



INDICATOR: BODY CONDITION AND SURVIVAL OF POLAR BEARS

STRATEGIC DIRECTION: Reduce Threats

TARGET: N/A

THEME: Pressures on Ontario's Biodiversity – Climate Change

Background Information:

Polar Bears are among the species most vulnerable to climate change because they are dependent on sea ice for feeding, mating, and resting. In many parts of the northern hemisphere, climate change is causing sea ice to break up earlier and freeze up later. In southern Hudson Bay and James Bay, the period of ice cover has decreased by almost 3 weeks since the mid-1970s (Cavalieri et al. 1996, updated yearly, Gagnon and Gough 2005; Figure 1). This reduces the amount of time Polar Bears can spend on the ice feeding on seals and other marine mammals to support reproduction and their seasonal fast (Stirling et al. 1999).

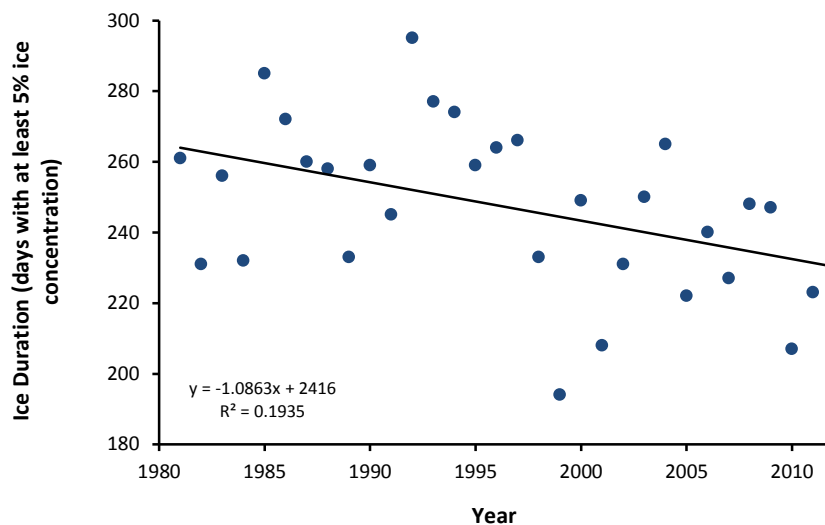


Figure 1. Annual duration of at least 5% ice cover on southern Hudson Bay and James Bay, 1981-2012 (analysis by M. Obbard and K. Middel (OMNRF) based on satellite data from Cavalieri et al. 1996, updated yearly).

Ontario is home to the southernmost subpopulation of Polar Bears in the world (southern Hudson bay subpopulation), and therefore the loss of sea ice due to climate change is expected to have an early effect on this population. (Derocher et al. 2004). This subpopulation is currently estimated to contain about 950 bears (Obbard et al. 2013), and a decline in population size is expected as the effects of climate change are realized (Obbard et al. 2007). Such declines have been observed elsewhere. For example, the Western Hudson Bay subpopulation of Polar Bears (shared by Manitoba and Nunavut) has



shown declines in body condition, reproductive success, and survival resulting in a 22% reduction in population size between 1987 and 2004 (Stirling et al. 1999; Regehr et al. 2007). The size of the Western Hudson Bay subpopulation has been stable over the last decade (Lunn et al. 2013; Stapleton et al. 2014) a period where there has been no observable trend in adjacent sea ice cover (Lunn et al. 2013).

Although studies indicate that the size of the Southern Hudson Bay subpopulation has not changed since the mid-1980s, an assessment of changes in body condition and survival can provide an indication of the status of the population and, more broadly, the current effects of climate change on Polar Bears (Obbard et al. 2006). This indicator assesses changes in the average body condition (defined as the combined mass of fat and skeletal muscle relative to body size; Cattet et al. 2002) for Southern Hudson Bay Polar Bears captured in three periods between 1984 and 2009, as well as changes in survival over the 1984–1986 and 2000–2005 periods.

Data Analysis:

This indicator is based on data collected from the Southern Hudson Bay Polar Bear population over three time periods (1984-1985, 2000-2005, 2007-2009; Obbard et al. 2006, 2007, unpublished data). Individual Polar Bears were captured and immobilized during the ice free season along the Hudson Bay Coast from Point Hook in northwestern James Bay to the Ontario-Manitoba border. The sex, reproductive status, body length, body mass and age were determined for each captured bear. The number of bears sampled in each time period ranged from 298-450.

A Body Condition Index value was calculated for each animal (Obbard et al. 2006). This index is strongly associated with the true body condition (combined mass of fat and skeletal muscle relative to body size), but is not biased by body size allowing comparisons between sex and age groups. The average values for each time period were calculated for adult females with and without young, adult males, sub-adults (< 5 years old) and all bears and compared between time periods (Figure 2).

Annual survival rates (i.e., proportion of bears surviving a period of a year, if all bears survived, the annual survival rate would = 1) of Polar Bears were estimated for the 1984-1986 and 2000-2005 time periods (Obbard et al. 2007). The average survival rate for each period was calculated for five age groups of bears – cubs, yearlings, sub-adult (2-4 years old), adult (5-20 years old) and senescent (> 20 years old) and compared between time periods (Figure 3). Survival rate estimates for the 2007-2009 time period will be added to this indicator when the analysis is complete.



Results:

Trend: Deterioration **Data Confidence:** High **Geographic Extent:** Hudson Bay Lowlands

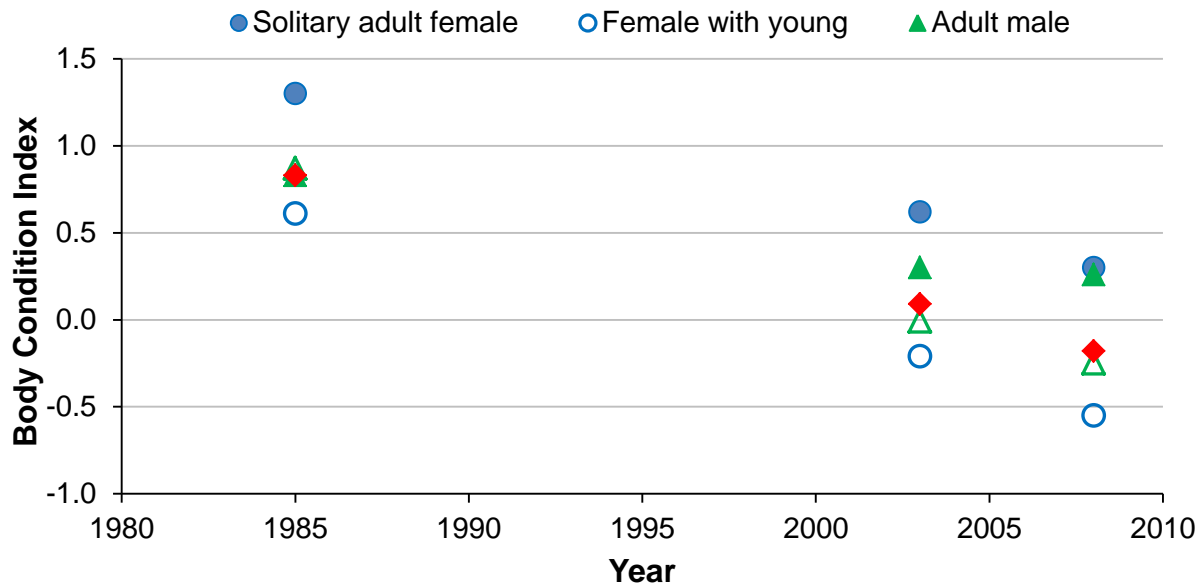


Figure 2. Changes in average body condition index values for Southern Hudson Bay Polar Bears captured in Ontario during 1984-1986, 2000-2005 and 2007-2009 (median year of sample periods plotted; adapted from Obbard et al. 2006 and Obbard, unpublished data).

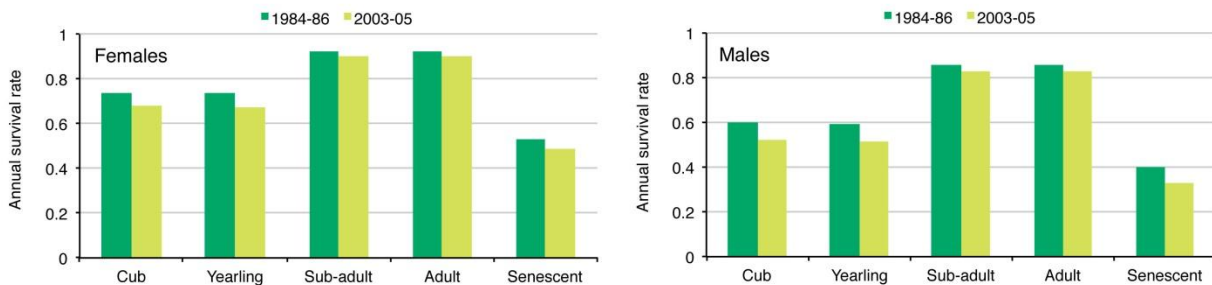


Figure 3. Comparison of annual survival rates of Polar Bears in the southern Hudson Bay subpopulation between 1984-86 and 2003-05 (adapted from Obbard et al. 2007).

Status:

- Significant declines in body condition are apparent for Polar Bears in the Southern Hudson Bay subpopulation; declines are greatest for pregnant females and juvenile (sub-adult) bears.
- Declines in survival are also apparent for both male and female Polar Bears of all age classes in the Southern Hudson Bay subpopulation.
- These data suggest that changes in the structure and duration of sea ice resulting from climate change (Gagnon and Gough 2005) have had consequences for Polar Bears in Ontario in the form of declines in body condition and overall survival.



Links:

Related Targets: 6. By 2015, plans for climate change mitigation are developed and implemented and contribute to Ontario's target to reduce greenhouse gas emissions by 6 percent below 1990 levels.

Related Themes: N/A

Web Links:

Polar Bear Administrative Committee for Polar Bear Management in Canada

<http://www.polarbearcanada.ca/>

References:

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Citation

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