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

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Pursuant to GN Wildlife Research Permit # WL-2016-003

AND

NWT Animal Care Committee Approval # NWTWCC 2016-005

AND

KIA Land Use Permit 160201KTX114X002

Version: 26 September 2016

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STATUS REPORT 2016-XX
NUNAVUT DEPARTMENT OF ENVIRONMENT
WILDLIFE RESEARCH SECTION
IGLOOLIK, NU

Dyck, M. 2016. Estimating the abundance of the M'Clintock Channel polar bear (*Ursus maritimus*) subpopulation by genetic mark-recapture. Nunavut Department of Environment, Wildlife Research Section, Status Report 2016-xx, Igloolik, NU. 29pp.

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 to 3 bears annually (2004/2005 – 2014/2015). 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, which led to an increase in the annual MC TAH from 3 to 12 bears for the 2015/16 harvest season.

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 19 April and 7 June 2016 a total of 95 polar bears in 65 groups of various age classes and both sexes were encountered, of which 86 were biopsied. 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 and 2015 seasons; however, in all years we were unable to survey the M'Clintock Channel area successfully due to the listed constraints. Nevertheless, we covered a total distance of approximately 14,200km during our searches for bears. Rate of sampling averaged 1 bear per hour of search time. Despite larger coverage we encountered less bears than the previous seasons, including offspring. Average litter sizes for cubs of the year and yearlings were 1.67 ± 0.33 (n = 3) and 1.57 ± 0.20 (n = 7), respectively. Nevertheless, until genetic results are available it is impossible to discern how many different individual bears were encountered. Preparations are under-way to have all genetic samples analysed so that population models can be developed. We anticipate to have final results available in March 2017.

NWRT PROJECT NUMBER: 2-16-03
PCSP PROJECT NUMBER: 304-16

SUMMARY INUKTITUT

ᓇᐃᓴᓕᑎᖅᓯᒪᔪᖅ

ᐃᑦᑐᐊᖅᑑᑦ (MC) ᑖᓐᓇ ᒥᕿᓐᓂᖅᓴᐅᓪᓗᓂ ᓄᓇᕐᓄᑦ ᐃᓂᒌᔭᐅᕙᒃᑐᖅ ᑕᐃᑲᓂᓗ ᐊᒥᓱᓂᖕᒋᑦ ᑲᒪᒋᔭᐅᒋᓪᓗᑎᒃ ᓄᓇᕗᒻᒥᐅᑐᐊᕐᓄᑦ. ᑕᐃᓐᓇ ᑕᖅᓯᖅᓯᕐᑲᑦᑕᕐᓂᖅ–ᑎᒍᓯᕐᑲᑦᑕᕐᓂᕐᓗ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ (1973–ᒥᑦ 1978–ᒧᑦ) ᐃᒪᐃᓕᖕᒐᔪᕙᓂᐅᓇᓱᒋᔭᐅᓯᒪᕗᖅ ᑕᐃᒃᑯᐊᒃ ᑕᒪᕐᒥᒃ (MC)–ᒥ ᐊᒻᒪᓗ ᐃᕿᕋᓴᐅᑉ ᐃᒪᖕᒐᓂ (GB)–ᒥ ᑲᑎᑕᐅᓚᐅᕐᓂᕐᒪᑎᒃ ᓈᓴᑦᑕᖕᒋᑦ 1081–ᖑᓪᓗᑎᒃ ᓇᓄᐃᑦ, ᓇᓗᓇᐃᔭᑎᓪᓗᓂᔾᔪᒃ ᑖᒃᑯᐊᒃ ᒪᕐᕉᓂᖕᒋᒃ ᐊᑐᓃᖕᒐᓂᖕᒋᒃ. ᑖᓐᓇ ᖃᐅᔨᒪᔭᐅᓪᓗᓂ ᐋᖅᑭᑦᑎᐊᖅᓯᒪᓇᓂ ᖃᓯᐅᓂᕋᖅᑕᐅᓯᒪᓂᖕᒐ ᐊᖕᒋᓕᒋᐊᖅᑕᐅᓚᐅᖅᓯᒪᖕᒪᑦ 900–ᓂᒃ ᓇᓄᕐᓂᒃ ᐊᑐᓂᑦ ᑖᒃᑯᓄᖕᒐ, ᑕᐃᒃᑯᐊ ᓇᓐᓄᒃᑕᐅᕙᒃᑐᑦ ᑕᐃᔅᓱᒪᓂ ᐅᒃᐱᕆᔭᐅᓚᐅᖅᓯᒪᖕᒪᑕ ᖃᓄᐃᔾᔪᑕᐅᖕᒋᓐᓂᖕᒋᓐᓂᒃ. ᑭᓱᐊᓂ ᓄᓇᓕᖕᓂ ᖃᐅᔨᒪᔨᑕᐅᔪᑦ ᐅᕐᑲᖃᑦᑕᓕᕐᒪᑕ ᓇᓄᐃᑦ ᐊᒥᓲᖕᒋᓐᓂᖅᓴᐅᓕᕐᓂᖕᒋᓐᓂᒃ, ᑕᐃᓐᓇ ᖃᓄᖅ ᐊᒥᓲᑎᒋᖕᒪᖕᒫᑕ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᖅ ᒥᒃᓵᒋᐊᖅᑕᐅᓚᐅᖅᐳᖅ 700–ᓄᑦ ᓇᓄᕐᓄᑦ. ᓄᑖ ᓈᓴᐃᓂᐅᓚᐅᖅᐳᖅ ᓇᓄᐃᑦ ᖃᔅᓯᐅᓕᕐᒪᖕᒫᑕ 1998 ᐊᒻᒪᓗ 2000 ᐊᑯᓐᓂᖕᒐᓂ ᓇᓗᓇᐃᖅᓯᓪᓗᑎᓪᓗ ᐃᑦᑐᐊᖅᑐᕐᕙᐅᑉ (MC) ᓇᓄᖕᒋᑦ ᐊᒥᓲᓂᒃᑲᓂᕋᖅᑕᐅᓪᓗᑎᒃ 284 ᓇᓄᐃᑦ. ᓇᓐᓄᒃᑕᐅᕐᑲᑦᑕᖅᑐᕙᓃᑦ 34 ᓇᓄᐃᑦ/ᐊᕐᕌᒍᒥ ᐱᒋᐊᖅᓘᓂ 1979–ᒥᑦ 1999–ᒧᑦ ᓇᓗᓇᐃᖅᑕᐅᓂᖅ ᐊᔪᕐᓇᕈᔪᓚᐅᖅᑐᑦ, ᐊᒻᒪ ᓄᖅᑲᖕᒐᑎᑕᐅᑲᓚᐅᖅᓯᒪᓪᓗᑎᒃ ᐱᒋᐊᖅᓘᑎᒃ 2001/2002–ᒥ – 2003/2004–ᒧᑦ ᑕᒫᓂᓗ ᐊᑐᓕᖅᑎᑕᐅᓪᓗᑎᒃ, ᑲᔪᓯᑎᑕᐅᓪᓗᑎᓪᓗ ᐊᒥᓲᔪᓐᓃᕆᐊᖅᑕᐅᓪᓗᑎᒃ ᓇᓐᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ 3–ᖕᒋᓐᓇᕐᓄᑦ ᐊᕐᕌᒍᑕᒦᕐᒧᑦ (2004/2005–ᒥᑦ – 2014/2015–ᒧᑦ). ᑕᒪᓐᓇ ᒥᒃᓴᒋᐊᖅᑕᐅᓂᕆᓚᐅᖅᑕᖕᒐᒃ ᓇᓐᓄᒍᓐᓇᖅᑕᖕᒋᑕ ᐱᔾᔪᑕᐅᓪᓗᓂ, ᐊᖑᓇᓱᒃᑏᑦ ᓄᓇᓕᖕᒥᐅᓪᓗ ᐃᓕᖅᑯᓯᑐᕐᑲᕐᒥᒃᑎᒍᑦ ᓇᓐᓄᒃᐸᓚᐅᕋᓗᐊᕐᒪᑕ (MC)–ᒥᑦ ᐊᓯᐅᔨᓯᒪᕖᑦ ᑮᓇᐅᔾᔭᒃᓴᐅᑎᒥᖕᓂᒃ ᐃᓕᖅᑯᓯᑐᕐᑲᕐᒥᖕᓂᓪᓗ. ᑖᕙᓂ ᐃᑦᑐᐊᖅᑑᒻᒥ (MC)–ᒥ ᓇᓄᐃᑦ ᐊᒥᓲᓂᖕᒋᑦ ᐱᐅᓯᕚᓪᓕᖅᓯᒪᕗᑦ, ᒫᓐᓇᓗ ᐊᖑᓇᓱᒃᑎᖕᒋᑦ ᖃᐅᔨᒪᔨᐅᔪᑦ ᐅᖃᖅᓯᒪᓕᕆᓪᓗᑎᒃ ᓇᓄᐃᑦ ᐊᒥᓲᓂᖅᓴᐅᓕᕐᓂᖕᒋᓐᓂᒃ ᑕᑯᔭᐅᕐᑲᑦᑕᖅᑐᑦ ᑕᐃᑲᓂ (MC)–ᒥ, ᑕᒪᓐᓇᓗ ᐊᑐᖅᑕᐅᓪᓗᓂ ᐊᒥᓱᕈᕆᐊᖅᑕᐅᓯᒪᓕᕆᕗᑦ ᓇᓐᓄᒃᑕᐅᔪᓐᓇᖅᑐᑦ ᐱᖕᒐᓱᓂᑦ ᐊᕐᕌᒍᑕᒫᑦ 12–ᓄᑦ ᓇᓄᕐᓄᑦ ᑖᕙᓂ 2015/16–ᒥ ᓇᓐᓄᓚᓱᖕᓇᐅᓂᐊᖅᑐᒥ.

ᒪᓕᒃᓗᑎᒃ ᐅᕐᑲᐅᓯᕆᔭᐅᓯᒪᔪᓂᒃ ᑖᕙᓂ 2005–ᒥ (MC) ᓇᓄᖕᒋᓐᓄᑦ ᑐᑭᓯᐅᒪᓂᕐᒧᑦ ᐊᖕᒋᕐᑲᑎᒌᒍᑎᒥ (MOU)–ᒥ, ᐱᔪᒪᔭᐅᓯᒪᓂᖕᒐᓄᑦ ᓄᓇᓕᖕᓂᑦ ᓇᓐᓄᕐᑕᒃᑲᓐᓂᕐᓂᖅ, ᓄᑖᖅ ᐱᖕᒐᓱᓄᑦ ᐊᕐᕌᒍᓄᑦ ᖃᐅᔨᓴᕐᑲᑦᑕᕐᓂᐅᓂᐊᖅᑐᖅ ᐊᑐᓕᖅᑎᑕᐅᓪᓗᓂ 2014–ᒥ ᑐᑭᓯᔾᔪᑕᐅᒃᑲᓐᓂᕐᓂᐊᖅᓘᓂ ᖃᓄᖅ ᐊᒥᓲᑎᒋᖕᒪᖕᒫᑕ ᓇᓄᐃᑦ (MC)–ᒥ. ᑖᒃᑯᐊᓗ ᐊᒥᓲᓂᖕᒋᑦ ᖃᓄᐃᑦᑑᓂᖕᒋᓪᓗ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᖅᓘᑎᒃ ᐅᑭᑦᑎᕙᐅᓂᒃᑯᑦ ᑎᑎᕋᖅᑕᐅᓃᑦ–ᐱᔭᐅᒃᑲᓐᓂᕐᓃᓪᓗ.

ᑖᒃᑯᐊ ᐊᑯᓐᓂᖕᒐᓂ ᐊᐃᕐᓇᓕ 19 ᐊᒻᒪ ᔪᓂ 7, 2016–ᒥ ᑲᑎᓪᓗᒋᑦ 95–ᖑᓚᐅᖅᑐᑦ ᓇᓄᐃᑦ 65–ᖑᓪᓗᑎᒃ ᑲᑎᙵᔪᕙᓃᑦ ᐊᔨᕖᖕᒋᑦᑐᓂᒃ ᐊᕐᕌᒍᕐᑲᖅᓘᑎᒃ ᑕᒪᕐᒥᒡᓗ ᐊᕐᓇᐃᑦ ᐊᖑᑎᓪᓗ ᑕᑯᔭᐅᓚᐅᖅᑐᑦ, ᑖᒃᑯᓇᙱᓪᓗ 86–ᖑᓪᓗᑎᒃ ᐅᑭᑦᑎᕙᐅᔪᑦ. ᓯᓚᑦᑎᐊᕙᐅᖕᒋᑦᑐᒧᑦ ᐊᑯᓂᐅᔾᔪᑎᕐᑲᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᕆᓇᓱᒃᑕᒥᖕᓂᒡᓗ ᐱᔪᓐᓇᕐᓯᓗᐊᓚᐅᖕᒋᓪᓗᑎᒃ ᑖᒃᑯᓈᙴᑦ, ᐱᔪᓐᓇᖅᓯᕐᑲᑦᑕᓗᐊᓚᐅᖕᒋᒻᒪᑕ ᑕᒪᒃᑭᖓᓐᓇᕋᓂᔾᔪᓗ ᑕᐅᕙᓐᓇ (MC)–ᒥ ᖃᐅᔨᓴᕐᓂᕆᔭᖕᒐᑦ. ᑭᓯᐊᓂᓕ ᐊᑐᖄᓐᓇᓚᐅᕐᒥᔭᕗᑦ ᑕᐅᕙᓐᓇ ᖃᐅᔨᓴᖅᓯᕚᕙᐅᓚᐅᖅᓯᒪᔪᖅ 2014–ᒥ ᐊᒻᒪ 2015–ᒥ; ᑭᓯᐊᓂᓕ, ᐊᕐᕌᒍᓂ ᖃᐅᔨᓴᕆᓐᓇᓚᐅᙱᓐᓂᖓᔭᕐᑎᓐᓂ ᑕᐅᕙᓂ ᐃᑦᑐᐊᖅᑐᕐᕙᖕᒥ (M’Clintock Channel)–ᒥ ᐊᔪᕐᓇᖕᒋᑦᑐᒃᑯᑦ ᐱᔾᔪᑎᕐᑲᖅᓗᑕ ᑎᑎᖅᑲᓂᒃ ᐊᔪᕈᑕᐅᓚᐅᖅᑐᓂᒃ. ᑕᐃᒪᐃᒃᑲᓗᐊᖅᑎᓪᓗᒍ, ᖃᐅᔨᓴᓚᐅᖅᐳᒍᑦ ᑲᑎᓪᓗᒋᑦ 14,200km–ᒥᒃ ᐅᖕᒐᓯᒃᓯᓂᖕᒥᒃ ᕿᓂᖅᓘᑕ ᓇᓄᕐᓂᒃ. ᐃᒪᓐᓇᑎᒋᐅᓚᐅᖅᓗᓂ ᖃᐅᔨᓴᖅᑕᕗᑦ ᐊᑕᐅᓯᖅ ᓇᓄᖅ ᐃᑲᕋᒧᑦ ᐊᑕᐅᓯᕐᒧᑦ. ᐃᓱᒪᒋᓇᒍ ᐊᖕᒋᓂᖕᒐ ᕿᓂᕙᒋᔭᕗᑦ ᑕᑯᓚᐅᖅᐳᒍᑦ ᐊᒥᓲᖕᒋᓐᓂᖅᓴᓂᒃ ᓇᓄᕐᓂᒃ ᐊᕐᕌᒎᓚᐅᖅᑐᓂ, ᐃᓚᐅᓪᓗᑎᒃ ᐃᕐᓂᐊᕆᔭᐅᕙᓪᓕᐊᔪᑦ. ᐃᕐᓂᐊᖑᕙᓪᓕᐊᕐᑲᑦᑕᖅᑐᑦ ᐊᕐᕌᓂᓕᓴᐃᓪᓗ ᐃᒪᓐᓇᑎᒋᐅᓚᐅᖅᐳᑦ 1.67 ± 0.33 (n = 3) ᐊᒻᒪ 1.57 ± 0.20 (n = 7). ᑕᐃᒪᓕ, ᑭᓯᐊᓂ ᖃᐅᔨᓴᖅᑕᐅᔾᔪᑎᖕᒋᑦ ᐱᔭᒃᓴᐅᓕᓚᐅᖕᒋᓐᓂᖕᒋᓐᓂ ᓇᓗᓇᑲᓚᐅᖅᐳᖅ ᖃᔅᓯᓪᓚᑎᐅᖕᒪᖕᒫᑕ ᐊᔨᕖᖕᒋᑦᑐᑦ ᓇᓄᐃᑦ ᑕᑯᔭᐅᓯᒪᓕᕐᒪᖕᒫᑕ. ᐸᕐᓇᒃᓯᒪᓕᖅᑐᑦ ᑎᒥᖕᒋᓐᓂᙳᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᕐᓗᑎᒃ ᓇᓗᓇᐃᖅᓯᔪᓐᓇᖅᓯᑯᓪᓗᒋᑦ ᖃᔅᓯᐅᖕᒪᖕᒫᑕ ᓇᓄᐃᑦ. ᐱᔪᒪᒻᒪᓇᒃᑲᓗᐊᖅᐳᒍᑦ ᐱᔭᒃᓴᐅᓕᕐᑯᓪᓗᑎᒍ ᒫᔾᔭ 2017–ᒥ.

SUMMARY INUINNAQTUN

NAITTUMIK

M'Clintock Tagiunga (MC) ikitut nannut amigaitpaknigiyait munagiyauyut hapkunanga Nunavunmiunin. Hivulliqmi naunaitkut-tiguqikniit naunaiyautit (1973-1978) itquqniaqhimayut amigainiit anginiit tamangnik MC uvalu Gulf of Boothia (GB) attautimukhimayut 1081 nannut, naunaiyaqhimaitumik hapkua pihimayut inmikuuqhugit.. Ilihimayauyuq itquqniagut amigaiqyuumiyuq hamunga 900 nannut attautimi. Kingungani nunamingni ilihimayut uqaqtait amigainiit ikitutut itut, amigainiit ikikliyuumiqhugit 700mun. Nutaaq amigainiq naunaiyaut piyauvaktuq qitqani 1998 uvalu 2000mi itquniaqhimayuq MCmi nannut amigainiit imaa 284 nannut. Kingungani anguniaqtut 34nik nanuqnik/ukiumi hamanga 1979min-1999mun Ihuaqhimalaitut, uvalu nutqaqtitauhimayut hamanga 2001/2002-2003/2004 atuqtauliqhuni, malikhugu ikikliyuumiqlugit attautimut anguniaqtaaqtait uvunga pingahut nannut ukiumi (2004/2005-2014/2015 . Ikikliyuumiqmata anguniagahat, anguniaqtut uvalu nunalaat ilitquhiit anguniaqtut hamanga MCmin tamaiyut maniliuqnikkut uvalu ilitquhiit idjuhiit. MC amigaiqniit munagiyauyut amigaigiangini, tadjaminlu nunamingni ilihimayut uqaqtut amigaitut nunnut tautuktauvaktut aalani nunani tamaini MCmi, pidjutauyuq amigaiyuumiblutik ukiumi MC TAH hamanga pingahunin hamunga tualunik nannuqnik haffumunga 2015/16 anguniagahat anguniaqnaghikpat.

Maliklugit akhuugutigiyait ataani uvani 2005 MCiip Nannuqtigut Naunaitkut Angiqatigiiknirmut (MOU), piyumayaitlu nunalaani ilauyut anguniagumayut amigavyaklugit nannut, nutaaq pingahuni ukiuni naunaiyaqniq piyauvaktuq uvani 2014mi tunihiyaangani nutaanik kangiqhidjutinik amigainiinik nannut uvani MCmi. Amigaitpangnigiyait anginiit uvalu qanuginiit naunaiyaqtauniaqtuq Kinguvagit titiqnit-tigutqikhaqnit.

Qitqani 19 Qitiqqautiyuq uvalu Imaruqtirvia 7, 2016 attatumiut 95 nannut 65ni katimayun aalakiit ukiungit qanuginiit uvalu tamangik angutit angnaluit tautuktauhimayut, hapkua 86 uuktuqtauhimayut piiqhiblutik uviniinik. Hilaqlukniqmik uvalu naunaigutihanik ayuqhautigivagain pihimayut hapkuninga, naunaiyaingitut tuyuqtaungitutlu tamaini MCiip naunaidjutighaanik. Qinihiahimayugut tahamani qinipaktaptingni naunaiyaqhimaniit nanuqnik pihimayut pitilugu 2014 uvalu 2015 ukiuni; kihimi tamaini ukiuni naunaiyaqhimayaqut hamna M'Clintock Channel nakuuyumik pihimablugit titiaqhimayut ayuqhautigivaktavut. . Taimaitkaluaqtilugu, piyaqqut ungahingnia 14,200 km qiniqhiatiluta nannuqnik. Naunaitkutaa uuktuqniq attauhiq nannuq ikangniqmi qinihianiq. Pihimablugu ungahitqiamik qiniqhianiq takuyugut ikitunik nannuqnik kingunganimin ukiuni, ilauyut nannuaqnunlu. Aktilaangit nannuat ukiuni uvalu angivyaktut imaa 1.67+0.33 (n=3 uvalu 1.57+0.20 (n=7), Taimaitqaluaqtilugu, pikpata aulaniit naunaiyautainik piinagialiqata ayungnaqtuq qaffiuniit aalakiit attautit nannut takuyauhimayut. Upalungaiyaliqtut piyaangini tamaita aulaniit uuktuutit naunaiyautit amigainiit naunaigiangini. Nigiutugut kinguliqmik naunaiyautinik piinagialaqiniaqut Qiqaiyalirviani 2017mi.

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INTRODUCTION

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, Taloyoak and Cambridge Bay with a Total Allowable Harvest (TAH) of 12 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 and recoveries of tagged bears, movements of satellite radio-collared adult female bears in adjacent areas (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 reduced TAH of 3 bears until 2015/2016. 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. This also resulted in an increase in a new TAH from 3 to 12 bears for the 2015/16 harvest season. 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 remains at risk.

In accordance with commitments under the 2005 Polar Bear Memorandum of Understanding (MOU) for MC and in response to concerns regarding subpopulation status, harvest opportunities and the temporary loss of traditional and cultural opportunities, we propose to undertake a 3-year study (2014-2016) involving genetic mark-recapture to reassess the size and status of the MC polar bear subpopulation.

OBJECTIVES OF STUDY

This was tentatively the last field season of a 3-year project. The project objectives are to:

1) Design and implement a comprehensive survey using genetic biopsy sampling to reliably estimate the abundance of polar bears in MC during the spring (e.g., April – June) of 2014 - 2016.

2) Estimate the current population size and composition of the MC polar bear subpopulation.

3) Compare a new estimate of abundance with the one derived during a past study in-order to gain insight into population trend and status in MC.

4) Estimate survival and reproductive parameters (to the extent possible) in-order to facilitate population viability analyses.

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

6) Enhance public participation and provide HTO-designated personnel with training in survey methods when logistically possible.

7) Provide base-line data for environmental or other assessments when needed for the North-West Passage area

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 (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 et al. 2016). 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. Currently, Cambridge Bay, Taloyoak and Gjoa Haven harvest from MC, with an annual TAH of 4 bears/community.

FIELD WORK SAMPLING / METHODOLOGY

Genetic Mark-Recapture

The basic study design is similar to that of the previous physical mark-recapture study conducted in MC (Taylor et al. 2006) - but does not involve the immobilization and handling of bears. Instead, DNA extracted from a small sample of skin and hair collected via a biopsy dart is being used to identify each bear; effectively genetically ‘marking’ each individual (and permitting future identification) without the need for ear-tagging or lip-tattooing. The ‘recapture’ event occurs when either the bear is biopsy darted on a later occasion or when a genetic sample is recovered from a polar bear harvested in Nunavut.

Biopsy darting activities were carried-out on the sea ice and coastal areas of MC, Victoria Strait, Franklin Strait, James Ross and Rae Strait, and Queen Maud Gulf in late April to mid-June. A helicopter (Bell 206 LR) was used to search for bears. Using data from previous mark-recapture and biopsy studies, combined with information on sea-ice conditions at the time of biopsy sampling and last year's field work experience, search effort was distributed in a manner designed to reduce potential sampling bias resulting from differences in space and habitat use amongst various age, sex and reproductive classes of bears. In particular, we used our sampling approach from the 2014 field season where we flew transect lines across the sea ice and islands that are spaced at either 7-10 km (high and medium density areas) and 10-15 km (low densities).

Once a bear was located, a small sample of tissue (<5 mm diameter), mostly skin, was taken using a biopsy dart (Pneu-Dart Inc., DNA dart). The darts are designed to fall to the ground after impact and can be retrieved without handling a bear (Pagano et al. 2014). The effectiveness of these darts for sampling polar bears has been previously demonstrated (see NWRT Interim Reports # 2-15-05, 2-14-09, 2-12-01). The darts are quick and easy to use and require less pursuit time of bears than during capture operations. The small size and design of the dart means that risk of injury to a bear is minimal. Typically, bears show no or very little response to the impact of the dart and are left with no visible mark. 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. We will also make use of the past study's collected tissue samples (1998-2000) to obtain data on survival rates, to extent possible.

Each biopsy dart was then stored in a pre-labeled envelope with a unique sample ID. The samples were processed each evening to separate the skin from the fat portion of the sample. The skin sample was stored in a paper coin envelope, air-dried for a minimum of 24 hours in a warm and dry location and stored for subsequent DNA analysis. The fat portion of the sample was placed in a 2 cc Cryotube® and kept frozen for subsequent fatty acid, contaminant, or other analysis. DNA samples will be analyzed by Wildlife Genetics International (WGI) Inc. (Nelson, British Columbia, Canada). WGI will amplify DNA extracts at 20 microsatellite loci and the ZFX/ZFY sex identification marker (Aasen and Medrano 1990) using methods and primers as described by Paetkau (2003) and Kendall et al. (2009). DNA extracted from biopsy and harvest tissue samples will be analyzed in-order to assign each bear sampled (and re-sampled) during the study a unique genetic identity and determine its sex.

For each bear sampled, GPS coordinates and information on location, behavior, body condition ranked between 1 to 5 (Stirling et al. 2008), estimated age/sex (when possible) and group/litter size was recorded (see Appendix 1).

FIELD ACTIVITIES/ ACCOMPLISHMENTS

A Bell 206L helicopter was used to search for and biopsy-dart polar bears across the study area. We began work out of Cape Sidney on 19 April 2016 and moved camp to Fort Ross on 3 June 2016.

In total, 95 polar bears of various age classes and both sexes in 65 groups were encountered. We biopsy-sampled 86 bears of which 82 (or 95.3%) produced adequate biopsy samples (Table 1). Cubs-of-the-year (COYs), which made up only 5.3% of the encountered bears during 2016 (Table 2), were not biopsied because we considered this to be an unsafe practice based on the risk of separation from their mother or of possible inflicted injuries due to their small size at this time of the year.

To reduce potential bias in sampling resulting from non-random distribution of bears within the study area, a semi-systematic search pattern in the form of transect lines was implemented in 2014. This approach was also fruitful because bears rarely left tracks on the hard snow cover for long distances so that tracking them became impractical. Areas that indicated a relatively high and medium bear density (based on experience and bear encounters and signs of bears) were searched with transect lines spaced between 7-10 km apart, whereas low bear density areas were searched at distances of about 10-12km. The 2016 field season start was again delayed, and sea ice conditions were later as compared to the previous 2 field seasons. This meant that no or very few small open leads or cracks were present in the ice where bears could be easily detected. In general, most of the sea ice was still covered by a layer of snow ranging subjectively between 10-30cm in thickness, and no melting had yet occurred. Our average transect distance was 9.1 ± 2.3 km (SD), which ranged between 4.2 and 15.2 km. During 2015, the transect lines were on average 12.2 km apart (range: 8-16 km).

As in previous years, we were not able to search the entire MC study area – something that may cause the final population estimate likely to be biased. The area not covered includes the M'Clintock Channel proper (Figures 1, 2, 3); it is uncertain at present what proportion of the MC bears use this area during spring. We did, however, fly a reconnaissance transect by Twin Otter across MC proper before we left for Cape Sidney Camp (Figure 2), as to examine whether the area is utilized by polar bears at this time, and to which degree. We also were not able to search the Jenny Lind area with the same rigor as we did in previous years due to being stuck at Cape Sidney for such a long time, and the progression of the season which meant potentially we were not able to complete as much of the study area as was previously possible - we had to make a judgment call regarding the trade-off and the timing for the relocation of research camps.

Because biopsy darting leaves no visible marks, the sample of possible 86 biopsied bears may include individuals that were sampled more than once during the 2016 field season. However, the number of duplicate samples is expected to be low and can be determined once genetic analyses are completed. Several measures were taken to avoid repeated biopsy of individual bears. Daily searches were limited to the extent possible to areas not previously searched. In situations where multiple bears were encountered at the same location duplication of sampling was avoided by distinguishing individuals based on size, sex or visible marks (e.g. scars, stains on fur etc.). However, since we had at times

several days of continuous terrible weather, it is likely that some bears moved out of the already searched areas into un-searched adjacent areas. Duplicate 2016 mark-recaptures will be genetically determined and adjusted for and will not confound the overall population estimate.

Since the bears were not being chemically immobilized they could be safely darted in all locations. Bears showed little or no reaction to the impact of a dart and no visible marks were left following darting in almost all cases. Immediately after being darted, each bear was allowed to safely move away from the helicopter before the dart was retrieved. Darts had fluorescent flagging tape attached to them to aid retrieval. This tape unrolled during flight and allowed darts to be located when they sank into the snow. Following retrieval each sample was divided into two parts for storage and labelled with a unique biopsy number assigned to each bear that could be used as a cross reference to other data on date, time, location of biopsy, body condition, estimated sex and age and associated confidence assignment, habitat, group size and activity (see Appendix 1).

PERSON DAYS

The project lasted from 1 April to 8 June 2016 (138 person days), with field work being conducted between 19 April – 7 June (98 person days). There were logistical issues that kept us at PCSP Resolute from 1 – 18 April (e.g., PCSP helicopter contract negotiations and awarding, negative weather).

AIRCRAFT HOURS

We flew a total of approximately 102 hrs during our field study, of which 7.8% (or about 8 hrs) was ferry time, excluding flying to reposition camps. Total search time for bears was 94 hrs. Search times per day averaged 5.8 hrs (including days with and without bears being sighted and sampled). We had a total of 16 days where we searched for bears compared to 18 days and 14 days in 2014 and 2015, respectively.

FIELD DATES

Biopsy sampling for the M'Clintock Channel (MC) polar bear study took place between 19 April and 7 June 2016. During this time frame, MC was completely snow and ice-covered and we assumed therefore that the majority of bears are distributed across the study area. The initial start date was set for 5 April, but federal government procedures related to PCSP and poor weather conditions delayed helicopter positioning and did not allow us to start field operations before the 19th of April.

FIELDWORK LOCATIONS

Fieldwork was conducted across the sea ice and smaller islands within the MC study area (Figure 1). In particular, we searched the areas in and around Gateshead Island, Albert Edward Bay, Admiralty Island, some portions of the east-side of Victoria Island in M'Clintock Channel proper, Franklin Strait, Victoria Strait, James Ross Strait and Larson Sound. Field bases for this work were Cape Sidney on King William Island, and Fort Ross

on Somerset Island. We omitted Cambridge Bay this year because of the terrible weather delays we encountered in previous years.

Additional Note:
A larger proportion of M'Clintock Channel proper [Fig. 1 and 3b)] was not surveyed in any of the 3 field seasons because of poor weather conditions that prevented safe access to this area.

PRELIMINARY RESULTS & DISCUSSION

Mark-Recapture Sampling

In 2016, the start-date and location to begin sampling was set to 6 April from Cape Sidney on King William Island. However, logistical delays through PCSP followed by poor weather did not allow deployment of the helicopter to the study area until 19 April, which somewhat compromised the remainder of field season activities. This delay and the resulting logistical constraints prevented us from surveying completely (or at least attempt to) the study area again (Figures 1 - 3). For example, the weather window between 6 and 19 April where we did not have access to a helicopter may have been sufficient to survey M'Clintock Channel proper although we will not know for certain. In total, we spent 46 days at Cape Sidney and 6 at Fort Ross. Because of the progression of the season, the bad weather and what still needed to be surveyed, our camp was relocated to Fort Ross on 3 June 2016 on a short-notice decision. As a result, we could not survey the areas around Jenny Lind and Royal Geographical Society Islands as detailed as during the past 2 field seasons. However, we also believe that these areas had low bear density at that time, as was the case during 2014 and 2015 (see Figures 2 and 3).

Other areas to the south-east and south-west of King William Island were only sparsely searched because local knowledge indicated that bears are generally rare in those areas and at that time, except Chantry Inlet (Figure 2). During the 2015 field operations hunters from Gjoa Haven mentioned that bears frequent Chantry Inlet and that we should examine the area.

Genetic mark-recapture sampling took place from 19 April to 7 June 2016 with a total of 16 sampling days. During this period, approximately 14,200 km (mean ± SE km/day: 887.3 ± 87.9 km; range: 171 – 1403 km) were flown while searching for polar bears on sea-ice habitat and islands across the MC study area (Figures 1, 2 and 3). When we examine 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).

In total, 95 polar bears of various age classes and both sexes in 65 groups (group size from 1 – 5) were encountered (NB: that is before genetic verifications; Figure 2, Table 1). Of these, 86 bears were biopsied including some individuals of 11 family groups (1 female with 1 COY, 2 females with 2 COYs, 3 females with 1 yearling, 4 females with 2 yearlings, 1 female with 2 2-yr-olds; Table 1). About 9.5% 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. One was an adult female with 2 yearlings that was

very skiddish and we did not want to risk exhaustion after prolonged darting efforts; and another yearling of a family group that we could not dart. There were fewer family groups encountered this field season as compared to the previous 2 sampling periods (Table 2).

Only 4, or 4.2%, of all encountered bears were observed with a seal kill. The 2016 spring season was late and very few seals were encountered (subjectively). We also noticed that most bears did not defecate when they were approached by a helicopter, which most usually do – a sign that many bears likely had not eaten much or recently. 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 this.

Without having covered the entire study area throughout the study period, the abundance estimate obtained from our data will be more reflective of the area sampled rather than the entire study area, and may therefore be somewhat biased low. In addition, up to this point and without any 2016 genetic verification and analyses, only few marks from the previous and the current study were recovered thus far which will also create a bias (e.g., overestimates the population) (Table 3). For example, out of 106 possible genetic marks identified in the study area in 2014, only 13, or 12%, were recaptured during the 2015 sampling period for this multiple year M/R population assessment. This could mean that the population is either very large, that marked bears were not available to recapture due to sampling bias (e.g., insufficient or biased sampling effort) or temporary/permanent emigration. However, this is speculative and must await the analyses of all genetic samples and the complete data set.

In order to examine possibilities of why there are so few recoveries up to this point, and whether some temporary emigration to neighboring sub-units occurs, the genetic scope of samples was broadened. Traditional knowledge has suggested for years that the GB and MC subpopulations are one rather than 2 distinct units. Genetic analyses and tag returns of previously marked bears have not supported this view at least until the early 2000s (Campagna et al. 2013; Malenfant et al. 2016; Government of Nunavut unpublished data). In order to be inclusive and to investigate whether new information has come to light, we included old capture (1998-2000) and current (2015-16) biopsy samples from GB and available capture samples from Lancaster Sound (LS; 1993-1997). Additionally, harvest samples from neighboring subpopulations are also examined for recovered marks (e.g., from GB, Foxe Basin, LS, and Viscount Melville Sound). We anticipate that all these genetics results will be available for error checking by September 2016, which will then facilitate exploration of population models. Depending on how modeling efforts progress (e.g., emigration or survival rates that cannot be explained), and whether there are sufficient recaptures to obtain meaningful results, we may have to invest into a 4th field season. If data suggest that temporal emigration into GB or LS is likely, then it would be advisable to deploy collars on a few selected individuals. The GN worked with the affected communities and the Regional Wildlife Organization through consultations and meetings in order to gain support for a small collaring program complementary to the genetic M/R study, both before and during the study, but unfortunately none of the communities backed these efforts.

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 75% of the 2016 collected sample consisted of adult bears (NB: based on field observations without genetic confirmation). Moreover, male proportion among all adults for the 1998-2000 study was approximately 0.21, which rose to 0.60 for the 2014-16 collective adult sample. After hunters raised concerns about not encountering many males while traveling on the ice, the harvest for MC was reduced from 34 bears in 1999 to only 3 bears between 2004 and 2015. This ultimately lowered the hunting pressure and harvest mortality of bears in the MC subpopulation.

During this field season we encountered few family groups with COYs but several mothers with twin yearlings, indicating cub survival from year 0 to year 1. The average (± SE) COY and yearling litter sizes were 1.67 ± 0.33 (n = 3) and 1.57 ± 0.20 (n = 7), respectively (NB: This is before genetic verification of individuals). It is difficult to say whether we missed family groups during sampling, or if the population exhibited relatively high cub mortality via infanticide due to the higher male proportion in the population (Dyck and Daley 2001; Taylor et al. 1985). Despite terrible weather, we were able to cover large areas adjacent to each other from Cape Sidney to Albert Edward Bay to north of Cape Michelsen and east to Cape Swineburne and across Franklin Strait to the Boothia Peninsula (Figures 1 - 3). Also some bears that initially were near Ballot Strait may have moved south through Larsen Sound and through to M'Clintock Channel proper during several days of bad weather where we were unable to continue our searches. This could explain why we encountered fewer family groups, and a few less bears in general between Paisley Bay and Fort Ross as compared to last year. Moreover, the fact that this year's spring was later by about 2 weeks as compared to last year with no open leads to access seals could also explain why fewer bears were encountered in this area.

The Twin Otter reconnaissance flight across M'Clintock Channel proper on 10 April 2016 allowed us to conclude that there were likely very few bears in that area during that time. Short-distance tracks of bears in snow were very rare while we only observed one bear during the flight.

Throughout the field season, we encountered 5 mating pairs, where at times 1 male would sequester 1-2 females. The timing of these observations is in synchrony with local and scientific knowledge that mating occurs between April – May (Ramsay and Stirling 1986). Most males in these groups showed signs of battles such as scars and fresh blood stains on neck, face and rump.

In general, 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). However, during the 2016 field season we subjectively noted a trend that bears were more often encountered towards the east (e.g., towards Boothia Peninsula and Larsen Sound) as compared to the previous 2 field seasons despite the lack of seals and open leads.

On days when bears were encountered (n = 14), an average of 7 bears/day (range: 1-16) was sampled. The mean efficiency of our sampling effort was about 1 bear/hr (range: 0.2 – 3.3 bears/hr) which was very low compared to previous years (1.9 and 1.68 bears/hr

during 2014 and 2015, respectively). Observed group sizes varied between 1 and 5 bears (mean group size: 2.0); most groups were family groups (see above text for details). Other groups included 5 male-female pairs, and one 5-male bear group.

Body Condition

During 2016 body condition scores [BCS] on a scale of 1 to 5 (leanest to most obese; Stirling et al. 2008) ranged from 2 to 4, similar to the previous field observations (Figure 4 and 5). Overall, 80% of the sampled bears had a condition score of 3 or better. For most of the age and sex groupings body condition was slightly poorer as compared to previous field scores. However, this should not be surprising given the time of year and the very late onset of spring and prime seal hunting season. In addition, our field study occurred during mating season, a time when particularly adult males lose body mass due to searching for females and competitive fights (Cherry et al. 2013).

Genetic Analyses

Currently field samples, some harvest samples, and old capture samples from GB, MC, LS, VM are being analysed. There are several harvest samples that still have to be processed in our lab (e.g., the samples have to be found, archived and prepared) before we can submit these to the genetics lab – this will create a small delay but likely 95% of all needed samples will be completed by the end of September 2016. DNA extracted from all tissue samples will be genotyped to identify individuals and confirm genetic sex.

Seal observations

We did not record seal observations during the 2016 field season because there were so few seals, and logistical difficulties during the field operations.

COMMUNITY INVOLVEMENT

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 did not work out of Cambridge Bay this field season which eliminated the opportunity for field participation. We contacted both Spence Bay HTA and Gjoa Haven HTA and were only able to receive information from the Spence Bay HTA about potential candidates to participate. Several individuals assisted in the 2016 Gulf of Boothia study out of Fort Ross, and our plan initially was to have others participate in MC as well out of Fort Ross. However, 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 46 days and had to use a small opening in the weather to relocate at short notice.

OTHER INVOLVEMENT

We had a member from the WWF – Global Arctic Program participate in our field activities for 7 days out of Cape Sidney (19 – 26 April, 2016). WWF is a sponsor of this project and as such wanted to see what it entails to get the polar bear genetics study done in MC. Rod Downie from WWF had an opportunity to experience the harsh and hostile environment first hand but also understand the challenges that a project like this brings with it.

OTHER INCIDENTAL ICE OBSERVATIONS

We observed a young male brown bear or a polar/brown bear hybrid near Cape Michelsen on the sea ice. We also had a female muskox visiting Cape Sidney camp for several days. Overall, we encountered approximately 200-250 muskoxen on ferry flights across King William Island, in groups between 25-50 individuals.

PLANS FOR NEXT SEASON

Abundance estimate

Having not covered the entire study area during several sampling sessions will create issues in estimating the abundance of bears within MC. We will explore and consult with some modeling experts on what possibilities exist to still obtain appropriate abundance results, and whether they come with assumptions and caveats. Options that will be explored include mark-recapture and spatially explicit capture-recapture analysis.

Biopsy Sampling in 2017

Throughout this project we were not able to survey the entire population area which will limit the statistical analyses and results. Moreover, we are currently plagued by obtaining only very few recoveries from either the old mark-recapture study and/or the 2014-15 marks which will not only impact vital rates estimates but also population estimates. We anticipate that we will have a rough population model established before 30 December 2016 in order to assess whether another field season is needed or the current data are sufficient.

Acknowledgements

The 2016 field season was logistically and financially supported by the Government of Nunavut, Nunavut Wildlife Management Board, World Wildlife Fund - Arctic Program, The Polar Continental Shelf Project, and Environment Canada. Additional excellent field support was provided by our pilots J. Barry and G. Hartery who kept us safe and persevered with a great sense of humour throughout these challenging weeks. Field assistance was provided by M. Harte and R. Downie.

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Table 1. Overview of polar bears sampled during the 2016 field season in M'Clintock Channel

Sex/Age Group	Biopsied			Total
	yes	no	maybe*	
Adult female	28	1	1	**30**
Subadult female	2			**2**
Adult male	40	0	2	**42**
Subadult male	2		1	**3**
Cubs-of-the-year		5		**5**
Yearlings	8	3		**11**
2-year old	2			**2**
Total	**82**	**9**	**4**	**95**

* "maybe" means that there was not sufficient tissue in the dart, but the barb needle and cutter piece will be examined for DNA residue that may be adequate for genetic gender and individual identification

Table 2. Polar bear litter sizes (SE) 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 (2016)	1.66 (0.33)	1.57 (0.20)	0.05	0.11	GN (unpublished data)
M'Clintock Channel (2015)	1.7 (0.15)	1.4 (0.24)	0.11	0.05	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)

Table 3. Overview of recovered samples from the original and recent MC studies.

	Biopsy attempts	Viable samples for Analyses	Newly identified individuals	Repeat biopsy in same year[b)]	Recaptures from 1998-2000 study	2014	2015
2014	132	129	106	18[c)] (13.9%)	7(5 MC; 2 GB)	-	
2015	98	92	76	3[c)] (3.3%)	3 (1MC, 2GB)	13	

[b)]Repeat sampling of same bear (percentage based on all biopsy samples for that year)
[c)] 16 x 2; 1 x 3; 1 x 4

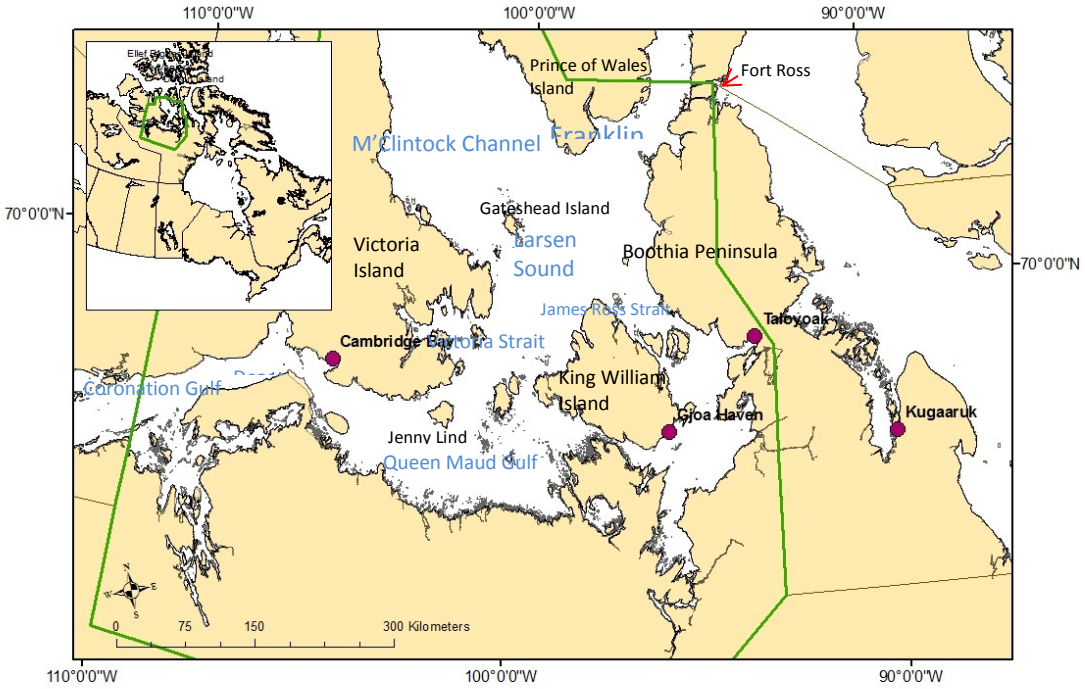

Figure 1. Map of the M'Clintock Channel polar bear subpopulation boundary, geographical and maritime features as well as locations of communities within.

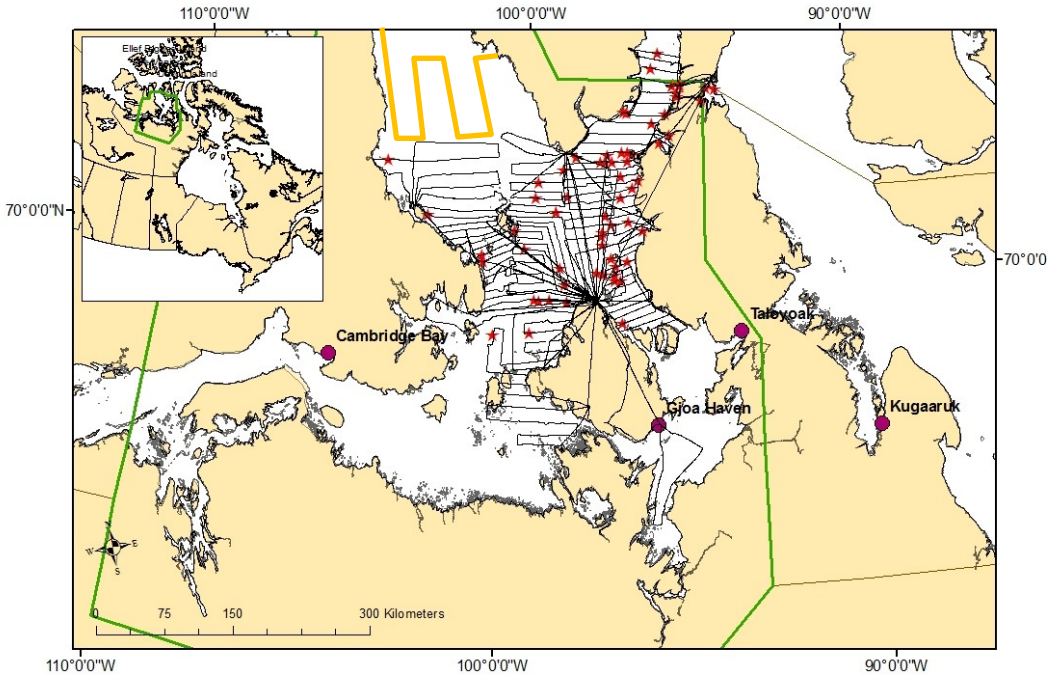

Figure 2. Location of polar bear encounters during the 2016 field season in M'Clintock Channel. The black lines mark the search paths. The golden line represents the Twin Otter reconnaissance path in M'Clintock Channel proper.

a)

b)

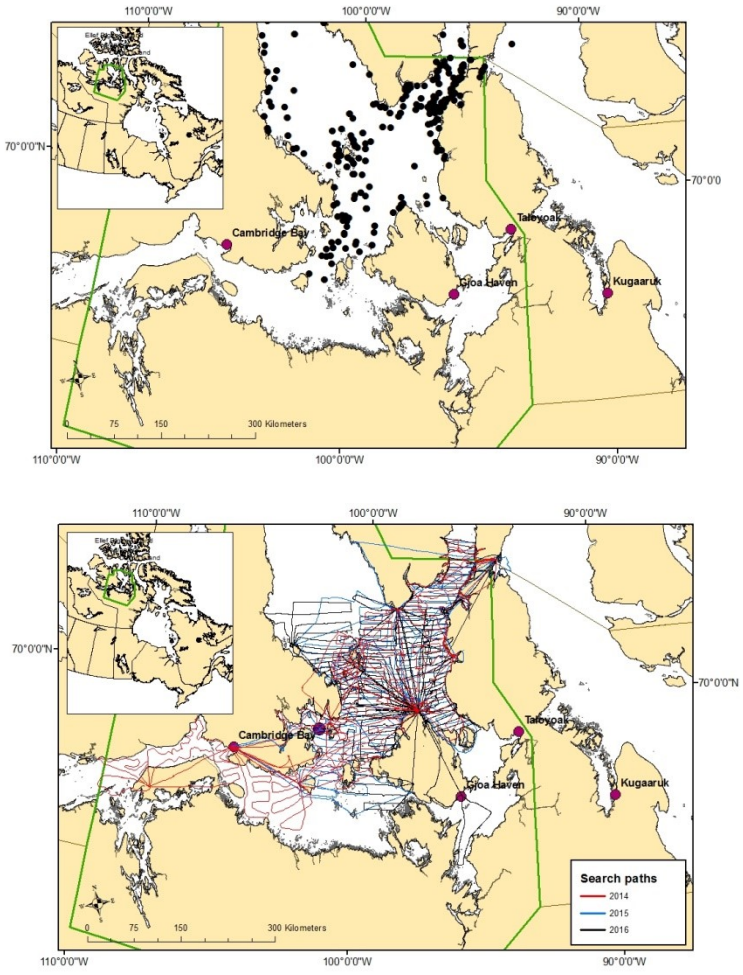

Figure 3. Polar bear capture locations during the past subpopulation study in M'Clintock Channel (1998-2000) [a], and all flight paths during the study period 2014-16 [b].

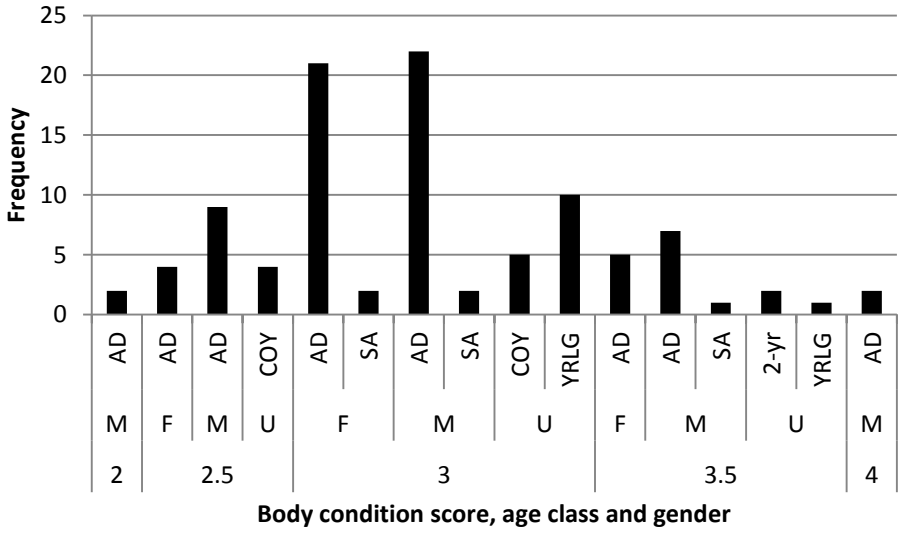

Figure 4. Overview of the frequency distribution of body condition scores for the M'Clintock Channel polar bears broken down by gender and age class for the 2016 field samples (Note that this is not based on genetic verification yet) [F=female; M=male; U=Unknown; AD=adult; SA=subadult; COY=cub-of-the-year; YRLG=yearling; 2-yr=2-year-old].

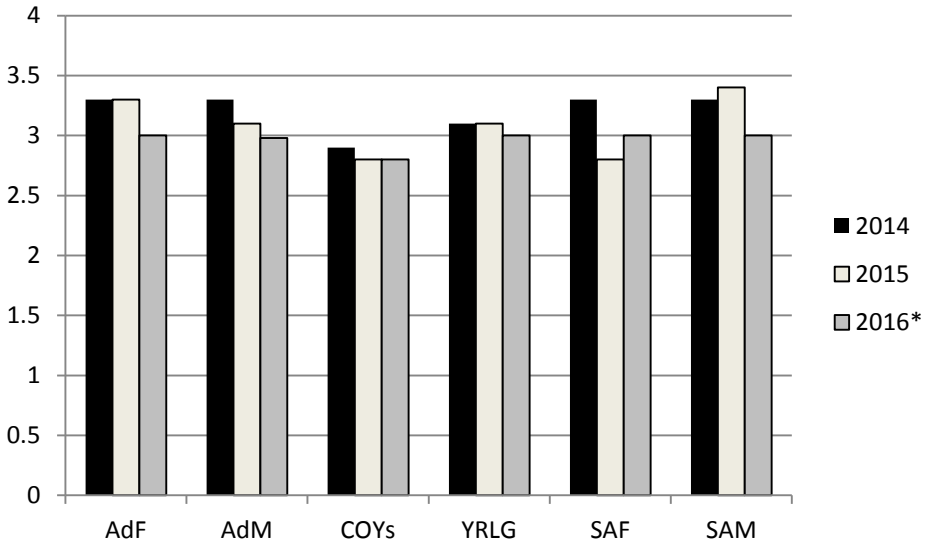

Figure 5. Summary of body condition scores (BCS) for polar bears encountered encountered during sampling in M'Clintock Channel (Nunavut) 2014-2016. Age and sex was estimated by distance examination, and 2016 data was not genetically verified yet [F=female; M=male; U=unknown; AD=adult; SA=subadult; COY=cub-of-the-year; YRLG=yearling; 2-year=2-year-old

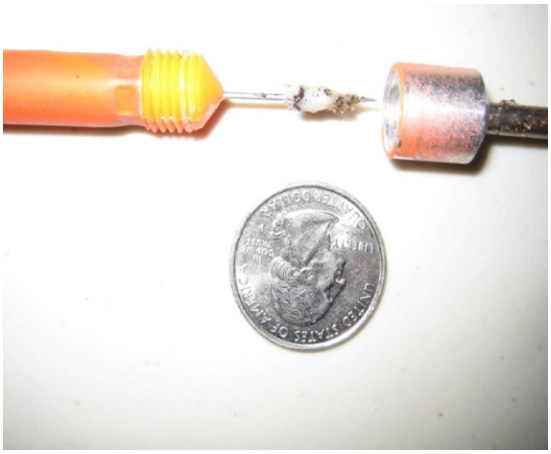

Plate 1. Small skin sample extracted during the DNA biopsy process.

a)

b)

c)

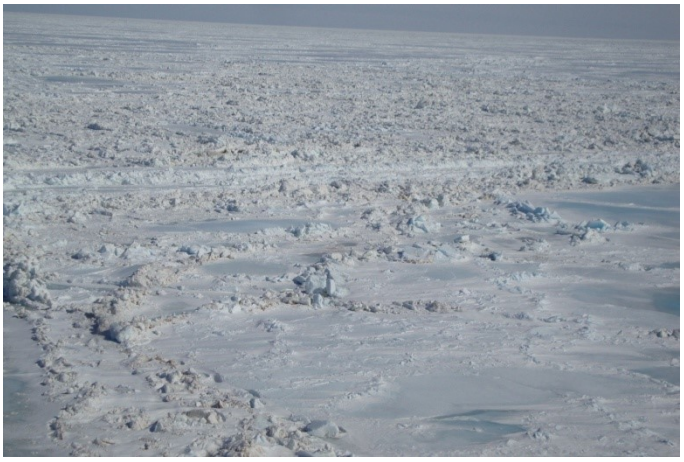

Plate 2. Various ice types encountered in M'Clintock Channel during the 2014 - 2016 spring field work: a) flat (with very few ridges; circle shows a bear on the ice); b) intermediate ice relief with more and higher pressure ridges; and c) rough ice – mixture of multi-annual and annual ice pushed and crushed together, large ice chunks. (Altitude: ~350 - 400 feet).

Appendix 1 – data recording sheet for MC polar bear study 2016

Date:_____2016 Region/Location_____ Page:____ of ____ Project Lead:

Daily Record Number	Time bear(s) seen	Start pursuit	Time darted	Biopsy (Y/N)	Biopsy Label	Way-Point	Age Class	Conf AC	Sex	Conf Sex	BCI	# in Grp	Topo (sea-ice).	Structure	General habitat Description	Visibility/ Weather	Poop (Y/N)	Feed Y/N	Comment*

Way Pt Locn: Record a waypoint where bear was first spotted
Age class: AD, SA, COY, YRL, IND
Sex: M, F, U (Unknown)
Confidence (subscript noted with Age and Sex): a – positive; b – probable
Body condition (1-5): 1 (poor); 3 (average); 5 (fat)
Feeding – is bear on a seal kill when spotted
Poop – shit collected from this bear? – put label with same ID in shit bag
Comment – if AClass or Sex is conf.=b, then explain alternative possibility
Start pursuit – when heli starts to follow bear to be darted

Topography (sea-ice): flat -1; mostly flat with few pressure ridges – 2; multiyear ice chunks and lots of pressure ice-3

Habitat structure: within 30 m radius obstructing visibility, such as rocks, snow fields, ridges; Low -1; moderate -2; high -3

General habitat: along lead? Flat ice? On pressure ridge? Open water?

Visibility: 1 – excellent; 2 – reduced; 3 – poor (note also specific weather conditions like fog, very cloudy, rain, snow, clear, etc.)

Entered into data base:

Date:_____

By:_____

Need L-#s

More comments: