<u>Abstract submittal for "Marine Mammals of the Holarctic III", 11-17 October, 2004</u>

Presenter: Mark S. Udevitz (oral presentation)

Title: Survey design for estimating Pacific walrus population size

Authors: Mark S. Udevitz[1], Douglas M. Burn[2], Anthony S. Fischbach[1], Chad V. Jay[1], Marc A. Webber[2]

Abstract: Previous surveys to estimate the size of the Pacific walrus population were conducted in the fall when the population was using haul-out sites on land and sea ice. Precision of counts at terrestrial haul-outs was not estimated but precision for the sea-ice portion of the surveys was low, primarily because walrus distributions at sea were highly aggregated and it was only feasible to cover a very small portion of the total range with a visual aerial survey. There were no attempts to estimate proportions of the population that were not hauled-out on either land or ice and therefore not available for detection during the surveys. Recent advances in thermal infrared scanner technology have made it feasible to fly at higher altitudes and therefore cover a substantially larger portion of the range while still being able to detect walruses on sea ice. Also, advances in satellite transmitter technology and deployment techniques have now made it feasible to estimate the proportion of time walruses are hauled-out during a survey period.

We developed a general survey design, utilizing these new technologies to provide improved estimates of Pacific walrus population size. The survey would be conducted in spring, when the entire population is distributed near the edge of the Bering Sea ice pack. Immediately prior to the survey, transmitters would be deployed on a sample of walruses distributed throughout this region. Data from these walruses would be used to estimate the mean proportion of time walruses were hauled-out during the survey period. For the survey, the region would be partitioned into survey blocks and a random sample of transects within each block would be scanned with an airborne thermal scanner following standard strip transect survey methodology for estimating the number of walrus groups. Locations of walrus groups detected by the scanner would be relayed to a second aircraft, flying at a lower altitude, which would obtain high-resolution digital photographs of a random sample of these groups. The photographs would be used to count the number of individuals in the sample groups and regression analysis would be used to estimate the relation between thermal signals and numbers of individuals. This relation would then be used to estimate numbers of individuals based on thermal signals for the remaining groups detected by the scanner but not photographed. The estimated number of individuals in surveyed transects would be divided by the proportion of the block area accounted for by these transects to obtain an estimate of the number of hauled-out individuals in each block. Block totals would be divided by the estimated proportions hauled out and then summed to obtain the total population estimate.

We conducted a pilot survey of 6 survey blocks around St. Laurence Island, Alaska in the spring of 2003 to test the feasibility of the aerial survey protocol. We also conducted a pilot study near Nunivak Island, Alaska in the spring of 2004 to test the feasibility of deploying satellite transmitters and using them to estimate the proportion of the time walruses were hauled out. We used estimates of the parameters and their variability obtained from these pilot studies

[1] USGS Alaska Science Center, 1011 E. Tudor Road., Anchorage, Alaska, USA
[2] U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska, USA

as a basis for estimating expected precision for various combinations of sample sizes for transects, photographed groups, and satellite transmitters in a full-scale survey of the entire Pacific walrus population.