Viscount Melville polar bear population assessment – Final Report 2014

Sound wildlife management is dependent on current information concerning distribution, abundance, demographic parameters, and knowledge of the spatial and temporal dynamics of populations. It cannot be assumed that demographic parameters are constant over time because they change with changing habitat and environmental conditions (1,2,3,4,5).

The Viscount Melville region previously consisted of stable landfast ice from November through July(6) that was predominantly multiyear ice with annual ice common in bays and inlets(7). Heavy multiyear sea ice, as was present in the deeper waters of Viscount Melville Sound, is poor habitat for seals (8), and accordingly yields lower densities of polar bears (*Ursus maritimus*). Previous research in the Viscount Melville sound noted seals and polar bears concentrated near the coast where cracks, active annual ice, and mixed annual/multiyear ice was found(8,9). Previously it was suggested that at no time would polar bears be forced ashore as a result of no ice in the region(7). Satellite collar locations from tracked individuals confirm this. In recent years the sea ice in the Viscount Melville region has dramatically changed. A MODIS image from late August 2010 indicates the region is ice free in late summer (attached figure)(10). The impact of this drastic change in habitat and environmental conditions on polar bears population parameters and movement patterns has yet to be investigated.

Polar bears primary food source is ringed seals (*Pusa hispida*), and to a lesser extent bearded seals (*Erignathus barbatus*)(11,12). Polar bear experts suggest that as sea ice dynamics change from a less consolidated system to have more open water, conditions may become more favourable for bearded seals(2). The impact of such a change in seal distribution and abundance and its subsequent affect on polar bears is unclear. Furthermore, it has been predicted that initial effects of a warmer climate in the northern interisland channels might benefit polar bears as a consequence of an increase in the proportion of annual sea ice which would create widespread shore leads and polynyas commonly used by subadult ringed seals during the winter(2).

Previous research documented low polar bear densities in the northeastern portion of the North Beaufort(13), and the region north of Melville was thought to have few polar bears due to the persistence of multiyear sea ice. The most recent population estimate for the Viscount Melville polar bears comes from a population viability analysis completed in 1999, which was derived from mark-recapture research conducted between 1972-1974 and 1989-1992(14). This population estimate of 215 bears was used allocate the current quota for subsistence harvest (7 bears annually). Prior to the 1989-1992 mark-recapture survey, average annual harvest was 16.1 (1980-1989) polar bears; following the survey, a 5 year moratorium on harvest occurred which ending in 2000 (ENR unpublished). It is unclear if the current total allowable harvest of 7 is accurate for this subpopulation that may presently be recovering or recovered.

The subpopulation boundary currently recognized to represent the Viscount Melville subpopulation was identified when multiyear sea ice persisted in the region. Since this is no longer the case the current subpopulation perimeters need to be delineated. Given the enormous change in sea ice, changes in the distribution of bears in this region may be equally as remarkable.

The objective of the proposed research is to 1)define the currently boundaries of the Viscount Melville polar bear subpopulation, and to 2)conduct mark-recapture and DNA mark-recapture research to estimate the current population size and population parameters.

Methods

Study Area- The Viscount Melville polar bear subpopulation occupies the region north of Banks Island and Victoria Island, in the Viscount-Melville Sound and eastern portion of M'Clure Strait. The western portion of this region is in the Inuvialuit Settlement Region (NWT), and the eastern part is in Nunavut. Field operations will be conducted from three cabins in the study region located at Polar Bear Cabin Banks Island, Polar bear Cabin Cape Providence (Melville Island), and Polar Bear Cabin Wynniatt Bay (northern Victoria Island); other camps\caches may be set up at Mould Bay (Prince Patrick Island) and Nias Point (Melville).

Overview- During 2010/2011 we conducted community consultations in both Ulukhaktok and Cambridge Bay, repaired the Wynniatt Bay cabin, and purchased Argos GPS satellite linked collars. Fuel was purchased and cached at base locations in 2011/2012. Field work occurred in spring 2012,2013 and 2014 and involved a mark-capture inventory of all bears encountered and deployment of 25 argos satellite-linked GPS collars throughout the study area on adult female polar bears. In 2012, an additional 5 collars were deployed on adult female polar bears north of Norway Island (and 10 south of Ulukhaktok by a different crew) in the Northern Beaufort Sea in a related project. When possible, collared adult females were re-sighted to confirm reproductive class.

Collaring and mark-recapture- Polar bears were immobilized with Telazol and marked following standard procedures (15). Captures were opportunistic in a systematic, geographically uniform search of the study region. Adult female polar bears were fit with Argos satellite-linked GPS collars in a uniform distribution across the study region. Each bear captured was marked with a unique identifying number tattooed into the upper and lower inside lips, and attached on an ear tag (dropped after year1). If the bear not been previously captured, a vestigial premolar was extracted and will be used for ageing (16). Samples of DNA, claw, hair, fat, and tissue were also collected.

DNA mark-recapture- DNA mark recapture was used when the situation prevented traditional M\R or the bear had already been captured that year. Collared bears will be relocated when possible to confirm reproductive class; all bears will be classified by age groups. DNA biopsy darting may be implemented to obtain a sample for genetic identification. Bears will be opportunistically darted with a DNA biopsy dart. After hitting the animal, the dart will drop and can be retrieved. DNA samples will be sent for analysis to identify animals to sex and individual. DNA biopsy darting was initially developed on free ranging cetaceans (17,18,19) but has also been used on grizzly bears (Ursus arctos horribillis) (M. Branigan and A.E. Derocher, upubl data).

DNA collection through hair snag stations - Using non-invasive bait lure sites to collect hair samples for DNA analysis to be used for estimating animal abundance is a well established technique for grizzly bears (20,21), and preliminary results suggest this approach may be successfully adapted to be applied on polar bears (Peter de Groot, pers. Com.). Community members from Ulukhaktok and Cambridge Bay traveled through areas of the study region accessible by snowmobile (primarily Wynniatt Bay and Hadley Bay) and erect traps on the sea ice parallel to the coastline approximately and spaced roughly 10-15 km apart. Each station will consist of a post with bait, and enclosed by barbed wire fence. Stations were to be checked after 8 days; all hair will be removed with the contents of a single barb placed in a labeled vile. Stations will be moved, rebaited, and revisited again. The stations will be dismantled at the completion of field work. Samples will be sent for analysis to identify animals to sex and individual.

Analysis - Locations from collared individuals will be examined using cluster analysis to delineate the current subpopulation boundary. Population parameters will be estimated by joint modeling of tag-recovery and live-resighting data using multistate models(22). Furthermore, samples collected during traditional mark-recapture can be examined to determine diet through analysis of fatty-acid signature(23) and stable isotope(24),fasting(25), reproductive state(26), reproductive history(27), and presence of contaminants(28).

References 1. Southwood, T.R.E., R.M.May, M.P.Hassell, and G.R.Conway. Am Nat 108:791-804; 2. Stirling,I. and A.E.Derocher. Arctic 46: 240-245; 3. Derocher,A.E., Lunn,N.J., Stirling,I. Integr Comp Biol 44:163–176; 4. Hunter,C.M., H.Caswell, M.C.Runge, E.Regehr, S.C.Amstrup, I.Stirling. USGS, Reston,VI; 5. Regehr,E.V.,C.M.Hunter,H.Caswell,S.C.Amstrup,and I.Stirling. J Anim Ecol 79:117-127; 6. Smith,M., and B.Rigby. In: Stirling,I., and Cleator,H., eds. Occ.Pap No.45.Ottawa: CWS; 7. Messier,F., M.K.Taylor, and M.A.Ramsay. Can J Zool 226:219-229; 8. Kingsley,M.C.S., I.Stirling, and W.Calvert. C an J Fish Aqu Sci 42:1189-1210; 9. Bethke,R., M.Taylor, S.Amstrup, and F.Messier. Ecol Appl 6:311-317; 10. NASA/GSFC, MODIS Rapid Response, http://rapidfire.sci.gsfc.nasa.gov/subsets/?project=arctic; 11. Stirling,I., and W.R.Archibald. J Fish Res Board Can 43: 1126-1129; 12. Smith,T.G. Can J Zool 58: 2201-2209; 13. Lunn,N.J., I.Stirling, and D. Andriashek. CWS Final Report to WMAC. Inuvik,NT; 14. Taylor,M.K. ,J.Laake, H.D.Cluff, M.Ramsay, and F.o.Messier. Ursus 13:185-202; 15.

Stirling,I., C.Spencer, and D.Andriashek. J Wild Dis 25:159-168; 16. Calvert,W., and M.A.Ramsay. Ursus 10: 449-453; 17. Lambertsen,R.H. J Mamm 68:443-445; 18. Baker, C.S., N.J.Patenaude, J.L.Bannister, J.Robins, and H.Kato. Marine Biol 134:1-7; 19. Gorgone,A.M., P.A.Haase, E.S.Griffith, and A.A.Hohn. J Wild Manag 72:926-932; 20. Boulanger,J., S.Himmer, C.Swan. Can J Zool 82:1267-1277; 21. Kendall, K.C., J.B.Stetz, D.A.Roon, L.P.Waits, J.B.Boulanger, D.Paetkau. J Wild Manag 72:1693-1705; 22.Choquet,R., A.M.Reboulet, R.Pradel, O.Gimenez, J.D.Lebreton. Anim Bio Cons 27:207-215; 23. Thiemann,G.W., S.J.Iverson, and I.Stirling. Ecol Mono 78:591-613; 24. Hobson K.A., Stirling I., and D.S.Andriashek. Can J Zool 87:50-55; 25. Cherry,S., A.Derocher, I.Stirling, and E.Richardson. Polar Biol 32: 383-391; 26.Derocher, A.E., Stirling,I., Andriashek,D. Can J Zool 70:561–566;27. Medill,S., A.Derocher, I.Stirling, and N.Lunn. Polar Biol 33:115-124; 28. Muir,D.G.C., S.Backus, A.E.Derocher, R.Dietz, T.J.Evans, G.W.Gabrielsen, J.Nagy, R.J.Norstrom, C.Sonne, I.Stirling, M.K.Taylor and R.J.Letcher. Env Sci Tech 40:449-455.

Timeline: (2010 to 2013 included for information purposes)
2010/2011
September 8th 2010 – granted approval from WMAC (NWT) to move forward with community consultations.
September 12th 2010 – granted approval from IGC to move forward with community consultations
October 18th – community consultation in Cambridge Bay
November 9th – community consultation in Ulukhaktok
Winter 2010/2011 – community members conduct recon on cabin

2011/2012
April 2011 – purchase fuel
Summer 2011 – barge supplies/equipment to repair cabins
Winter 2012 – arrange for cabins to be repaired
Winter 2012 – arrange for fuel and supplies to be flown from communities to field base camps

2012/2013
Spring 2012 – first year field season conduct mark-recapture research, collar adult females
Summer 2012– Barge\Cache and fuel and supplies
Fall 2012 - communities for research planning meeting
Winter 2013 cache fuel and supplies

2013/2014
Spring 2013 - fieldwork: conduct DNA mark recapture research (traditional M\R and hair trap line)
- deployed remaining collars and resight collared females
Summer 2013- fuel barged to Ulukhaktok (NT), Sachs Harbour (NT), and Resolute(NU);
Winter 2014 –fuel flown from communities to field base camps

2014/2015
Spring– fieldwork: conduct DNA mark recapture research and resight collared females
Summer\fall - arrange to have samples analyzed
Winter - analyze and write up results
Summer 2014 \ winter 2015 - arrange to have empties removed

2015
Spring\Summer – return to Cambridge Bay and Ulukhaktok to present findings to community

2013/2014 – 2014/2015 deliverables

- Purchased supplies for field work (gear and food) (completed)
- Cached gear and supplies for 2014 field season(completed)
- Staged crew to commence fieldwork(completed)
- Spring 2014 field season conducted(completed)
    - year 3 for mark-recapture population estimate
    - deployed 5 collars in VM
- Produced field report for co-management authorities(draft completed)
- Plan to hold community meetings in Ulukhaktok and Cambridge Bay to discuss field season and approach forward. (yet to be completed)
- Remove drums from remote fuel caches to central locations (partially completed)
- Analysis (yet to be completed)

Funds received from WWF were used helicopter time (see CHL invoice attached). Reporting is more complicated due to different fiscal years. Figures below correspond to preliminary - ENR 2014/2015 season costs – not complete yet.

The Viscount Melville polar bear subpopulation survey proceeded as planned; overall it was a successful season but weather caused significant delays. Analysis still needs to be conducted. Please find a PRELIMINARY field report attached; this report has been not yet been distributed to partners.

Project Budget (2013-2014)

Item	*Budget*	*Actual (preliminary)*
Field Gear	46,082	
Land Use Permits	1,368	
Field Camp Supplies Capture Crew	15,000	
Fuel Purchase Capture Crew	24,330	
Fuel Cache Capture Crew	114,940	
Helicopter Time	166,833	
Wages – Hair Snag Crew	77,280	
DNA Analysis	1,760	
Total	**447,594**	

Project Funders (2013-2014)

Organization	*Amount*	*Actual*
Environment Canada	120,000	120,000
Nunavut Wildlife Management Board (Nunavut Wildlife Research Trust)	75,000	75,000
GNWT Inuvialuit Implementation Funds	50,000	
GNWT – Headquarters	50,000	100,000
Government of Nunavut	20,000	
WWF-Canada	30,000 (allocated to fuel caching)	15,000
Total	**345,000**	
Deficit/surplus	**-102, 594**	

Because WWF fiscal is different than GNWT, 15K was spent in 2013/2014 on fuel caching and second 15K will be for helicopter in 2014/2015 fiscal (see attached bills)