Environment Canada Research Report

Demography and Population Assessment of Polar Bears in Western Hudson Bay, Canada

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SUMMARY

- We evaluated the population status and demography of the Western Hudson Bay polar bear subpopulation for the period 1984-2011, using live-recapture data from research studies and management actions, and dead-recovery data from the subsistence harvest in Nunavut.

- We used a Bayesian implementation of multistate capture-recapture models, coupled with a matrix-based demographic projection model, to integrate several types of data and to incorporate variation across the polar bear life cycle. This approach allowed the estimation a suite of vital rates, including both survival and reproduction, in a unified framework linked directly to estimating current and projecting future population trends.

- Survival of female polar bears of all age classes was correlated with sea ice conditions, with lower survival in years of early sea ice break-up. While this supports previous findings linking body condition, productivity, and status of Western Hudson Bay polar bears to environmental changes associated with climatic warming, other productivity parameters were not linked to changes in the environmental variables that we examined.

- Survival of male polar bears of all age classes was not correlated with sea ice conditions, perhaps due to the over-riding effect of mortality from the male-biased subsistence harvest of polar bears in Nunavut.

- The 2011 population estimate for Western Hudson Bay subpopulation based on capture-recapture analysis is 806 bears with 95% confidence intervals of 653-984. This is broadly consistent with the abundance estimate of 1,000 (95% CI = 715-1398) resulting from the 2011 aerial survey. The capture-recapture study point estimate is somewhat lower than the aerial survey estimate, likely due to differences in the size of the effective study population considered by each approach.

- The overall declining trend in size of the Western Hudson Bay subpopulation over the period 1987-2004 was similar to the previous demographic evaluation (Regehr

et al. 2007), suggesting consistency between the two analyses. However, point estimates differed slightly, with somewhat lower absolute values estimated using the updated statistical approach.

- This updated population assessment suggests that polar bear numbers in Western Hudson Bay have been relatively stable over approximately the past decade. Female survival is the most important determinant of Western Hudson Bay population growth, and the growth rate of the female segment of the population was estimated to be stable during 1991-2011 (Lambda =1.02; 95%CI = 0.98-1.06).

- As the estimate of female growth rate was derived from survival and reproductive rates, which are more robust than point estimates of population size, this value likely represents a reliable indicator of recent population trend.