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

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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 were too high to sustain this population, and an initial moratorium was implemented following this inventory study which was followed with a

reduced total allowable harvest that has been in place up to today. 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 18 June 2014 a total of 155 polar bears (in 119 groups) of various age classes and both sexes were encountered, of which 127 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. Nevertheless, we covered a total distance of approximately 12,600 km. Rate of sampling averaged 1.9 bears per hour of search time. The number of bears encountered during the spring of 2014 was equivalent to approximately 55% of the previous 2000 mark-recapture population estimate currently used for harvest management. However, until genetic results are available it is impossible to discern how many different individual bears were encountered. Preparations are under-way for the second field season which will begin in April of 2015.

ᓇᐃᒡᓕᒋᐊᖅᓯᒪᔪᒃᑯᑦ ᑐᑭᓯᑎᑦᑎᒋᐊᕈᑎ

ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᑕ ᓇᓄᙱᑦ ᐊᒥᓲᙵᕐᒋᕐᔪᑎᒃ ᐊᐅᓚᑕᐅᕗᑦ ᓄᓇᕗᒻᒥᐅᓂᑐᐊᖅ. ᓯᕗᓪᓕᕐᒥᑦ ᓇᓗᓇᐃᒃᑯᓯᖅᓱᐃᑎᓪᓗᒋᑦ (1973-1978) ᓇᓚᐅᑦᑖᓚᐅᖅᑐᑦ ᐅᓄᖅᑎᒋᓂᖏᑦ ᑕᒪᐃᓐᓄ ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᓂ ᐃᑭᕋᓴᐅᑉ ᐃᒪᖓᓂᓗ ᑲᑎᕐᔪᒋᑦ 1081-ᖑᓂᖏᓐᓂ, ᐃᓛᒃᑰᖓᑎᙱᕐᔪᒋᑦ ᑕᒪᒃᑯᐊ ᐊᕕᒃᓯᒪᓂᖏᑦ. ᖃᕐᓯᐅᓇᓱᒋᔭᐅᓂᖏᑦ ᐅᓄᖅᓯᒋᐊᖅᑕᐅᓚᐅᖅᑐᑦ 900-ᒧᑦ ᑕᒪᐃᓐᓂ, ᓇᓐᓄᒃᑕᐅᕙᖕᓂᖏᑦ ᑲᔪᓯᔪᓐᓇᕋᓱᒋᔭᐅᓪᓗᑎᒃ. ᓄᓇᓕᖕᒥᐅᑦ ᖃᐅᔨᒪᓂᖏᑦ ᒪᓕᒃᑯᒍ ᐅᓄᕈᓐᓃᕐᓂᕋᖅᑕᐅᓚᐅᖅᑐᑦ, ᐅᓄᖅᑎᒋᓂᖏᑦ 700-ᖑᓕᓚᐅᖅᑐᖅ. ᖃᓄᖅ ᐅᓄᖅᑎᒋᓂᖏᓐᓂ ᖃᐅᔨᓴᒃᑲᓐᓂᓕᓚᐅᖅᑐᑦ 1998-ᒥᑦ 2000-ᒥᓪᓗ ᓇᓚᐅᑦᑖᖅᑯᑎᒃ ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᑕ ᓇᓄᖏᑦ 284-ᖑᓂᕋᖅᑕᐅᓪᓗᑎᒃ. ᓇᓐᓄᖃᑦᑕᓗᐊᓕᕐᓂᑰᖓᑕ ᐅᓄᕈᓐᓃᖅᐸᓪᓕᐊᔾᔪᑎᒋᓪᓗᓂᐅᒃ, ᓯᕗᓪᓕᕐᒥᑦ ᓄᖅᑲᖓᑎᑦᑎᓕᓚᐅᖅᑐᑦ ᖃᐅᔮᓂᒃᑎᓪᓗᒋᑦ ᐅᓄᕈᓐᓃᕆᐊᖅᑕᐅᓪᓗᓂᓗ ᓇᓐᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ ᑲᔪᓯᓪᓗᓂᓗ ᐅᓪᓗᒥᒧᑦ. ᓇᓐᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ ᐅᓄᕈᓐᓃᕆᐊᖅᑕᐅᓂᖓ ᐱᔾᔪᑎᒋᓪᓗᒍ, ᐊᖑᓇᓱᒃᑏᑦ ᓄᓇᓖᓪᓗ ᓇᓐᓄᒃᐸᓚᐅᖅᑐᑦ ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᓂ ᑮᓇᐅᔭᓕᐅᕋᓱᐊᕐᓂᕐᒧᑦ ᐱᖅᑯᓯᑎᒍᓪᓗ ᐊᓯᐅᔨᔪᑦ. ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᑕ ᓇᓄᖏᑦ ᐅᓄᖅᓯᕙᓪᓕᐊᓯᒪᓕᖅᑐᑦ, ᒫᓐᓇᓗ ᓄᓇᓕᖕᓂ ᖃᐅᔨᒪᓂᖏᑦ ᒪᓕᒃᑯᒍ ᐅᓄᕐᓂᖅᓴᓂᒃ ᓇᓄᕐᓂᒃ ᑕᑯᖃᑦᑕᓕᖅᑐᑦ ᓇᓂᑯᓘᔭᖅ ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᓂ. ᒪᓕᒃᑯᒍ ᐊᑐᖅᑕᐅᓇᓱᐊᖅᑐᑦ 2005 ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᑕ ᓇᓄᖏᓐᓄ ᑐᑭᓯᐅᒪᕐᑲᑎᒌᒍᑎ, ᓇᓐᓄᕐᑲᑦᑕᒃᑲᓐᓂᕐᓂᕆᔭᐅᔪᒪᔪᓪᓗ ᓄᓇᓕᖕᒥᐅᓂ, ᓄᑖᕐᒥᑦ ᐊᕐᕌᒎᖕᓄ ᐱᖓᓱᓄᑦ ᖃᐅᔨᓴᓯᒋᐊᓚᐅᖅᑐᑦ 2014-ᒥᑦ ᐅᓪᓗᒥᓕᓴᕐᒥᑦ ᑐᑭᓯᒋᐊᕈᑎᕐᑲᕈᒪᓪᓗᑎᒃ ᖃᓄᖅ ᐅᓄᖅᑎᒋᓂᖏᓐᓂ ᓇᓄᐃᑦ ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᓂ. ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᑕ ᓇᓄᖏᑦ ᖃᕐᓯᐅᓕᕐᓂᖏᑦ ᖃᓄᐃᓕᖓᓕᕐᓂᖏᓪᓗ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᖅᑐᑦ ᓇᓗᓇᐃᒃᑯᓯᖅᓱᐃᓂᖅᑎᒍᑦ.

ᒪᐃ 5 ᐊᒻᒪᓗ ᔫᓂ 18 2014 ᐊᑯᓐᓂᐊᓂ ᑲᑎᕐᔪᒋᑦ 155 ᓇᓄᐃᑦ (119-ᖏᑦ ᑲᑎᙵᕙᒃᑯᑎᒃ) ᖃᓄᐃᑦᑐᑐᐃᓐᓇᐃᑦ ᑕᑯᔭᐅᓚᐅᖅᑐᑦ, 127-ᖏᑦ ᖃᐅᔨᓴᖅᑕᐅᓯᒪᓪᓗᑎᒃ, ᖃᐅᔨᓴᕆᒃᓴᐅᑐᐃᓐᓇᓇᐊᖅᑲᒥᔪᑦ 8

ᓇᓄᒃᑲᓐᓃᑦ. ᓱᓚᕈᔮᕐᑲᑦᑕᓚᐅᕐᓂᖓ ᐱᓪᓗᒍ ᓄᒃᑕᕈᑎᓄᓪᓗ ᐊᔪᕈᑕᐅᔪᑦ, ᖃᐅᔨᓴᒐᒃᓴᓕᐅᕐᓂᓚᐅᙱᑦᑐᑦ ᐃᑦᑐᐊᖅᑑᑦ ᐃᒪᖓᓂ ᖃᐅᔨᓴᕐᕕᐅᔪᒥᑦ. ᑕᐃᒪᐃᒃᑲᓗᐊᖅᑎᓪᓗᒍ, ᖃᐅᔨᓴᖅᓯᒪᓕᖅᑐᑦ 12,600 ᑭᑏᒥᑕᔅᒥᒃ ᐊᒃᑎᕆᔪᒥᑦ. ᖃᐅᔨᓴᒐᒃᓴᓕᐅᖅᐸᒃᓗᑎᒃ 1.9 ᓇᓄᕐᓂᑦ ᐃᑲᕐᕿᑕᒫᖅ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ. ᓇᓄᐃᑦ ᑕᑯᔭᐅᔪᑦ 2014 ᐅᐱᕐᕖᖓᓂ ᐊᔾᔨᖃᓚᐅᖅᑐᖅ 55%-ᖓᓂ ᑭᖑᓪᓕᕐᒥᑦ 2000-ᓂᒃ ᓇᓗᓇᐃᒃᑯᓯᖅᓱᐃᓚᐅᖅᑎᓪᓗᒋᑦ ᒫᓐᓇ ᐊᑐᖅᑕᐅᔪᖅ ᓇᓐᓄᑲᓱᒃᑕᐅᕙᒃᑐᒧᑦ. ᑭᓱᐊᓂᓕ, ᖃᐅᔮᓂᒃᑎᓪᓗᒋᑦ ᓇᓗᓇᕈᓐᓃᕐᓂᐊᖅᑐᖅ ᖃᔅᓯᐅᖕᒪᖕᒫᑦ ᓇᓄᑦ ᑕᑯᔭᐅᔪᑦ. ᒫᓐᓇ ᐋᖅᑭᒃᓱᐃᕙᓪᓚᐊᓕᖅᑐᑦ ᑭᖑᓪᓕᖓᓂᑦ ᖃᐅᔨᓴᕈᑎᒋᓂᐊᖅᑕᒥᓄᑦ ᐱᑎᐊᕐᕕᒃᓴᖅᑲᖅᓗᓂ ᐊᐃᕐᓇᓕ 2015.

NAITUMIK TITIRAQHIMAYUQ

M'Clintock Channelmik (MC naitumik titiraqhimayuq) mikitqianguyuq amigaitilaangit nanuit munagiyauyut talvanga tamaini Nunavunmi. Hivulliuyuq naunaiyagiikhimayuq havaaq ihivriugiangat (1973mi-1978mun) nallautiqhimayuq taima amigaitilaangit tamangnik MC-mi talvanilu Gulf of Boothiami (GB naitumik titiraqhimayuq) katitiqhimayut taima 1081nik nanungnik, ilitagihimaitumik ukuat katimaviingit taima naunairutiqangitun ayungnautikharnik. Naunaiyagiikhimayut nallautikhimayut angikliyumiqhimayut 9 hananik nanungnik tamangni katimaviani, taima naunaiyagiikhimayuq anguyaangat angutikhat talvuuna ayungnautiqangitun. Talvanga nunalaani ilitugidjutikharnin ihumagiyut amigaitilaangat ikitungnaqhiyut, amigaitilaangat ikikliyumiqhimayut taima 7 hanatmun. Nuutaanguyuq amigaitilaangitnun ihivriuqnikkut aulavakhimayuq talvuuna 1998mi 2000milu nallautikhimayuq taima MC-ngit nanuit amigaitilaangat piqaqtun 284nik nanungnik. Kinguliqhimayut anguyauyut amigaitpalaaqmanik uvani amigaitilaangani, talvanga hivulliuyuq nutqaqvikharnik anguyaangat aulavakhimayuq naunaiyagiikhimayuni uvani ihivriurutmi malikhautiqhimayuq ikikliyumiqhimayunut katitiqhimayunik angugiaqaqtunik aulaliqhimayu ublumun. Talvuunattiaq uvanga ikikliyumirutikhatigun anguyaangat hanaqidjutikharnik, anguniaqtiit nunalaanilu anguinaqtun angutingnik talvanga MCmi taimailiqhimayut maniliurutikharnik pitquhitittigun maniliurutikharnik. Tamna MCmi amigaitilaangit munagiyauvakhimayut amigaiqyumigiangat, kinguliuyuniklu naunairutingnin ihumaliurutiqaqhimayut taima amigaitun nanuit tautuktauhimavaktun qaffiuyunik hanigaqpainik talvani MCmi nunangani. Talvuunattiaq mikhaatigun havagumayainikkut talvanga 2005mi MCngit Nanungnik Ilitugidjutikhat Ilihimayainik (MOU naitumik titiraqhimayuq), havagumayainik nunalaani ilauhimaaqtunut angugiaqaqtun nanungnik, nuutaanguyuq pingahunik ukiunganik ihivriuqtaudjutikhaq havaaq aulatitihimayuq talvani 2014mi tuniyaangat naunaitumik naunairutikharnik amigaitilaanikkut nanungnik talvani MCmi. Tamna amigaitilaangit kihidjutikhangitlu ihivriuqtauniaqtun talvuuna qanuritmangangit anguhimavakhimayunik naunaitkuhiqtauhimayutlu.

Talvuuna Qiqaiyaqluarvia 5mi Imaruqtirvia 18mi 2014mi katitiqhimayut 155nik nanungnik (talvani 119nik katimaviani) ukiuqaqtunik qanurlikiak katimaviangit anguhaluit arnaqluitluuniit piyauvakhimayut, talvanga 127nik idjuhianganik piyauvakhimayut, naunairutiqaqtunik 8nguyunik ilauqaqtun nanungnik taimaliukpaktun taima ihivriuqtaugiaqaqhutiklu. Hilaqluknikkut ayungnautigivaktun naunairutikhatlu ayukhavyakpaktun naunairutikharnik ukuninga, ihivriudjutikhat ayungnautigivaktun,

taima upautauvangitun tamaini talvani MCmi ihivriuqtauvikharnik. Talvuunattiaq, hanguvaktugut katitiqhimayumik ungahiqtilaarutikharnik taima 12 tausin 6 hananik ungahiktilaarutingnik. Taima ihivriuqhutik 1.9nik nanungnik ikaaknimik atauhirmik qiniqhiavikharnik. Qaffiuyut nanuit tautuktauhimayut talvuunga upinngami 2014mi aadjikiiktuq taima 55 pusanmik kingulirmi 2000mi ukiungani anguyauvakhimayunik nanuit amigaitilaangani nallautiqhimayuq hadja atuqtauhimayuq angutikharnik munagidjutingnik. Kihiani, idjuhiangit naunairutiit pigiaqagumik nallunaqtun naunaiyaiyaangat qaffiuyut allatqiinguyut nanuit tautuktauhimayut. Pangnairutikhat aulahimaaqtun kingulikhaq havagiangat taima aulaniaqtuq Qitiqauyaqvia 2015mi.

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

Mark-Recapture

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-2014-007), NWT Animal Care Committee approval (NWTWCC 2014-003) and Land Use Permit (KTX114X002).

Seal observations

During the spring of 2014, we collected seal observations during our searches 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 2014, 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 4 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. For example, we were not able to search in the areas of M'Clintock Channel proper. As well, 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 18 June 2014 with a total of 18 sampling days. During this period, approximately 12,600 km (mean ± SE km/day; range: 740.5 ± 94.2 km; 230.00 – 1335.12 km) were flown while searching for polar bears on sea-ice habitat and islands across the MC study area (Figure 1). We flew a total of approximately 112 hours, of which 13% was ferry time, leaving a total search time of approximately 97.5 hours. Search times per day averaged 5.13 ± 0.64 hrs (including days with and without bears being sighted and sampled).

As expected, sea-ice habitat was variable across the area we sampled. Areas of Dease Strait and Coronation Gulf up to the west-side of Jenny Lind Island were dominated by relatively flat annual sea ice with very few pressure ridges intersecting sea ice. This area also showed next to no signs of any bear activity although seals were observed to make use of that sea ice habitat (Figure 3). 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 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). This is also the area where the majority of bears/bear activity and seals were encountered.

In total, 155 polar bears of various age classes and both sexes in 119 groups were encountered (Figure 2, Table 1), including hair samples of one bear that visited one of our field camp locales before our arrival. Of these, 127 bears were biopsied including some individuals of 15 family groups (3 females with 1 coy, 7 females with 2 coys, 3 females with 1 yearling, and 2 females with 2 yearlings; Table 1). Biopsy samples of an additional 8 bears also could produce reliable genetic results but their quality is currently unknown. About 13% 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 3 bears were not sampled because of concerns of prolonged approach phases and risk to overheating. Without having covered the entire study area, the 2014 sample size of 155 bears represents approximately 55% of the previous 2000 mark-recapture population estimate currently being used for harvest management (Taylor et al. 2006). However, we must await the genetic results first in order to determine precisely how many different individual bears were sampled since several bears were likely re-sampled within the 2014 study time frame.

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 67% of the collected sample consisted of adult bears. The harvest for MC was reduced from 34 bears in 1999 to only 3 bears over the past 10 years lowering the hunting pressure and harvest mortality. As well, the standing sex distribution appears to be male-biased (Table 1), but this can only be confirmed once the entire study area was sampled and gender has been verified via genetic testing. Nunavut's polar bear harvest management provides for a harvest that is male-biased (2 males for every female) which generally results in a female-biased standing sex-distribution (Taylor et al. 2008, McLoughlin et al. 2005). A reduced male-biased harvest pressure in MC has likely allowed the male proportion in the population to increase over time. Alternatively, adult male bears from neighbouring populations (e.g., Gulf of Boothia or Lancaster Sounds) may have temporarily or permanently migrated into the MC study area, but more research is needed to confirm this hypothesis.

The spatial distribution of bears within the covered search area was somewhat similar to that of bears sampled in the previous study. From the collected data it appears that the surveyed study area can be classified into high, medium, and low bear density areas. High bear density (based on captures of bears and signs of tracks) in MC can be found in a) areas just east of Fort Ross; and b) between Gateshead Island and Cape Swinburne (e.g. central and northern Larsen Sound). Medium densities of bears were encountered in Franklin Strait, and 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 considered low bear density areas. On days when bears were encountered (n = 14), an average of 11 bears/day was sampled. The mean efficiency of our sampling effort was 1.9 bears/hr (range: 0.4 – 4 bears/hr). Observed group sizes varied between 1 and 6 bears; the 6 bears were adult males feeding together on a bearded seal carcass.

Unexpectedly, we encountered low numbers of subadults and family groups with cubs-of-the-year and with yearlings. Again, a complete coverage of the entire study area may provide more detailed information of whether more family groups and subadults are present in this population in areas that could not be sampled during 2014. Nevertheless, mean (± SE) COY and yearling litter sizes were 1.7 ± 0.15 (n = 10) and 1.4 ± 0.24 (n = 5), respectively. At this stage 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 2014, body condition scores [BCS] on a scale of 1 to 5 (leanest to most obese; Stirling et al. 2008) ranged from 2.5 to 4.5. Most adult bears (94.1%) rated in average condition or better, and only 5.8% (all older adult males) were below average (Table 3). Mean adult female and male BCS were 3.33 ± 0.05 and 3.32 ± 0.05, respectively, which were not significantly different (t-test, $p > 0.05$). Overall, with the exception of a few smaller cubs of the year, bears appeared well-fed indicating an ample supply and availability of prey items (e.g., bearded and ringed seals). In fact, during our sampling effort we encountered many bears with either fresh or recently killed prey items.

Genetic Analyses

DNA extracted from tissue samples collected from bears biopsied in 2014 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 2169 seals during the course of our searches for polar bears (Figure 3), all across various ice-types (Plate 2). As the season progressed into late May and early June many seals were observed basking along open leads. Although not all seals were identified to species, subjectively ringed seals appeared to be the most abundant.

REPORTING TO COMMUNITIES/RESOURCE USERS

Following consultation meetings in 2013, the project received support from the Ekaluktutiak HTA, Spence Bay HTA and Gjoa Haven HTA. One Spence Bay and Ekaluktutiak HTA member each participated in fieldwork out of Fort Ross and Cambridge Bay, respectively. HTA members from Gjoa Haven could not participate in field activities: some were already involved in another project, others were forced to return to town from Cape Sidney as the melting of snow on the land made the travel back to Gjoa Haven near impossible.

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, then meeting cancelled)	Spring 2014, 2015 & 2016, in-community during fieldwork Winter 2014, 2015 & 2016, by correspondence	Summer 2017, in-community
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

Table 1. Overview of polar bears sampled during the 2014 field season in M'Clintock Channel[1].

Sex/Age Group	Biopsied			Total
	yes	no	maybe*	
Adult female	37	2	0	**39**
Subadult female	7	0	1	**8**
Adult male	64	0	1	**65**
Subadult male	15	0	2	**17**
Cubs-of-the-year**	0	17	1	**18**
Yearlings	4	1	2	**7**
Unknown***	0	0	1	**1**
Total	**127**	**20**	**8**	**155**

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

** includes one COY found dead

*** includes recent hair samples collected in a cabin

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 (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. (2013)
Southern Hudson Bay (2011)	1.56 (0.06)	1.54 (0.08)	0.16	0.12	M. Obbard et al. 2014
Foxe Basin (2009-2010)	1.54 (0.04)	1.48 (0.05)	0.13	0.10	Stapleton et al. (2012)
Davis Strait (2005-2007)	1.49 (0.15)	1.22 (0.28)	0.08	0.09	Peacock et al. (2013)

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

Table 3. Summary of body condition scores (BCS) for polar bears encountered during biopsy sampling in M'Clintock Channel (Nunavut) 2014. Age and sex estimated by distance examination.

Age Class	Sex	Body Condition Score						TOTAL
		2	2.5	3	3.5	4	4.5	
COY	Unknown		5	10	2			17
Yearling	Unknown			5	1		1	7
Sub-adult	Male			9	6	2		17
	Female			3	5			8
	Unknown							
Adult	Male		6	23	26	9	1	65
	Female (with offspring)			7	7			14
	Female (without offspring)			9	13	1	1	24
	Unknown							
TOTAL			**11**	**66**	**60**	**12**	**3**	**152**

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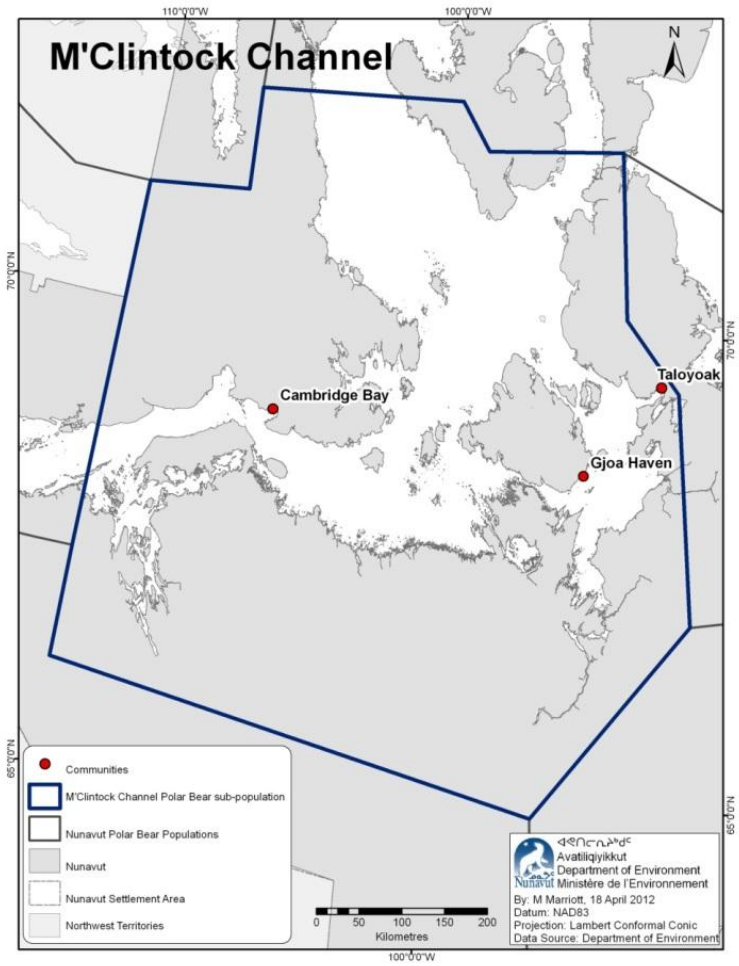

Figure 1. Map of the M'Clintock Channel polar bear subpopulation boundary and location of communities within.

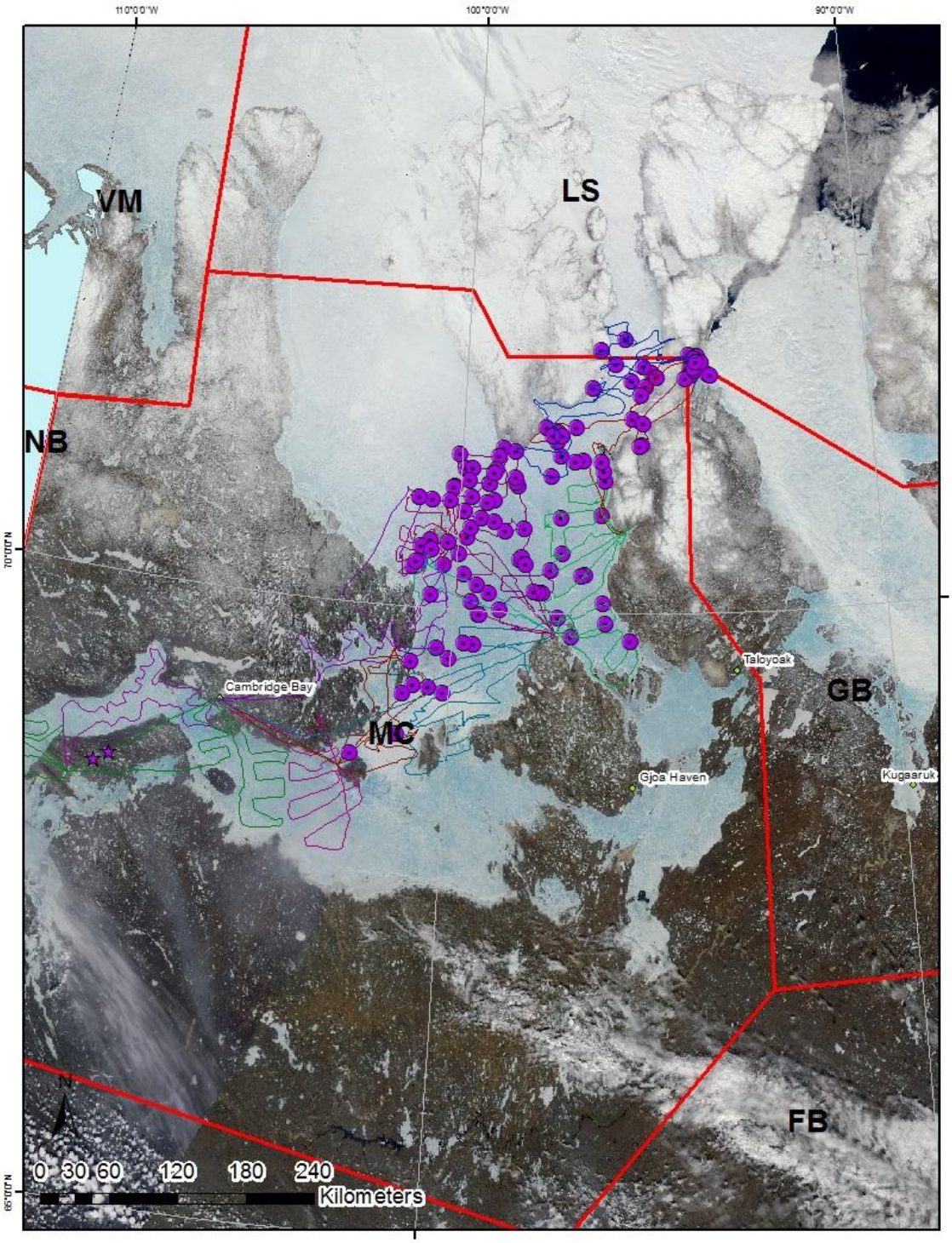

Figure 2. Locations of individual and groups of polar bears encountered during the spring of 2014 in M'Clintock Channel. The 2 stars represent brown bears, and the lines the daily search tracks (NB: not the entire study area was covered; NASA satellite image 25 June 2014).

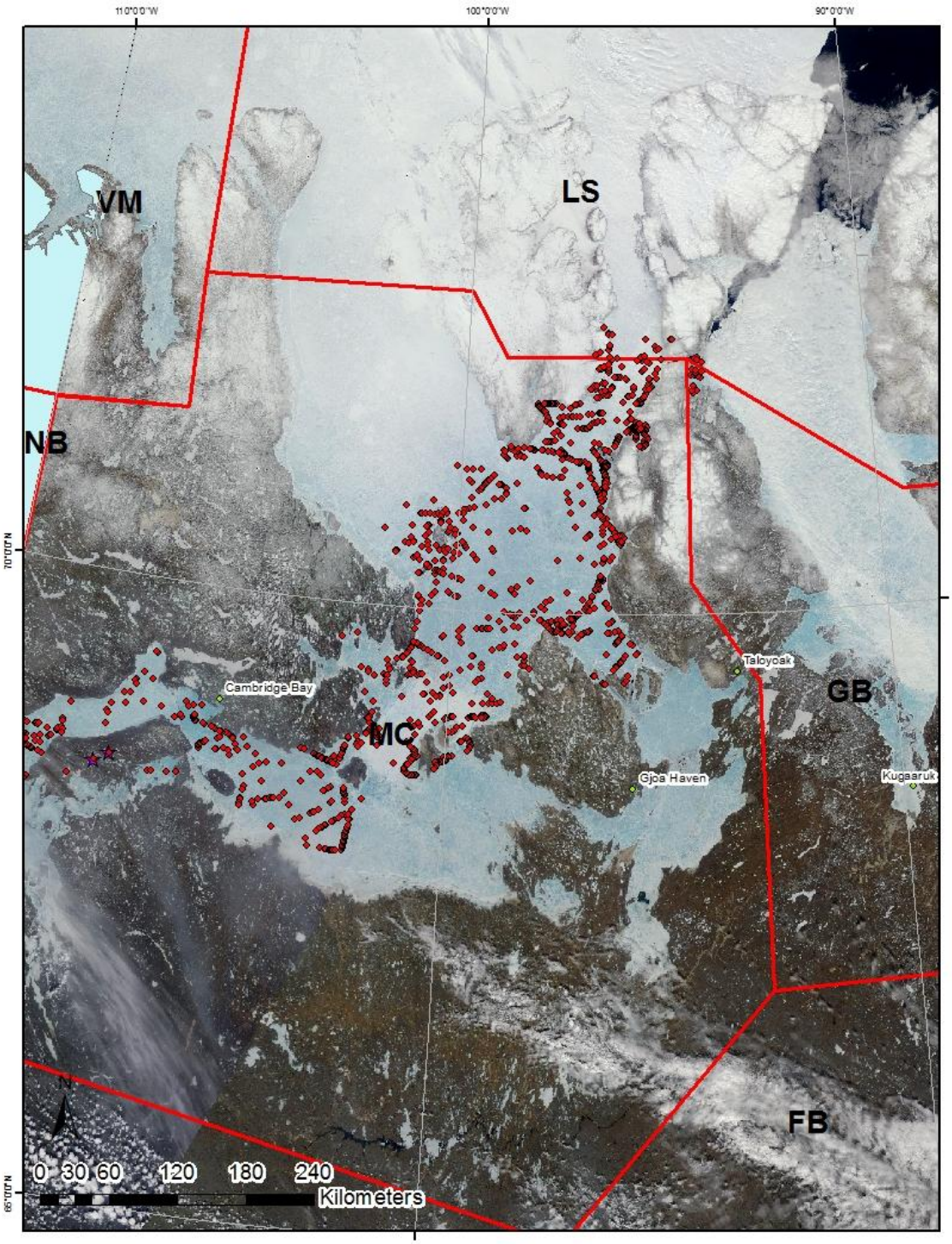

Figure 3. Locations of seal observations recorded during the 2014 field season in M'Clintock Channel (not corrected yet). [NB: NASA satellite image 25 June 2014].

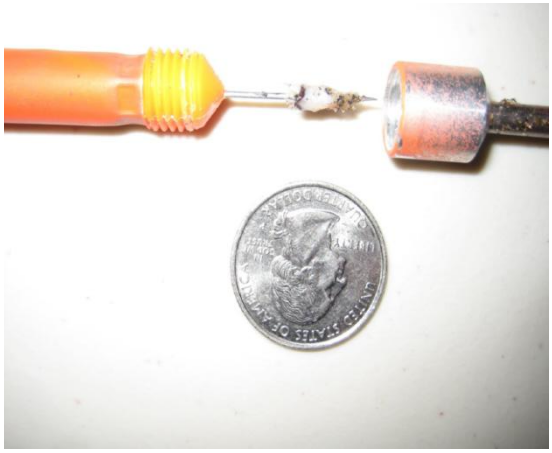

Plate 1. Small skin sample extracted during the DNA biopsy process.

a)

b)

c)

Plate 2. Various ice types encountered in M'Clintock Channel during the 2014 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).