Scenarios of strategic investments in coordinated observing of Pacific walrus sea ice habitat

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Monitoring reductions in Arctic sea ice habitat plays a key role in improving understanding of the impacts of future habitat change on Arctic species populations. In the U.S., legislation such as the Endangered Species Act (ESA) provides support for conserving critical habitat for listed species, potentially providing an influx of additional research dollars to support monitoring key habitat. Arctic marine mammal species recently considered for listing under the ESA include the polar bear, ringed and bearded seals, and the Pacific walrus. In each case the listing determination was further subjected to additional litigation as a result of challenges to the initial listing decision. Arguably, the cost of litigation and delayed implementation of species habitat research further reduces opportunities to establish a robust sea ice habitat observing program, which can subsequently lead to more challenging species management in the future. This short statement explores two scenarios of sea ice habitat observing efforts for the Pacific walrus (*Odobenus rosmarus divergens*) to examine the long-term cost and benefits of a sustained, coordinated sea ice habitat monitoring program that is shared between the U.S. and Russia. The value of the approach used is not in identifying the exact costs of such an observing program (the dollar values used in the model assumptions are intended to be more illustrative than absolute), but rather, the approach demonstrates at a high level that early, coordinated, sustainable funding yields a more useful decision-making product on critical sea ice habitat.

Model methodology: A simplified walrus population model was developed to simulate the potential rate of walrus population decline related to anticipated declines in sea ice habitat. Given the high levels of uncertainty in quantifying current walrus population size, the model was used to identify the approximate time period when a 50% drop in population size was detected, after which it was assumed that ESA listing status would no longer be challenged, and the ESA-listed status would provide much-needed additional funding for sea ice habitat research. Two scenarios of funding coordination were investigated for developing an ice-habitat observing program: 1) **Non-coordinated** funding for observations between U.S. and Russia, but with more sustained funding in the U.S. once the Pacific walrus population drops by 50%; 2) **Coordinated** and sustained funding between the U.S. and Russia once the Pacific walrus population dropped by 50%, and occasional significant investments in observing the marginal ice zone before the walrus population shows significant declines.

Additional assumptions in the scenarios include: 1) during non-coordinated funding periods there was a 30% chance of a research project being funded in any given year that could inform sea ice habitat research; 2) in the event of sustained funding over consecutive years, the sustained annual funding would allow some expansion of the observing program, given that previous year's investments would continue to function for an additional 1 year after initial deployment; 3) a percentage of the overall potential sea ice habitat (including nearshore sea ice and pack ice) could be reasonably monitored at a fixed dollar value that was arbitrarily set, but well within the range of U.S. spending for listed marine mammal species (Gerber 2016), and shared equally between the U.S. and Russia (i.e. 50% potential habitat in Russia, 50% potential habitat in the U.S.); the cost of observing a given proportion of potential sea ice habitat remained fixed at the cost in 2017 dollars; 4) given that few Pacific walruses are observed east of Utqiaġvik, we assumed that the Canadian nearshore sea ice would remain negligible walrus habitat.

Results. The cumulative cost of a coordinated, sustained observing program remained higher than the scenario of the non-coordinated observing program through the year 2115, although the difference in cumulative cost shrinks over time (Fig. 1A). The coordinated, sustained funding model showed less fluctuations in anticipated funding at 5-year intervals, particularly after 2056 when the significant walrus population decline was simulated. As a result, the maximum annual cost beyond 2056 could remain substantially lower than the total annual cost in the non-coordinated model (Fig. 1B). The anticipated proportion of potential walrus habitat monitored could be maintained around 80% (fluctuating annually between 70-90%) once sustained, coordinated funding was implemented in 2056 in the coordinated scenario. In the non-coordinated scenario, the proportion of habitat monitored fluctuated between 47% and 85%, with a 10-year average of less than 70% of habitat monitored each year.

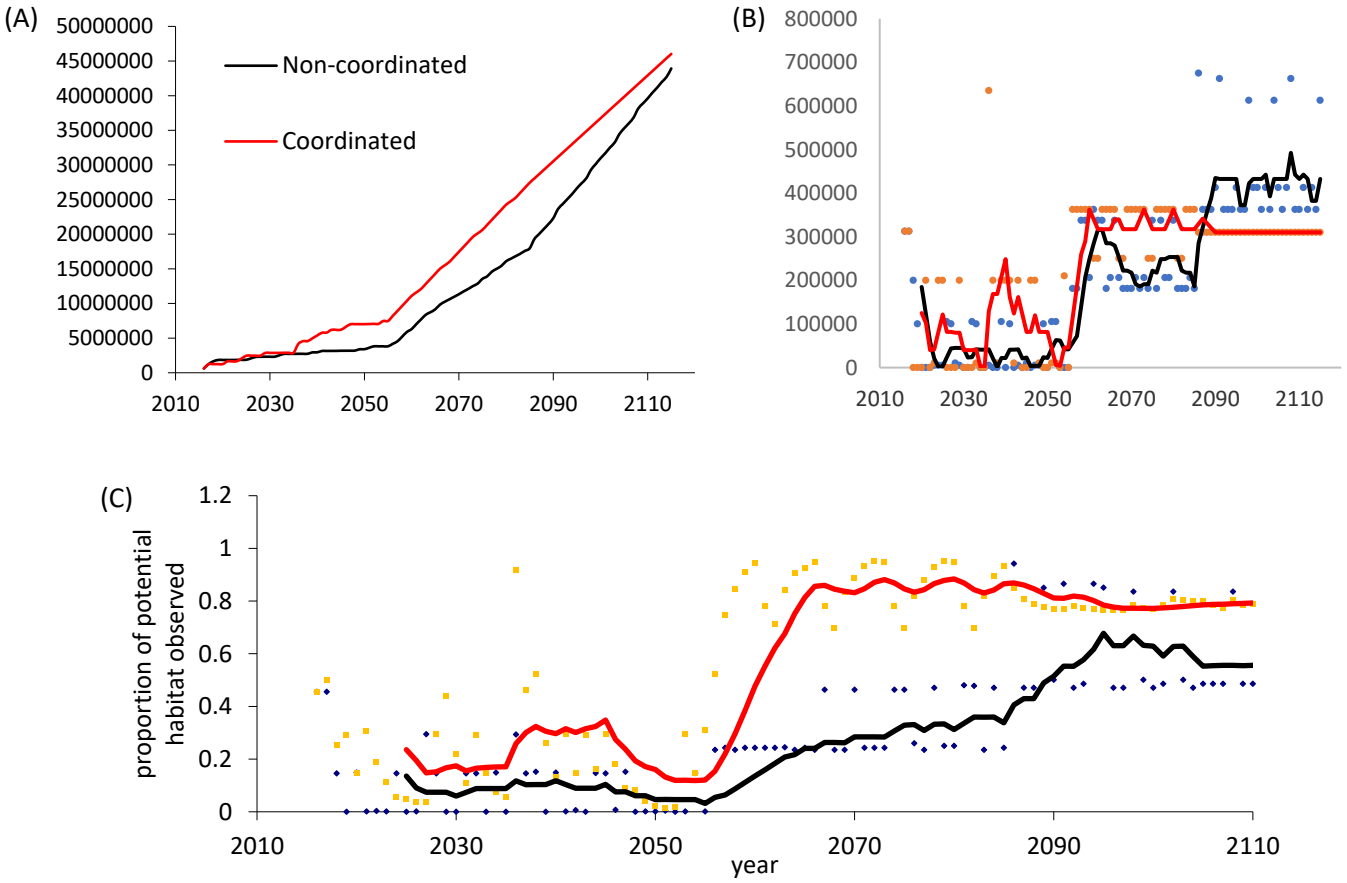

Figure 1. A) Cumulative cost of observing potential walrus sea ice habitat by scenario: non-coordinated (black) and coordinated (red); B) Annual cost of observing effort with 5-year average trendline; C) proportion of potential ice habitat covered by observing program with 10-year average trendline. All dollar amounts shown as 2017 dollars.

Conclusions: The scenarios present possible long-term outcomes of potential costs of a sustained observing program to inform serve management needs for the Pacific walrus. The coordinated, sustained funding scenario shows substantial improvement in the proportion of potential habitat monitored over time (~ 80%), and this could be achieved with more modest annual investments, whereas the non-coordinated scenario improved proportion of habitat monitored only during years when there was an influx of additional funding. Policies for coordinated sustained funding internationally is key to management of migratory Arctic species, and ideally such efforts should not only be triggered by species protections that occur after significant population declines as was the case in the scenarios presented here.

References

Gerber, L. R. (2016) Conservation triage or injurious neglect in endangered species recovery. PNAS 113:3563-3566