

**Project No. : B64**

**Title: Seabird Broad-Scale Distribution**

**Principal Investigator(s) and Recipient Organization(s):**

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**Contract Period and Amount of Funding:** 1 February 2008 to 31 December 2012. \$550,438

**Report Period:** 1 April 2009 through 30 September 2009

**Report Date:** 1 October 2009

**Lead Author of Report:** Kathy Kuletz

**Proposed timeline and milestones within report period: BSIERP Broadscale Seabird Distribution,**

PI Kathy Kuletz, [Kathy\\_kulet@fws.gov](mailto:Kathy_kulet@fws.gov); 907-786-3453 2009 Timeline and Milestones

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates/items</i>
Coordinate cruises with NSF and NOAA chief scientists	<b>Kuletz</b>	January – September	via email & phone, annually
Plan travel & budgets, hire and allocate observer time, buy supplies	<b>Kuletz</b>	Jan -September	2009-2010, annually
Coordinate with other at-sea PIs for data exchange/analysis	<b>Kuletz, other PIs (NSF, BSIERP)</b>	Jan - September	2009-2010, annually
Conduct broad-scale at-sea surveys	<b>Kuletz, Labunski, other observers</b>	February -September	Complete field studies in conjunction with NSF & BSIERP cruises, 2009-2010
Process data for formatting and entry into NPPSD	<b>Kuletz, Labunski, M. Renner</b>	August-December	2009-2010, annually
Send diet samples to contractors	<b>Kuletz, Byrd, H.Renner</b>	September - November	2009 stomach subsamples sent Sept; rest in Nov. Sending stable-isotope samples in November 2009
Complete NPRB progress reports	<b>Kuletz</b>	1 October	Semi-annually, 2008-2011

**Project Summary:** This project will examine seabird and marine mammal distribution relative to oceanographic and biological features of the Bering Sea. Our goal is to examine the current influence of oceanographic and prey dynamics on the distribution and abundance of seabirds as top predators. By using multiple years of data to examine seabird response to these variables, we aim to predict how changes in the Bering Sea ecosystem will alter the distribution of apex predators. This project addresses the following BSIERP hypotheses: **3a:** Competition with abundant, piscivorous fish species for forage species will lead to a decline in murres, kittiwakes and fur seals. **3b:** Growing populations of humpback and fin whales increasingly will both consume and compete with forage fish (juvenile pollock) for

zooplankton (euphausiids and copepods). **3c:** In a top-down control community, fishing will reduce the degree of top-down control of forage species (including juvenile pollock) by adult pollock, cod and arrowtooth flounder. Owing to light exploitation rates, top-down control by arrowtooth flounder will increase, as will their level of competition with piscivorous fish, seabirds and marine mammals. As a result of these two processes, arrowtooth flounder will determine ultimate community composition, such that the climax community will be arrowtooth flounder-dominated (similar to the Gulf of Alaska). **4a:** Climate-ocean changes will displace predictably located, abundant prey (hot spots) necessary for successful foraging by central place (seabirds and fur seals while nurturing young) and hot spot (baleen whales, walrus) foragers. **4b:** Central place foragers will shift their diet, foraging locations or rookery locations to increase foraging opportunities (based on differential foraging success).

**Progress Summary:** We successfully placed seabird observers on 13 cruise legs, representing 4 different programs. These included: a) the BEST spring cruises in the north Bering Sea onboard the USCGC *Healy* (March 12 – May 12) and their summer cruise on the shelf on the *R/V Knorr* (June 14 – July 13); b) NOAA's MACE hydroacoustic surveys of the Bering Sea shelf (June 9 – 7 August); c) NOAA's FOCI ichthyoplankton surveys (February-March, April-May, and September-October) in the southeastern Bering Sea/Bristol Bay area; d) the BASIS cruises in the southeastern Bering Sea (September 2 – 30). NOAA ships were the *Oscar Dyson* and the *Miller Freeman*. We surveyed a total of approximately 29,760 km. Data from all surveys completed by mid-September have been edited and are ready for processing to calculate seabird and marine mammal densities. An inter-agency agreement was initiated with U.S. Geological Survey for the time of Dr. Martin Renner to process the data and produce a publication. All of the 2006 – 2008 survey data was submitted to NPRB and the BSIERP data manager, with metadata.

Among the collaborative projects that provided survey platforms for our surveys, NOAA's Pollock acoustic survey of the Eastern Bering Sea (Mid-water Assessment & Conservation Engineering [MACE]) has one of the most extensive and systematic track lines. Using only the MACE surveys, we made preliminary broad scale distribution maps for black-legged kittiwakes and thick-billed murre, which are the two seabird focal species in the Patch Dynamics Study. We used raw observations using a Kernel density function of ArcGIS. The results illustrate a general pattern of wider dispersal for black-legged kittiwakes (Fig. 1) than that of thick-billed murre (Fig. 2), although both show evidence of limitations due to breeding colony locations (the main colonies are Pribilof Islands, St. Matthew Island, and for kittiwakes possibly the Russian Cape Navarin). Although both species had highest densities near the Pribilof Islands, kittiwakes were abundant to the north as well, whereas the murre were highly concentrated to the south of the Pribilof Islands, and over the Pribilof Canyon area.

**Lessons learned and project adjustments:** Changes in the USFWS contracting rules made it difficult to rely heavily on contracted observers, so this year I relied more on biological technicians hired for the season. While this made salaries a larger share of the budget, it hiring, scheduling, and travel arrangements more efficient, and allowed me to maintain an experienced core of observers. Data processing will also be more efficient in 2009, following program refinements and identification of problems in the organization of raw data that impeded the conversions from 2006 through 2008. For the PDS portion of this project, our experience with collecting murre and kittiwakes in 2008 (funded under B64) improved our success rate in the 2009 collections, which in 2009 were funded under B77 (PDS, at-sea FWS).

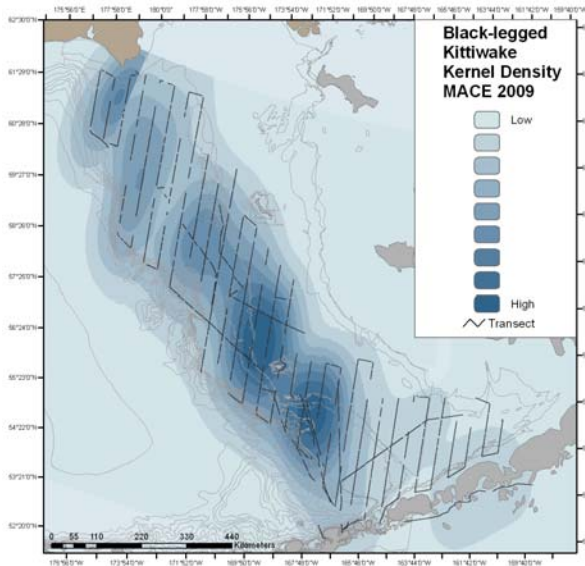


Figure 1. Distribution of black-legged kittiwakes

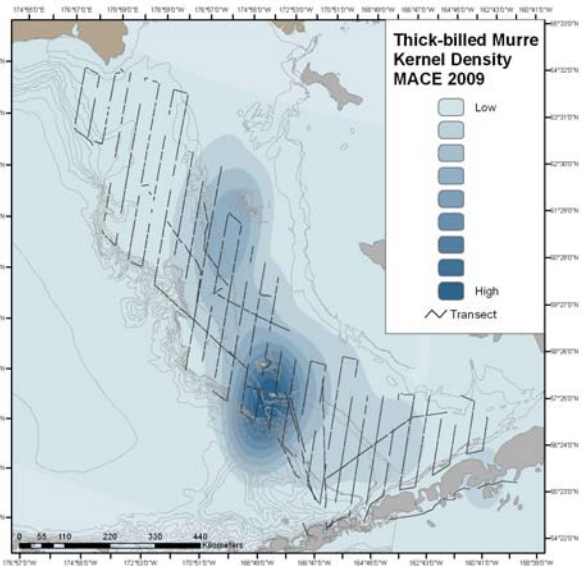


Figure 2. Distribution of thick-billed murre.

**Integration activity:** This project depends on securing vessel space for one or two observers on the BEST, NOAA, and BASIS cruises, which we have been able to do. It will depend on temperature, salinity, and chlorophyll measurements from the biophysical moorings project (B52) and those collected during vessel transits. It will require data on the summer spatial distribution and abundance of juvenile pollock, forage fish, euphausiids, and other forage species (B58, B59, B60, B62) as well as nutritional energy data from the seasonal bioenergetic project (B54), which will be related to seabird (B64) broad-scale distributions. The direct sampling of seabird diet at the forage patches depends on the fine-scale Patch Dynamics Study (B67 and B77). Upon request of the chief scientists, we provided a summary of results to include in individual cruise reports. Data from 2006-2008 were processed for inclusion in the North Pacific Pelagic Seabird Database, and these files were provided to the BEST and BSIERP data manager in July and September, 2009. Data collected for this project (B64) will also be used to examine Seabird and Cetacean Foraging Response to Prey Persistence (B92), and retrospective analyses of trophic interactions among fish, birds, and mammals (B68). During this reporting period, meetings or email exchanges were initiated with PIs of projects B67, B77, B68, and B92.

**Education and Outreach:** During the April-May 2009 cruise on the *Healy* our work was profiled by 'Teachers at Sea' reports and interviews posted on the web, through the PolarTREC ([www.polartrec.com](http://www.polartrec.com)) program (<http://www.polartrec.com/bering-ecosystem-change>).

**Next year's Workplan:** Following is our workplan for the coming years.

**2009-2012 Tasks, Assignments, Timeline**

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates/items</i>
Plan studies, including liaison with other BSIERP & PDS collaborators; provide progress and results for presentations at Oct. PI meeting.	<b>Kuletz, Irons, Byrd, Renner, Roby, Kitaysky, Mueter, Sigler</b>	October - February	Meetings at PI meeting (Oct), AMSS (Jan), Arctic Fish. Symp. (Oct), PSG (Feb)
Coordinate cruises with NSF and NOAA chief scientists	<b>Kuletz</b>	October – August	PI (Oct) & BSIERP (Jan) meetings, and via

			email & phone.
Plan travel, budgets, hire & allocate observer time, buy supplies	<b>Kuletz</b>	Feb - August	2010 is final field season
Contracts for prey remains identification & stable isotope analyses	<b>Kuletz</b>	October - Nov	Subset of 2009 samples sent in; rest will be sent in November
Submit data to NPRB and BEST data managers	<b>Kuletz</b>	November - May	Annually, 2009-2011
Complete NPRB progress reports	<b>Kuletz</b>	April, October	Semi-annually, 2010 - 2012
Complete analysis	<b>Kuletz and other PIs</b>	2011-2012	
Complete manuscripts	<b>Kuletz and other PIs</b>	2011-2012	