ATTACHMENT C ***EVOSTC Annual Project Report Form***

Form Rev. 10.3.14

1. Program Number: *See*, Reporting Policy at III (C) (1).

12120114-F

2. Project Title: *See*, Reporting Policy at III (C) (2).

Data synthesis, analysis and recommendations for sampling frequency and intensity of nearshore marine bird surveys to detect trends utilizing existing data from the Prince William Sound, Katmai and Kenai Fjords coastlines.

3. Principal Investigator(s) Names: *See*, Reporting Policy at III (C) (3).

Heather Coletti

Collaborators: David Irons, James Bodkin, Brenda Ballachey, Tom Dean

4. Time Period Covered by the Report: *See*, Reporting Policy at III (C) (4).

February 1, 2014-January 31, 2015

5. Date of Report: *See*, Reporting Policy at III (C) (5).

March 1, 2015

6. Project Website (if applicable): *See*, Reporting Policy at III (C) (6).

www.gulfwatchalaska.org

7. Summary of Work Performed: *See*, Reporting Policy at III (C) (7).

The original objective of the marine bird surveys was to estimate long-term trends in the seasonal abundance of seabirds and sea ducks, which can be difficult when data are highly variable. Initially, we planned to summarize data annually, and acknowledged that trends should be estimated after 10 years of data collection. The goal of the surveys was to be able to detect a significant decline (>50%) after 10 years of data collection. As we conducted annual data summaries, questions arose: 1) Is current survey intensity adequate to detect trends? 2) How do we account for imperfect detection? and 3) How do we correlate changes in abundance and distribution of marine birds with the other metrics being collected by the nearshore component of GWA?

Early analyses of Katmai National Park and Preserve (KATM) and Kenai Fjords National Park (KEFJ) survey results showed high between year variation in density estimates, making trend detection difficult. These early analyses resulted in CVs well over 0.50 (CV range: 1.27 to 4.00) for all taxa. Therefore confidence intervals for almost all species in all years encompassed zero, constraining our ability to detect trends over time at our current sampling intensity.

Data on harlequin ducks (*Histrionicus histrionicus*) at KATM were used for the test case occupancy analysis because harlequins are common and relatively evenly distributed along the KATM coast.

We found that transect length was the most important predictor of both detection and occupancy, occurring in all models with AIC < the no-covariate model. Both detection and occupancy increased with increasing transect length. There was weak evidence of heterogeneity in occupancy with sites with different habitat types. Although there was much variation, protected and semi-protected sites had a slightly lower probability of being occupied than exposed sites. A slight latitudinal gradient was observed, where the probability of occupancy increased with increasing latitude. The model-averaged proportion of sites occupied was 0.87 (90% CI = 0.77 - 0.97).

Because a unit of occupancy is spatially defined, we also assume we will be able to quantify metrics such as prey availability, habitat type, exposure, shoreline complexity, water quality parameters, etc. to that same spatial unit(s). Changes or shifts in site occupancy could theoretically be correlated to other physical or biological drivers of the system. This becomes particularly important in the face of climate change as potential stressors to a system increase. Understanding how a species or community is responding to those stressors through changes in distribution will be informative for resource managers to implement appropriate management actions.

This preliminary analysis indicated that allocation of survey effort is critical. In the initial design, transects were 5 km long. However, during standard skiff surveys, depending on tide height, conditions and the abilities of the skiff driver, transects could be significantly more or less than 5 km in length. This equates to variable effort per transect. While standardizing length would be ideal, it is not feasible. We suggest effort is modeled rigorously. This could include time on transect or actual length travelled during a single transect survey. There was also high model-selection uncertainty (all models have nearly the same AIC). This indicates that there is still some un-modeled heterogeneity and this may be improved by calculating more appropriate habitat covariates (e.g., shoreline type and bathymetry).

Sample size was also an issue in the preliminary analysis. Although we had five (5) replicate encounter histories, there were large uncertainties associated with estimates. Essentially, the limited number of transects does not capture the level of heterogeneity in the existing data. Despite this, the current sampling protocol represented the maximum effort that can be expended on surveys, given logistical constraints. Further discussion and analysis may lead to: 1) reducing the scope of the monitoring program by focusing our efforts in specific habitats; 2) increasing the number of transects sampled; 3) changing the spatial grain of sampling (sample unit size); 4) considering more complex model structures in a fully Bayesian framework. The optimal course of action will depend on refinement of monitoring objectives. For example, the estimated proportion of sites occupied was close to one, and near the upper boundary of that considered to be “meaningful” for occupancy analysis (MacKenzie et al. 2006). Reducing the sample unit size could remedy this problem for harlequin ducks, but may reduce the effectiveness of the sampling design for a species that is less common. A discussion of objectives should address the following: spatial extent of analysis, spatial grain of analysis, target species, hypothesized population drivers, and feasible courses of action (e.g. management or conservation) if change is detected.

MacKenzie, D. I., J. D. Nichols, J. A. Royle, K. H. Pollock, L. A. Bailey, and J. E. Hines. 2006. Occupancy modeling and estimation. Academic Press, San Diego, California, USA.

Deliverable/Milestone	Status
Finalized proposal (statement of work for contract)	Completed, June 2013
Contract Package submitted to NPS	Completed, July 2013
Contract Award	No bids were submitted for evaluation and award
Data collection	Annual summer surveys continue under the Nearshore component (Ballachey et al.) in KATM and KEFJ. This data will be amended to existing data sets to strengthen analysis
Data Analysis	Subset of data analysis completed with NPS collaborator for GWA synthesis report -Fall 2014
Synthesis	Completed Fall 2014

8. Coordination/Collaboration: *See,* Reporting Policy at III (C) (8).

- We continue to provide updates to the GWA PIs as well as to the GWA marine bird subgroup. We also continue to collaborate closely with the nearshore component, as nearshore skiff-based survey data are collected each summer along the Katmai and Kenai Fjords coastlines, during the Nearshore component fieldwork.

9. Information and Data Transfer: *See,* Reporting Policy at III (C) (9).

Publications & Reports:

Coletti, H.A., Dean, T.A., Kloecker, K.A., and Ballachey, B.E. 2014. Nearshore marine vital signs monitoring in the Southwest Alaska Network of National Parks: 2012. Natural Resource Technical Report NPS/SWAN/NRTR—2014/843. National Park Service, Fort Collins, Colorado. http://science.nature.nps.gov/im/units/swan/publications.cfm?tab=2

Dean, T.A., Bodkin, J.L., and Coletti, H.A. 2014. Protocol Narrative for Nearshore Marine Ecosystem Monitoring in the Gulf of Alaska, Version 1.1. Natural Resource Technical Report NPS/SWAN/NRTR—2014/756. National Park Service, Fort Collins, Colorado.

Konar, B., K. Iken, H. Coletti, T. Dean, and D. Monson. 2015. Static habitat attributes influence biological variability in intertidal communities in the central Gulf of Alaska. Alaska Marine Science Symposium. Anchorage, AK, January, 2015. Poster

Monson, D., T. Dean, M. Lindeberg, J. Bodkin, H. Coletti, D. Esler, K. Kloecker, B. Weitzman, and B. Ballachey. 2015. Inter-annual and spatial variation in Pacific blue mussels (*Mytilus tross*ulus) in the Gulf of Alaska, 2006-2013. Alaska Marine Science Symposium. Anchorage, AK, January, 2015. Poster

Meeting attendance: January 2015 Alaska Marine Science Symposium: Ballachey, Coletti, Doroff, Esler, Kloecker, Lindeberg, Monson, Shephard, Weitzman.

November 2013 Gulf Watch PI meeting, Anchorage: Ballachey, Bodkin, Coletti, Dean, Doroff, Esler, Kloecker, Lindeberg, Monson, Shephard.

Data & metadata uploaded to data portal: In cooperation with the nearshore benthic group, marine bird and mammal survey data for KATM and KEFJ was uploaded to the workspace (raw count data and metadata in form of description of project and methods).

10. Response to EVOSTC Review, Recommendations and Comments: *See*, Reporting Policy at III (C) (10).

There were no recommendations for changes to this project component in the recent EVOSTC reviews.

11. Budget: *See,* Reporting Policy at III (C) (11).

Budget forms submitted separately. This project has been delayed since the initial funding of year 1 due to contracting issues and the inability to solicit a suitable contractor. We therefore initiated work in-house through NPS this past year, charging personnel costs. A subset of our results are presented in the GWA synthesis report. Results indicate it will be difficult to fit existing data into an occupancy data analysis framework. However, this tool could certainly be used in future study designs to maximize resources. To date, NPS does not require any additional financial support from GWA. The remaining funds will be expended during years 4 and 5 in order to complete optimization of survey design for nearshore reliant species such as sea ducks.