and Gulf of Boothia (GB) was a combined 1081 polar bears, not identifying these units as being distinct separate units. The known biased estimate was increased to 900 bears for each unit, given that the harvest at that time was believed to be sustainable. After local knowledge suggested that the population abundance appeared to be low, the population size was lowered to 700. A new population study was conducted between 1998 and 2000 which estimated the MC polar bear population to be 284 bears. Past harvests of 34 bears/year from 1979-1999 were unsustainable, and a moratorium from 2001/2002 – 2003/2004 was implemented, followed by a reduction in Total Allowable Harvest. Because of this reduction in harvest opportunities, hunters and communities that traditionally harvested from MC have lost economic and traditional prospects. The MC population has been managed for recovery, and recent local knowledge suggests that in fact more bears are observed in various areas across MC. In accordance with commitments under the 2005 MC Polar Bear Memorandum of Understanding (MOU), and a desire by community members to harvest more bears, a new 3-year research project was initiated in 2014 to provide updated information on the abundance of bears in MC. The sub-population size and status will be assessed by means of genetic mark-recapture.

Between 5 May and 8 June 2015 a total of 122 polar bears (in 79 groups) of various age classes and both sexes were encountered, of which 90 were biopsied, with samples of 8 additional bears possibly also being suitable for analyses. Due to weather delays and logistical constraints resulting from these, sampling was unfortunately not distributed across the entire MC study area; we were able to search the same portions of the study area for bears that were covered during the 2014 season. Nevertheless, we covered a total distance of approximately 10,100 km. Rate of sampling averaged 1.6 bears per hour of search time. The number of bears encountered during the spring of 2015 was equivalent to approximately 43% of the previous 2000 mark-recapture population estimate currently used for harvest management. IQ, however, would indicate that the subpopulation has increased, suggesting the sampling rate would be lower than 43%. Nevertheless, until genetic results are available it is impossible to discern how many different individual bears were encountered. Preparations are under-way for the third (and likely last) field season which will begin in late April of 2016.

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ᓄᓇᕗᓕᒫᒥᒃ ᖃᔅᓯᓐᓇᐅᓂᖅᓴᐅᕗᑦ ᓇᓄᑦ ᐊᐅᓚᑕᐅᔪᑦ ᑕᐃᑲᓂ ᖃᒡᒋᐅᔭᐅᑉ ᑕᕆᐅᖓᓂᒃ ᐊᒻᒪ ᐃᑭᕋᓴᐅᑉ ᐃᒪᖓᓂᒃ ᖃᐅᔨᓴᖅᑕᐅᒃᑲᓂᕐᓂᕐᐳᑦ ᖃᔅᓯᐅᓪᓗᐊᕐᓂᖏᑦ (1973-1978 ᐊᑯᓐᓂᐊᓂ) ᓇᓄᑦ ᑲᑎᑕᐅᓂᖏᑦ 1081-ᖑᓚᐅᖅᐳᑦ, ᑲᑎᙵᓂᖏᑦ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᖏᓚᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ. ᓇᓄᑦ ᖃᐅᔨᓴᖅᑕᐅᑎᐊᓚᐅᖏᒻᒪᑕ ᐅᓄᖅᓯᒋᐊᖅᑕᐅᓗᑎᒃ 900−ᖑᔪᑦ ᓇᔪᖅᑕᒥᖕᓂᒃ, ᐊᖑᓇᓱᒃᑎᓄᑦ ᑕᐃᑲᙵᓂᒃ ᐅᒃᐱᕆᔭᐅᓚᐅᖅᓯᒪᕗᑦ ᐊᕙᑎᒥᙵᓄᑦ ᒪᓕᒃᓱᑎᒃ. ᓄᓇᓕᖕᓂᕐᒥᐅᑦ ᖃᐅᔨᒪᔾᒥᖕᓂᒃ ᐃᓱᒪᓕᐅᕆᓯᒪᕗᑦ ᖃᔅᓯᓐᓇᐅᓕᕐᓂᖏᓐᓄᑦ, ᖃᔅᓯᐅᓐᓇᐅᓕᕐᓂᖏᓐᓄᑦ ᒥᒃᓵᒋᐊᖅᑕᐅᓐᓂᖅᐳᑦ 700-ᒥᑦ.

ᓄᑖᖅ ᖃᐅᔨᓴᖅᑕᐅᔪᕕᓂᖅ ᖃᔅᓯᐅᓂᖏᓐᓄᑦ ᐊᑯᓂᐊᓂᒃ 1998-ᒥᑦ 2000-ᒧᑦ ᓇᓚᐅᑦᑖᖅᑕᐅᔪᕕᓃᑦ ᖃᕐᒋᐅᔭᐅᑉ ᑕᓇᐅᓪᓚᓂᒃ ᓇᓄᑦ 284-ᖑᓚᐅᖅᑐᑦ. ᓯᕗᓂᒃᓴᒥᑦ ᓇᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ 34-ᖑᓚᐅᖅᐳᑦ ᑕᐃᑲᓂ 1979-1999-ᒧᑦ ᐊᐅᓚᑕᐅᑦᑎᐊᓚᐅᕐᒋᑉᐳᑦ ᖁᔭᓈᖅᑕᐅᓪᓗᑎᒃ 2001/2002–ᒧᑦ – 2003/2004-ᒥᑦ ᐱᓕᕆᐊᖑᓕᖅᓱᑎᒃ, ᒥᒃᓵᒋᐊᖅᑕᐅᓗᑎᒃ ᓇᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ. ᒥᒃᓵᒋᐊᖅᑕᐅᓂᖓ ᓇᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ, ᐊᖑᓇᓱᒃᑎᑦ ᓄᓇᓕᖕᓂᒃ ᐃᓕᖅᑯᓯᕐᒥᒍᑦ ᓇᓐᓂᐊᕈᐃᓐᓇᐃᓕᓚᐅᖅᓯᒪᕗᑦ ᖃᕐᒋᐅᔭᐅᑉ ᑕᓇᐅᓪᓚᓂᒃ ᕿᓇᐅᔭᒃᓴᐅᑎᒥᖕᓂᒃ ᐊᓯᐅᔨᓗᑎᒃ ᐱᖅᑯᓯᖏᓐᓂᓪᓗ. ᐊᑲᐅᓯᔾᔫᒥᕗᑦ ᖃᔅᓯᐅᓂᖏᑦ ᖃᕐᒋᐅᔭᐅᑉ ᑕᓇᐅᓪᓚᓂᒃ, ᐅᓪᓗᒥᒨᖓᔪᓪᓗ ᓄᓇᓕᖕᓂᒃ ᖃᐅᔨᒪᓂᖏᑦ ᐃᓱᒪᓕᐅᖅᓯᒪᕗᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᖅᓴᐅᓕᖅᓱᑎᒃ ᓇᓄᑦ ᓇᓕᒥᕈᓘᔭᖅ ᑕᐃᑲᓂ. ᑐᖖᓂᒃ 2005–ᒥᒃ ᒪᓕᒡᓗᒋᑦ ᐊᖏᖅᑕᐅᓯᒪᔪᑦ ᖃᕐᒋᐅᔭᐅᑉ ᑕᓇᐅᓪᓚᓂᒃ ᓇᓄᕐᓂᒃ ᑐᑭᓯᐅᒪᕐᑲᑦᑕᐅᑎᓂᕐᒧᑦ, ᐱᔭᐅᔪᒪᔪᓂᓪᓗ ᓄᓇᓕᖕᓂᖕᓕᖅᑐᓂᒃ ᐅᓄᕐᓂᒃᓴᓂᒃ ᓇᓐᓂᐊᕈᓐᓇᖅᓯᕐᑯᓗᑎᑦ, 2014–ᒥᓂᒃ ᖃᐅᔨᓴᕋᓱᐊᖅᐳᑦ ᐱᖓᓱᓂᓪᓗ ᐊᕐᕈᒍᓂᒃ ᐅᓪᓗᒥᒨᖑᓗᑎᒃ ᑐᓴᒃᓴᑦ ᐅᓄᖅᓯᒋᐊᕐᓂᖏᓐᓄᑦ ᓇᓄᑦ ᑕᐃᑲᓂ. ᖃᔅᓯᐅᓂᖏᑦ ᖃᓄᐃᑦᑐᓂᖏᓐᓗ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᕿᓇᐅᔭᐅᔪᑎᖏᑦ ᓄᐊᑕᐅᒃᑲᓐᓂᕐᓗᑎᑦ.

ᐊᑲᐅᓂᖓᓂᒃ ᒪᐃ 5 ᐊᒻᒪ ᔪᓂ 8, 2015-ᒥᑦ ᑲᑎᙵᓱᑎᑦ 122 ᓇᓄᑦ (79 ᑲᑎᙵᓱᑎᑦ) ᐊᔾᔨᒌᖏᑦᑐᑦ ᓇᓄᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᐳᑦ ᑕᒪᒃᑭᑦ ᐊᕐᓇᓗᑦ ᐊᖑᓴᓪᓗᑦ, 90–ᔪᑦ ᐱᖅᓯᕕᐅᓪᓗᑎᒃ ᕿᓇᐅᔾᔪᑎᖏᓐᓂᒃ, 8–ᑲᓐᓂᑦ ᓇᓄᑦ ᓈᒻᒪᓚᐅᖅᐳᑦ ᖃᐅᔨᓴᖅᑕᐅᑲᓐᓂᕐᓗᑎᑦ. ᓯᓚᓗᖕᓂᖓᓂᒃ ᐊᐅᓚᓂᕆᔭᖓᓗ ᑖᒃᑯᓇᖓ ᑭᖑᕙᖓᑎᑦᑎᓚᐅᖅᐳᖅ, ᖃᕐᒋᐅᔭᐅᑉ ᑕᓇᐅᖓ ᖃᐅᔨᓴᑦᑎᐊᕐᓇᐅᕐᒋᑉᐳᖅ; 2014-ᖑᑎᓪᓗᒍ ᖃᐅᔨᒍᓐᓇᓚᐅᖅᐳᑦ ᓇᓄᕐᓂᑦ ᕿᓂᖅᑕᒥᖕᓂᒃ ᐊᔾᔨᐸᐊᓗᓂ; ᐅᖓᓯᖕᓂᕆᐸᓗᒃᑖᓂ 10,100 ᑭᖄᒥᑐᔅᓗᐊᒥᒃ. ᐅᑕᐅᑦᑎᒃᑯᐸᓗᒃ 1.6 ᐃᑲᕋᓗᐊᐸᓗᐊᓂᒃ ᖃᐅᔨᓴᖅᐸᒃᓱᑎᒃ ᓇᓄᕐᓂᑦ. ᐅᐱᕐᖔᖓᓂᒃ 2015–ᒥᑦ 43%–ᓗᐊᒥᒃ 2,000–ᖑᓚᐅᖅᑐᑦ ᓇᓄᑦ ᐱᔭᐅᒃᑲᓐᓂᖅᓱᑎᒃ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᐳᑦ ᐊᐅᓚᑦᑎᔩᓂᒃ ᐊᖑᓇᓲᑕᐅᓪᓗᑎᒃ ᐅᓪᓗᒥᒧᑦ ᑎᑭᓱᒍ. ᐃᓄᐃᑦ ᖃᐅᔨᒪᔭᑐᖅᑲᖓᑦ ᓇᓗᓇᐃᖅᓯᒪᕗᑦ ᐅᓄᖅᓯᒋᐊᓕᕐᓂᖓᓂᒃ, 43%-ᒥᑦ ᖃᔅᓯᓐᓇᐅᖁᔭᐅᓯᒪᕗᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᔭᐅᓯᒪᔪᑦ. ᑭᓯᐊᓂᒃ ᕿᓇᐅᔾᔪᑎᖏᑦ ᐃᓕᓴᕆᔭᐅᔪᓐᓇᖏᑦᑐᑦ ᖃᔅᓯᐅᓕᕐᓂᕆᔭᖏᑦ ᐊᔾᔨᒌᖏᑦᑐᑦ ᓇᓄᑦ ᖃᐅᔨᓴᖅᑕᐅᓯᒪᔪᑦ. ᐱᖓᔪᙳᖓᓂᒃ ᐱᕙᑏᕋᓱᐊᖅᐳᑦ (ᑭᖑᓪᓕᖅᐹᖑᑐᐃᓐᓇᕆᐊᓕᒃ) ᐄᑉᐳ 2016-ᒥᑦ ᐃᓱᐊᓂᒃ ᖃᐅᔨᓴᒃᑲᓐᓂᕈᖅᑐᑦ.

NAITUMIK TITIRAQHIMAYUQ

M’Clintock Channel-mi (MC) mikitqiaqaqtuq nanungnik amigaitilaangait munagiyauyut tamainin Nunavunmi. Taima anguplugit uumayumik ihivriuqpaktaingit (1973mi-1978milu) nallautaaqhimavaktaingit amigaitilaangit tamangni MC-mi Gulf of Boothiamilu (GB) katitiqhimayuq amigaitilaangit 1081 nanungnik, ilitagihimaitumik ukuat katimaviit aviktuqviqaqtun allatqiinik. Ilihimayangit nallautiqhimayut angikliyumikhimayut taima 9 hananik nanungnik tamangni aviktuqviangani, naunairutiqaqtuq taima anguyaanganik nanungnik ayungnautiqalimaituq. Nunalaani ilihimattiarutingnin amigaitilaangat naunairutiqaluaqtun 7 hananik. Nuutaanguyuq amigaitilaanganik ihivriudjutikhaq aulavakhimayuq talvuuna 1998mi 200mun taima nallautiqhimayuq MC-mi nanuit amigaitilaangat piqaqtun 284nik nanungnik. Kingulirmi anguniaqtauvakhimayut 34nik ukiumi atauhirmi talvanga 1979mi-1999mun anguniaqtauvakhimayut, talvanga anguniaqtailiyauvakhimayut 2001mi/2002mun – 2003mi/2004mun aulatitivakhimayut, malikhautiqaqhutik ikiklilaarutikharnik Katitiqhimayunik Anguniaqtaugiaqaqtunik. Talvanga uminga ikikliyumirutitigun anguniaqtaugiaqaqtunik, anguniaqtiit nunalaangitlu

pitquhitigiyangnun anguniangingaqtun talvanga MCmi maniliuqluagungnaiqtun. Tamna MC-ngit amigaitilaangit munagiyauvaktun amigaiqyumigianganik, ilitugidjutikhangitlu naunairutiqaliqtuq amigaitilaangat nanuit takunaqhiliqtun maniqami MC-mi. Malikhautitigun tamna atuqtauhimaaqtangit talvani 2005mi MC-mi Nanuit Naunaitkut Angiqatigiiknirmut (MOU), ihumagiyauyuniklu nunalaani ilauyunik anguyukharnik amigaitunik nanungnik, nuutaanguyuq 3nik ukiunganik ihivriudjutikharnik havaaqhaq aulatitihimavaktuq 2014mi tuniyaangat naunairutikharnik amigaitilaangitlu nanungnik talvani MC-mi. Amigaitilaangit kihidjutikhangitlu ihivriuqtauniaqtun kitkuumatilaangayut nanuit anguplugit uumayumik.

Talvanga 5 Qiqaiyaqluarvia Imaruqtiqvia 8mi, 2015mi katitiqhimayut 122nik nanungnik (talvani 79nik katimaviinik) allatqiinguyut ukiuqaqtunik tamangnik anguhaluit arnaqluitlu piyauvakhimayut, taima 90nguyut ihivriuqtauvakhimayut, taima naunairutikharnik uvinirmin 8nguyut nanungnin naunairutiqaqpaktun ihivriuqtauyaangat. Kihimi hilaqlungnirmin ayungnautigivaktaingitlu imailiugiangat, naunairutikhangit atungitun tamaini MC-mi; qiniqhivagiaqaqtavut aadjikiiktun ihivriuqtauvaktun nanuit taima nayugaani talvuuna 2014mi ukiungani anguniarvingani. Talvuunattiaq, hanguvaktavut ungahiktilaangit hanguvaktavut 10,100 kmiitanik. Katitiqhimayut naunairutikhangit nallautiqhimaqaqtun taima 1.6nik nanungnik ikaakninirmi qiniqhiavikharnik. Qaffiutilaangit nanuit piyauvakhimayut talvuuna upinngami 2015mi aadjikiiktilaaqaqtuq 43 pusanmik kinguliuyunik 2 tausinik naunaitkuhiqhimayunik anguyauvakhimayut uumayumik amigaitilaangit nallautiqhimayut atuqtauhimaaqtun anguyukharnik munagidjutikharnik. IQnik, kihiani, naunairutiqaqniaqtun taima amigaitilaangat amigaiqyumiqhimayut, taima ihumaliuqnikkut ihivriuqtauyaangat ikikliyumiqniaqtun taima 43 pusanmik. Talvuunattiaq, kitkuumatilaangit naunairutiit pigiaqaqtun havagiaqaqtun naunaiyaiyaangat qaffiuyut allatqiinguyut nanuit hanaqiyauvakhimayut. Upalungairutikhangit aulahimaaqtun pingahuani (taimalu kinguliuniaqtuq) maniqami hanaqidjutikharnik aulatitiyangat Qitiqauyaqviani 2016mi.

BACKGROUND

M'Clintock Channel (MC) is a smaller polar bear sub-population managed by Nunavut (Figure 1). This subpopulation is currently hunted by residents of Gjoa Haven and Cambridge Bay with a Total Allowable Harvest (TAH) of 3 bears per year. An initial mark-recapture study was done from 1973-78 (Furnell and Schweinsburg, 1984) for MC and Gulf of Boothia (GB), but it did not identify them as individual demographic units. However, a summed population estimate for both areas of 1081 was derived. The estimate was known to be biased by non-representative sampling, and was subsequently increased to 900 for GB and 900 for MC based on the belief that the current harvests were sustainable, and the estimated number was the one required to sustain the harvest.

In the mid-1990s, the MC estimate was revised downwards to 700 based on hunter reports of reduced densities of polar bears. Both populations were later delineated

based on movements of satellite radio-collared adult female bears in adjacent areas and recoveries of tags in the harvest of tagged bears (Taylor and Lee, 1995; Taylor et al., 2001), and local knowledge of Inuit about how local conditions may influence the movements of polar bears. Past harvests of 34 bears/year from 1979-1999 were unsustainable, and a moratorium from 2001/2002 – 2003/2004 was implemented, followed by a reduction in TAH. The subpopulation has been managed to achieve recovery, and in fact local traditional knowledge confirms that there are more bears being seen in recent years. The past abundance estimate for MC, based on a physical mark-recapture study (1998-2000) was 284 bears (Taylor et al. 2006). At such low abundance levels, the population still remains at risk (Molnar et al. 2014).

OBJECTIVES

1) To estimate the current population size and composition of the MC polar bear subpopulation.

2) To compare a new estimate of abundance with the one derived during the last study in-order to gain insight into population trend and status in MC.

3) To estimate survival and reproductive parameters (to the extent possible) in-order to facilitate population viability analyses.

4) To evaluate polar bear distribution with respect to environmental variables, particularly ice conditions, topography and food availability distribution (to the extent possible).

5) To demonstrate the utility of genetic mark-recapture as a less invasive alternative to physical capture for the purpose of population monitoring.

6) To enhance public participation and provide HTO-designated personnel with training in survey methods.

STUDY AREA

The current population boundaries for both MC and GB are mainly based on telemetry data and movements of adult female bears in adjacent areas and tag returns from harvests (Taylor et al., 2001; Bethke et al. 1996; Schweinsburg et al. 1982). These boundaries have also been supported by recent genetic work (Campagna et al. 2013; Malenfant pers. comm.). The area (about 300 000 km^2) that the MC population is distributed across (Figure 1) is bound by Victoria Island to the west, Prince of Wales Island in the north, Boothia Peninsula in the east, and the mainland to the south.

MATERIALS AND METHODS

The study design is similar to that of the previous mark-recapture conducted in MC (Taylor et al. 2006) but does not involve the capture and physical marking of every bear encountered. DNA extracted from skin samples is being used to genetically 'fingerprint' bears; effectively marking each individual (and permitting future identification) without the need for ear-tagging or lip-tattooing. The 'recapture' event occurs when a bear is re-sampled by researchers on a later occasion or when a tissue sample is recovered from a polar bear harvested in Nunavut.

During the spring (April to June) of 2014, 2015, and 2016, sampling is being carried-out on the sea-ice and coastal areas within the MC study area. A helicopter (Bell 206 LR) is used to search for bears. To reduce potential sampling bias resulting from differences in habitat use amongst various age, sex and reproductive classes of bears, information initially derived from previous mark-recapture studies, combined with current knowledge of sea-ice conditions at the time of sampling, and local knowledge of hunters is being used to allocate search effort across MC. We are also employing a systematic search where transects are flown across the sea ice at approximately 7-10 km distance, depending on whether the areas exhibit high or medium-to-low bear densities.

Once a bear is located, a small sample of skin (Plate 1) is collected using a DNA dart (Pneu-Dart Inc.). The darts are designed to fall to the ground after impact and can be retrieved without handling a bear. To detect the recovery of previously 'marked' bears by hunters, tissue samples are being collected from all bears harvested in MC (and surrounding sub-populations) throughout the duration of the study. For each bear sampled, date and time, GPS coordinates and information on location, behavior, body condition, estimated age/sex (when possible) and group/litter size are recorded. DNA extracted from the tissue samples will be analyzed in-order to assign each bear a unique genetic identity and determine its sex using validated techniques, similar to those described by Kendall et al (2009). Tissue samples collected during the previous MC mark-recapture (1998-2000) are also being analyzed. The pursuit of bears will be abandoned if intense chase times are > 3 mins (NB: This project was carried out under a Nunavut Wildlife Research Permit (WL-2015-014), NWT Animal Care Committee approval (NWTWCC 2015-005) and Land Use Permit (KTX114X002).

Seal observations

As during the spring of 2014, we collected seal observations during our 2015 field season as we searched for polar bears. Every time we passed a seal perpendicularly to our search path for polar bears, its GPS location was recorded. Visibility was generally good so that seals could be spotted usually within 1 – 1.5km to the left and right of the helicopter path. Although subject to numerous potential biases (i.e. ice type, weather, time of day, etc), analyses of these observations may provide some insight into the distribution, relative densities or availability of prey for polar bears in MC

PROJECT SCHEDULE

The project currently remains on schedule as originally proposed; with final results to be reported tentatively in 2017.

OUTPUT OR STEP	START DATE	END DATE	PERSON DAYS
Logistical preparations (e.g. fuel caching, cabin prep, field equipment)	Fall 2013	Spring 2014	65
	Spring 2015	Spring 2015	25
	Spring 2016	Spring 2016	25
Biopsy darting	April 2014	June 2014	60
	April 2015	June 2015	35
	April 2016	June 2016	35
Harvest sampling	Fall 2014	Fall 2016	80
Analysis of tissue samples	Summer 2014	Spring 2017	TBD
Final data analyses, preparation of reports and peer-reviewed publications	Summer 2017	Winter 2017	TBD

PRELIMINARY RESULTS & DISCUSSION

Mark-Recapture Sampling

In 2015, the start-date and location to begin sampling was set to 17 April and Cambridge Bay, which was based on a previous study (Taylor et al. 2006) and suggestions made by HTO members during consultations. However, poor weather conditions did not allow deployment of the helicopter to the study area until 5 May, which affected the remainder of the field season. This delay and the resulting logistical constraints did not allow us to completely survey the study area again. For example, we were not able to search in the areas of M'Clintock Channel proper. Other areas to the south-east and south-west of King William Island were not searched because local knowledge indicated that bears are generally rare in those areas and at that time. Genetic mark-recapture sampling took place from 5 May to 4 June 2015 with a total of 13 sampling days. During this period, approximately 10,100 km (mean ± SE km/day: 721.93 ± 115.3 km; range: 126 – 1264 km) were flown while searching for polar bears on sea-ice habitat and islands across the MC study area (Figure 1 and 2). When compared to capture locations during the last inventory study (1998-2000), not many bears were located in MC proper, and our current coverage of the study area appears to incorporate the majority of previous captures locations (Figure 3).

As expected, sea-ice habitat was variable across the area we sampled. Near-shore areas along King William Island, Gateshead Island, Admiralty Island and the surveyed portions along the east-side of Victoria Island were interspersed with annual intermediate and multi-annual rough ice. The area where Franklin Strait, M'Clintock Channel, Victoria Strait and James Ross Strait intersect consisted mostly of flat and intermediate ice types (Plate 2; Figure 4, Table 3). This is also the area where the majority of bears/bear activity and seals were encountered last year. Bears were generally distributed across the same areas as last year, but in lower densities. The fact that we were not able to sample at closer transects may also contribute to that impression. In general, 60% of encountered bear groups were found in flatter ice (Type 1), and 40% in ice with more features (Type 2; Table 3).

In total, 122 polar bears of various age classes and both sexes in 79 groups were encountered (Figure 2, Table 1). Of these, 90 bears were biopsied including some individuals of 24 family groups (7 females with 1 coy, 8 females with 2 coys, 4 females with 1 yearling, and 3 females with 2 yearlings, 1 female with 2 2-yr-olds and 1 female with 1 2-yr old; Table 1). Biopsy samples of an additional 8 bears also could produce reliable genetic results but their quality is currently unknown. About 19% of all encountered bears were not sampled: the majority of those were COYs which we decided not to biopsy because of their small size and potential risk of injury. The other remaining bear was the female adult part of a family group of 3 - they were not sampled because the group split up upon approach of the helicopter, and after several minutes of bringing them together successfully we abandoned the idea of repeated sampling because of concerns of prolonged approach phases and risk to overheating.

Only 4 (about 3.3%) of all encountered bears were observed with a seal kill. Subjectively, about 20-25% of bears were with kills the previous year. The fact that this spring was late by about 2 weeks and no or very few open leads and cracks were observed for seals to haul out and bask in the sun could have contributed to that fact.

Without having covered the entire study area twice it will be difficult to assess the population abundance. In addition, genetic results from the first season are not completely analysed yet by the genetics lab because of the Baffin Bay/Kane Basin studies and their high priority. Once we receive these final genetic results we will be able to assess the individuality of bears and the potential recapture rates.

Although the entire study area was not sampled, preliminary data indicate that the population exhibits relatively high adult survivorship. This is expressed by the fact that about 64% of the collected sample consisted of adult bears (NB: based on field observations without genetic confirmation). The harvest for MC was reduced from 34 bears in 1999 to only 3 bears since 2004 lowering the hunting pressure and harvest mortality. Most adult females were members of family groups, and only a few unencumbered adult females were sampled; similarly only a few subadult males and females were observed. It is still unclear what the true picture of the age and sex distribution for MC bears looks like without having been able to survey the entire study

area. Having genetic analyses completed will also assist in illuminating cub survivorships, which could be negatively affected by the high presence of adult males.

The spatial distribution of bears within the covered search area was somewhat similar to that of bears sampled during the previous 1998-2000 study (Figure 3 and 4). We were subjectively able to discern bear density across the surveyed area based on bear activities and encounters during last field season; however, during this season it appeared bears were more distributed across the sea ice, recognizing that this also could have been a sampling artefact or a result of a late spring season that did not produce open leads for bears to search along for prey. Bear activity was present in moderate densities just east of Fort Ross, between Gateshead Island and Cape Swinburne (e.g. central and northern Larsen Sound), in Franklin Strait, Victoria Strait, eastern Larsen Sound and James Ross Strait. The Dease Strait and Queen Maud Gulf areas up to Jenny Lind Island had very few signs of bear activity and presence and are therefore still considered low bear density areas. On days when bears were encountered (n = 12), an average of 10 bears/day was sampled. The mean efficiency of our sampling effort was 1.68 bears/hr (range: 0.14 – 3.2 bears/hr). Observed group sizes varied between 1 and 4 bears; most groups were family groups, 2 male-female pairs, and one female-3 male group.

Our subjective perception is that there are lower numbers of subadults and family groups with cubs-of-the-year and with yearlings. A comparison of the first 2 capture years of the 1998-2000 study to the current study indicates that subadults in fact are in lower proportions (12%) in the current sample than previously (42%). However, we were not able yet to genetically confirm individual capture and recaptures from our recent 2 field season samples to verify actual proportions. The average (± SE) COY and yearling litter sizes were 1.5 ± 0.13 (n = 15) and 1.4 ± 0.20 (n = 7), respectively. We found more offspring in 2015 as compared to 2014, which is indicated by a greater proportion they represent within the overall sample, but we also encountered less bears than the previous field season. At this stage, and without genetic identifications, it is too early to draw any inferences on how these litter sizes compare to other subpopulations that were recently sampled (Table 2).

Body Condition

During 2015, body condition scores [BCS] on a scale of 1 to 5 (leanest to most obese; Stirling et al. 2008) ranged from 2.5 to 4 (Figure 5). Mean adult female and male BCS were 3.3 and 3.2, respectively. Overall, with the exception of a few smaller cubs of the year, bears appeared healthy given the time of year and season (e.g., pre-seal prime feeding season), which is comparable to the previous year.

Genetic Analyses

The Baffin Bay/Kane Basin project samples took longer than expected to analyse by the genetics lab, in part also because of the large quantity of samples that were required –

this affected many other projects, including the MC 2014 sample analyses. DNA extracted from tissue samples collected from bears biopsied in 2014 and 2015 will be genotyped to identify individuals and confirm genetic sex. We will also use past capture samples (e.g., 1998-2000) in this analyses to obtain polar bear survival estimates of recaptured (e.g., re-sampled) bears.

Seal observations

We observed a total of 336 seals in 190 groups (group size ranging from 1 – 17) during the course of our searches for polar bears, across ice-types 1 and 2 (Figure 6, Plate 2). This sharp decline in seal observations between 2014 (about 2200 seals) and 2015 was likely caused by the delayed onset of spring and ice break-up therefore reducing basking opportunities.

COMMUNITY INVOLVEMENT and REPORTING TO COMMUNITIES/RESOURCE USERS

Following consultation meetings in 2013 and regional KRWB meetings in 2014, the project received (continued) support from the Ekaluktutiak HTA, Spence Bay HTA and Gjoa Haven HTA. We announced and requested support for our field work activities ahead of the field season – all HTOs had interested parties. However, we only were able to have an Ekaluktutiak HTA member participate out of Cambridge Bay. HTA members from Gjoa Haven were initially interested, but did not participate in field activities because of their involvement in another field project. We were unable to take Spence Bay HTA members to Fort Ross because of logistical constraints: we were hampered by bad weather and stuck at Cape Sidney for almost 2 weeks. The decision to relocate to Fort Ross was made unexpectedly one morning in conjunction with a Polar Continental Shelf Program weather discussion so that we were able to continue work – it was a short-notice decision. We explained the situation by phone to the Spence Bay secretary manager. A field report will be sent to all affected communities and RWO.

Community / HTO	Before research	During research	Completion of research
Cambridge Bay/Ekaluktutiak HTA	Feb 2013, in-community (partially completed; not all board members were initially there,	Spring 2014, 2015 & 2016, in-community during fieldwork Winter 2014, 2015 & 2016, by	Summer 2017, in-community

	then meeting cancelled)	correspondence	
Gjoa Haven/Gjoa Haven HTA	Feb 2013, in-community (completed)	Spring 2014, 2015 & 2016, in-community during fieldwork Winter 2014, 2015 & 2016, by correspondence	Summer 2017, in-community
Taloyoak/Spence Bay HTA	Feb 2013, in-community (completed)	Spring 2014, 2015 & 2016, in-community during fieldwork Winter 2014, 2015 & 2016, by correspondence	Summer 2017, in-community

OTHER INCIDENTAL ICE OBSERVATIONS

We observed a young male brown bear in Albert Edward Bay on the sea ice, and several rough-legged hawks throughout the searched areas either on seal carcasses or just flying.

Table 1. Overview of polar bears sampled during the 2015 field season in M'Clintock Channel[1].

Sex/Age Group	Biopsied			Total
	yes	no	maybe*	
Adult female	35	1	2	**38**
Subadult female	4	0	0	**4**
Adult male	38	0	3	**41**
Subadult male	2	0	1	**3**
Cubs-of-the-year	0	23	0	**23**
Yearlings	8	0	2	**10**
2-year old	3	0	0	**3**
Total	**90**	**24**	**8**	**122**

* "maybe" means that the collected sample may be adequate for genetic gender and individual identification

Table 2. Polar bear litter sizes and number of dependent offspring observed (as proportion of total observations) during recent studies in central and eastern Canada. Litter size data presented as mean (standard error).

Subpopulation	Litter size		Proportion of total observations		Source
	COY	YRLG	COY	YRLG	
M'Clintock Channel (2015)	1.5 (0.13)	1.4 (0.20)	0.18	0.08	GN (unpublished data)
M'Clintock Channel (2014)	1.7 (0.15)	1.4 (0.24)	0.11	0.05	GN (unpublished data)
Baffin Bay (2013)	1.63 (0.08)	1.37 (0.09)	0.16	0.08	GN (unpublished data)
Baffin Bay (2012)	1.47 (0.06)	1.53 (0.08)	0.13	0.10	GN (unpublished data)
Baffin Bay (2011)	1.57 (0.06)	1.51 (0.09)	0.19	0.10	GN (unpublished data)
Western Hudson Bay (2011)	1.43 (0.08)	1.22 (0.10)	0.07	0.03	Stapleton et al. (2014)
Southern Hudson Bay (2011)	1.56 (0.06)	1.54 (0.08)	0.16	0.12	M. Obbard et al. 2013
Foxe Basin (2009-2010)	1.54 (0.04)	1.48 (0.05)	0.13	0.10	Stapleton et al. (2012)

[1] Identifications of age/sex classes may change slightly after genetic analyses of biopsy samples.

Table 3: The area of habitat types (1 = flat ice, 2= flat with some ridges, 3 = large ice chunks) in the M'Clintock Channel subpopulation area is listed below. Also listed is the observed/expected (O/E) number of polar bear sightings (excluding dependent COYs and yearlings) and seal sightings by habitat type. Preference/Avoidance was calculated as the ratio of observed to expected, and the Fisher's Exact Test probability (p value) of no preference/avoidance was calculated from the 2X2 contingency table of observed and expected sightings for habitat versus all other habitats pooled. Significant preference (O/E > 1) or avoidance (O/E <1) of habitat types is in **bold**.

Habitat Type	**1**	**2**	**3**	**TOTAL**
Habitat Area (km^2)	27,820	28,947	1,678	58,445
Polar Bear Sightings (O/E)	46/37	31/38	0/2	77/77
O/E Ratio **(p value)**	1.24 (0.1958)	0.82 (0.331)	- (0.4967)	
Seal Sightings (O/E)	242/134	35/140	5/8	282/282
O/E Ratio **(p value)**	**1.81** **(<0.0001)**	**0.25** **(<0.0001)**	0.63 (0.5765)	
Seal kills Sightings (O/E)	11/9	7/9	0/0	18/18
O/E Ratio **(p value)**	1.22 (0.738)	0.78 (0.738)	-	

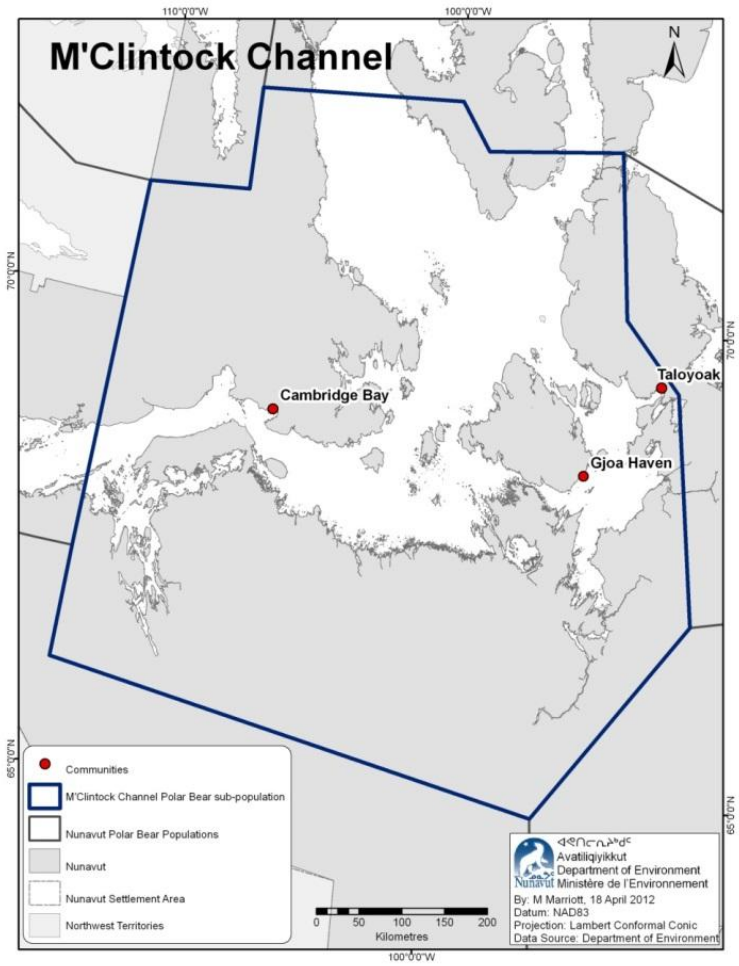

Figure 1. Map of the M'Clintock Channel polar bear subpopulation boundary and location of communities within.

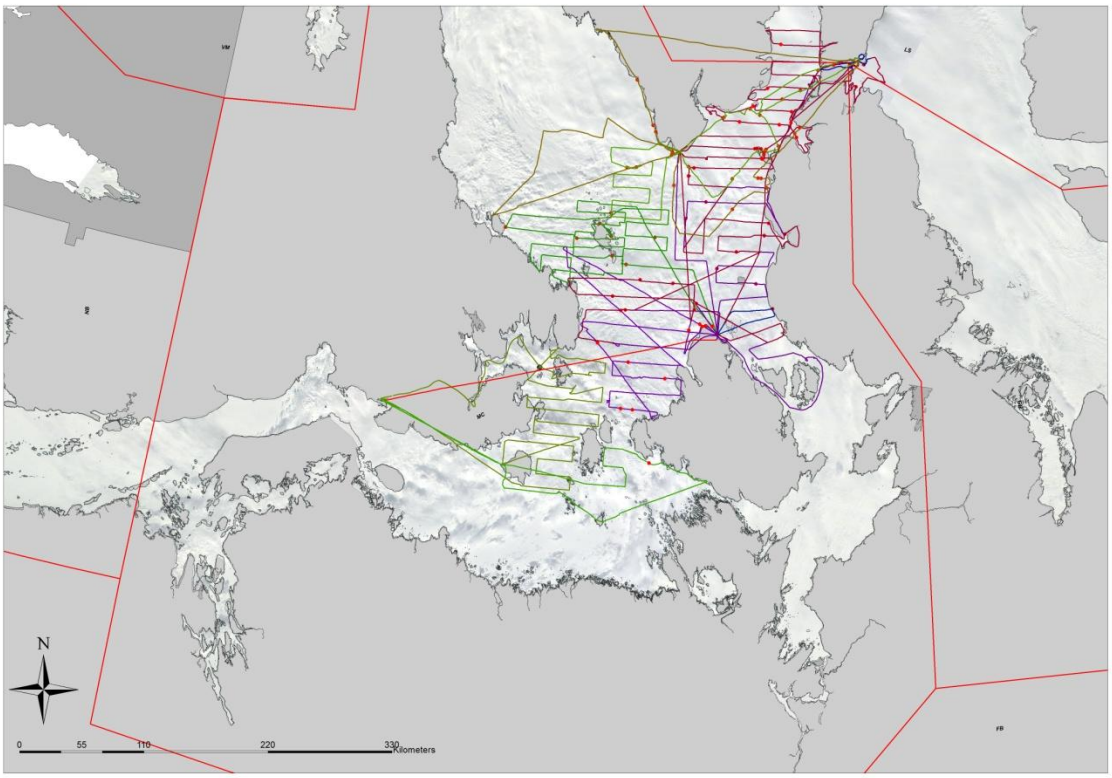

Figure 2. Locations of individual and groups of polar bears encountered during May - June 2015 in M'Clintock Channel (red dots). The lines represent the daily search tracks (NB: not the entire study area was covered; NASA/MODIS satellite image 21 May 2015; blue dot represents a brown bear).

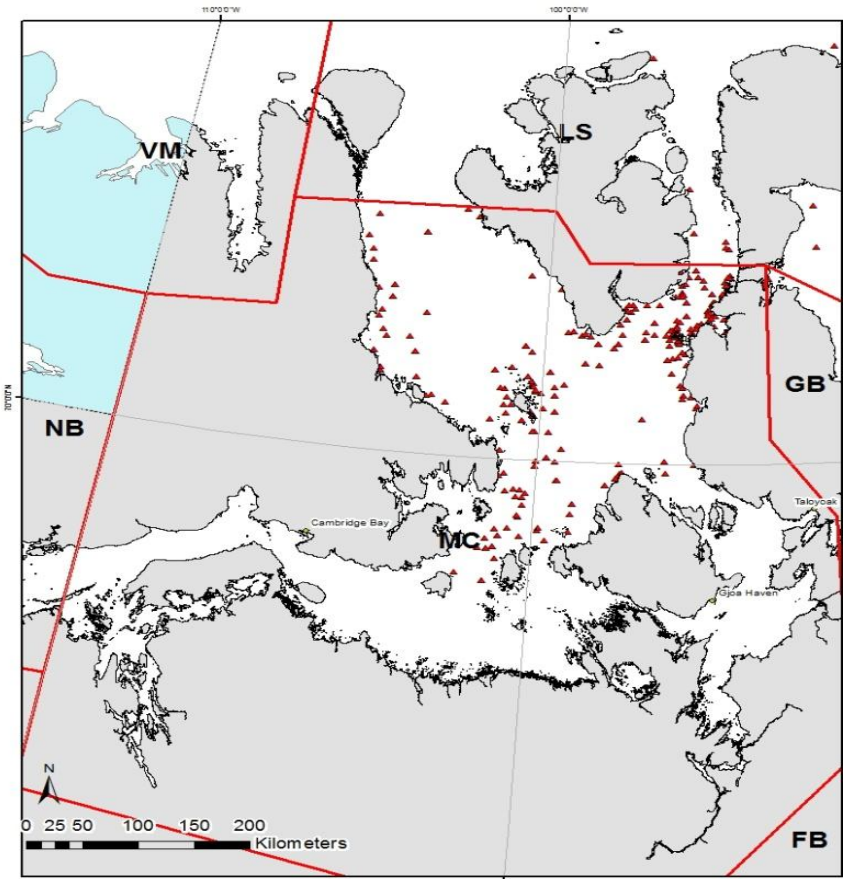

Figure 3. Polar bear capture locations during the past subpopulation study in M'Clintock Channel (1998-2000)

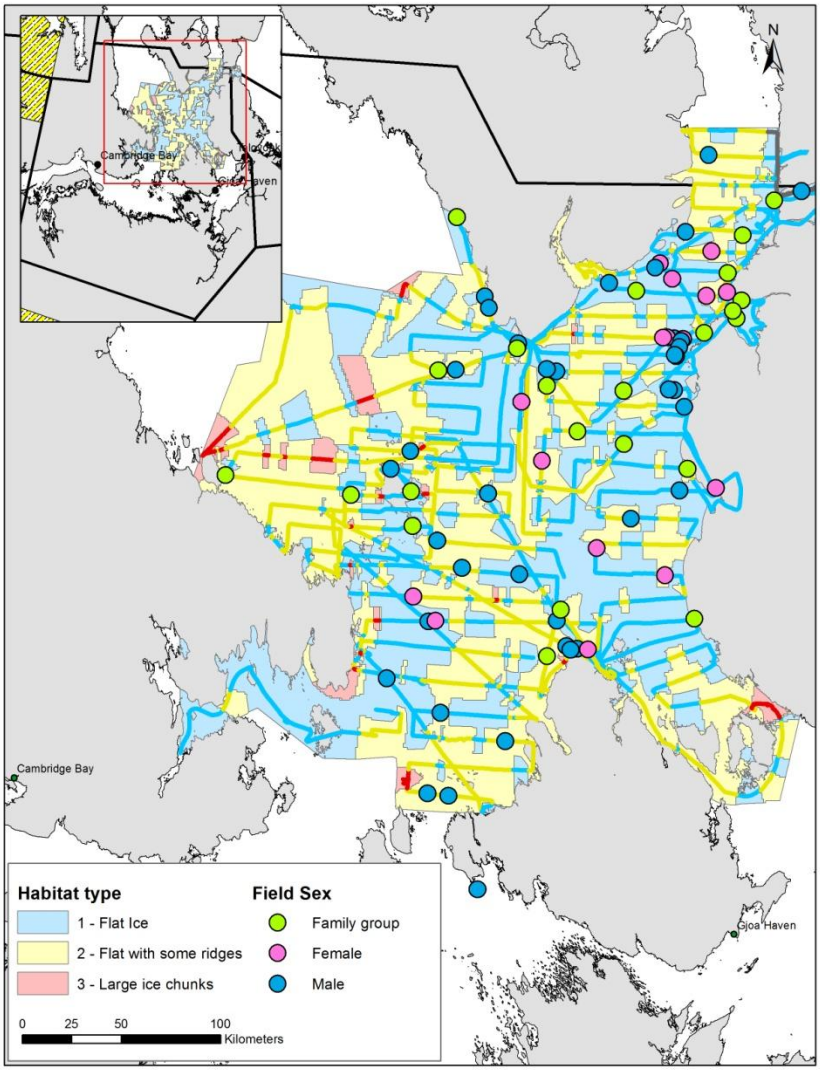

Figure 4. Habitat types (1-3) and polar bear distribution across the area searched during 2015 field activities within the M'Clintock Channel polar bear subpopulation boundary.

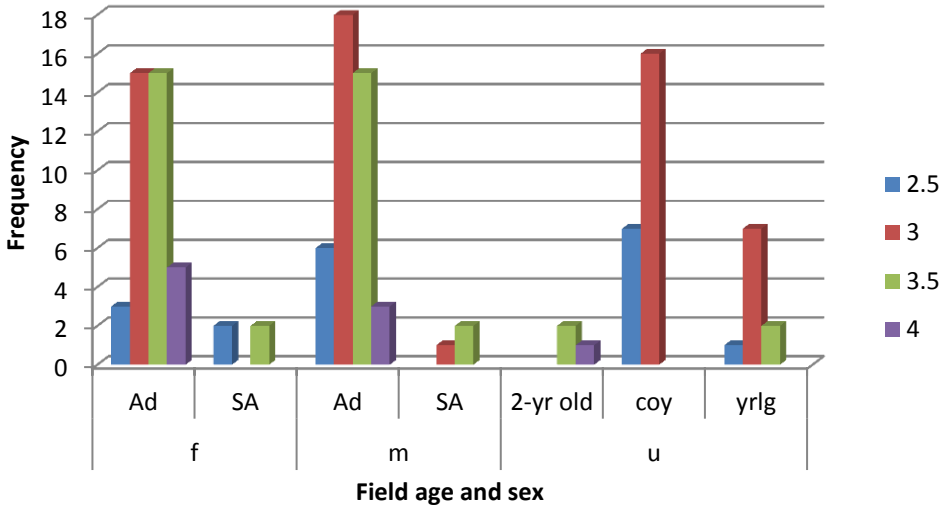

Figure 5. Summary of body condition scores (BCS) for polar bears encountered during sampling in M'Clintock Channel (Nunavut) 2015. Age and sex estimated by distance examination [NB: f = female; m = male; Ad = adult; SA = subadult; u = unknown gender; coy = cub of the year; yrlg = yearling].

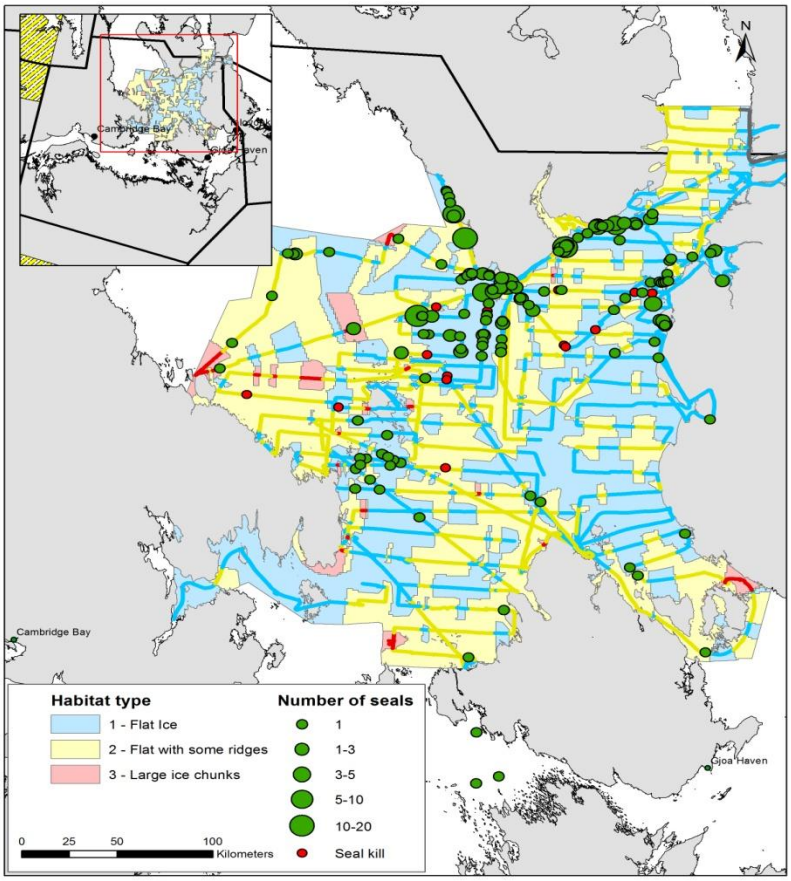

Figure 6. Distribution of seals across the various ice types during the 2015 field season in M'Clintock Channel.

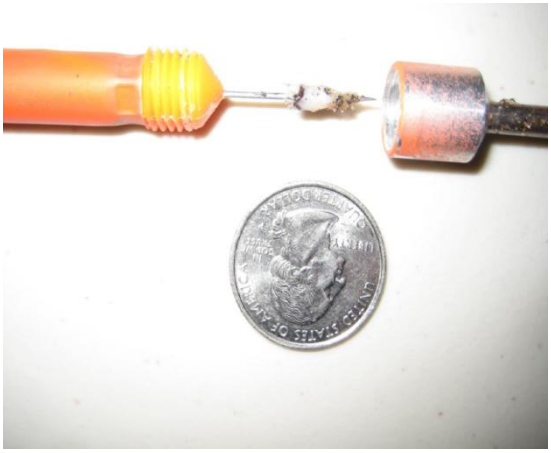

Plate 1. Small skin sample extracted during the DNA biopsy process.

a)

b)

c)

Plate 2. Various ice types encountered in M'Clintock Channel during the 2014 and 2015 spring field work: a) flat (with very few ridges; circle shows a bear on the ice); b) intermediate ice relief with more and higher pressure ridges; and c) rough ice – mixture of multi-annual and annual ice pushed and crushed together, large ice chunks. (Altitude: ~350 - 400 feet).

Acknowledgements
The 2015 field season was logistically and financially supported by the Government of Nunavut, Nunavut Wildlife Management Board, World Wildlife Fund - Arctic Programme, The Polar Continental Shelf Program, and Environment Canada. We greatly appreciate the participation of the HTO member of Cambridge Bay (W. Nakashook). Additional excellent field support was provided by our pilots J. Barry and J. Innis who kept us safe and persevered with a great sense of humour throughout these challenging weeks. The assistance of the local Conservation Officers with logistics was also greatly appreciated.

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