Marine Predators

SOUTHEAST ALASKA NETWORK – PROTOCOL DEVELOPMENT SUMMARY

PARKS WHERE PROTOCOL WILL BE IMPLEMENTED: GLBA

Justification/Issues Being Addressed

Marine mammals and seabirds in GLBA are among the most emblematic and readily observable wildlife in the park. A large proportion of these species are also of particular management concern, due either to conservation status iconic or charismatic characteristics. Many visitors to GLBA both aspire and expect to observe a variety of seabirds, cetaceans, and pinnipeds. Top trophic-level predators (including marine mammals and seabirds) can serve as an index of ecosystem health because they assimilate and reflect the dynamics of populations at lower trophic-levels.

Specific Monitoring Objectives to be Addressed by the Protocol

1. Determine long-term trends in the numbers and spatial distribution of marine birds and mammals within GLBA proper using grid-based sampling of at-sea surveys twice a summer stratified by along-shore (shoreline) and pelagic line transects that covers approximately 10% of the marine habitat.
2. Generate population estimates for select marine seabird and mammal species or guilds from annual counts over the next 15-20 years.

Basic Approach

Two approaches can be taken for surveys of top marine predators. First, a monitoring program can focus on the dynamics of a single species, with a sampling design focused on maximizing precision in population estimates by accounting for spatial and temporal process error and minimizing observation error. Although single-species approaches tend to maximize precision and minimize time needed for trend detection, they do not, by definition, account for changes in the dynamics of other species. Too, because population trends of a single species probably will not reflect the dynamics of all components of an ecosystem, it is problematic to use of such trends to infer ecosystem state or condition. A second, alternative approach is to survey a number of upper trophic species simultaneously using systematic transects. This approach is not likely to generate high-precision population estimates for any single species with concomitant rapid trend detection. However, the marine predator community simultaneously results in trend estimates for large number of species or guilds, which, together, are more likely to reflect ecosystem dynamics. This approach would also generate data on species that may not currently be of management concern but might ultimately be of significance as management or understanding of ecosystem linkages evolves.

Between 1999 and 2003 boat-based surveys for marine birds and mammals were conducted annually in and around Glacier Bay proper by USGS. These surveys were originally designed to inventory forage fish and associated predators such as seabirds and marine mammals, and to assess important areas of marine predator concentration in Glacier Bay. However, they also

served as a means of surveying multiple species of marine birds and mammals for understanding long-term trends. These systematic surveys were conducted in June of each year covering nearly 30% of total marine habitat, covering the entire shoreline and sampling the offshore with a fine-scale grid. A subset of June transects was surveyed in November of 1999 and repeated in March for four years (2000-2003).

Recent analysis of this data by USGS (Drew et al. 2007) revealed that for most species transect lengths in the 4-8 km range are the best statistical compromise between low variance among a small number of sample units with more normally distributed properties (long transects) and high variability among a large number of sample units with binary properties (short transects). Transect lengths of 4-8km also reflect typical patch sizes for marine bird species present in GLBA. Not surprisingly, stratification (2 levels: nearshore and offshore) increases precision of estimates for many species. Also, simulations showed that sampling approximately 30% of the original survey area provided fairly consistent population estimates for most species, with the exception of highly aggregated species such as Surf Scoters (*Melanitta perspicillata*). For all species, coefficients of variation (CVs) increased rapidly as coverage decreased below 30% of the original effort, suggesting that reasonable power to detect change could occur with a reduction of survey effort by 70%. Monitoring cost would be reduced somewhat, though not nearly proportionate to the reduction in effort; samples would be collected over the same spatial area (Glacier Bay proper), and travel time would not change dramatically. Although this approach will provide trend data for a larger number of species, because marine bird and mammal surveys are inherently variable, if sampling continued at levels used in the 1999-2003 baseline surveys, sufficient power to detect, a 50% decline in abundance would require 15-25 years. Protocol development will focus first on identifying the species of greatest interest to GLBA, then designing the sampling effort to maximize power to detect changes in those species.

Principal Investigators and NPS Lead

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Development Schedule, Budget, and Expected Interim Products

2008-2012: NPS collaborates with USGS to develop and refine survey protocol and implement surveys.