

Project #: B67

Title: BSIERP Patch Dynamics Study

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Contract Period and Amount of Funding:

October 2007-September 12, 2012: \$2,385,016

Report Period:

1 April 2008 through 30 September 2008

Report Date:

30 September 2008

Lead Author of Report:

Andrew W. Trites

Proposed timeline and milestones within report period:

Walrus and Benthics

<i>What</i>	<i>Who</i>	<i>When</i>	<i>Other key dates</i>
Order radio-tags	Jay, NPRB	December	2007
Order supplies and prepare for HLY0801 cruise	Grebmeier, Cooper, Jay, Fischbach, Trites	December - February	2007-2008
Make plenary talk at NRPB Annual Symposium; participate in Patch Dynamics PI meeting	Grebmeier	January	2008
Field radio-tagging from Healy	Jay, Fischbach, Trites, Pungowiyi	March	2008
Benthic data collections-spring Healy cruise (HLY0801)	Grebmeier, Cooper	March	2008
Establish services agreement with EWC for blubber collection during spring hunt	Jay	April	2008
Blubber sample collection Savoonga and Gambell	Hunters, FWS, EWC, Fischbach, Jay	May	2008
Compile and decode telemetry data	Fischbach	July	2008
Contract with Dalhousie	Jay, Iverson	July	2008

University for analysis of lipid and fatty acid content of blubber samples			
Prepare annual report to NSF for BEST core support for prey portion of collaborative Patch Dynamics study; approved	Grebmeier, Cooper	July	2008
Sediment grain size completed; data sets to BEST data archive	Grebmeier, Cooper	July-Aug	2008
Ship blubber samples to D.U.	Fischbach, Jay	August	2008
Retrospective analysis of 2006 benthic data in SLIP region for dominant walrus prey, compare with 2006 walrus tagging results	Grebmeier, Cooper	ongoing	2008

Forage Fish

<i>What</i>	<i>Who</i>	<i>Start (2008)</i>	<i>Other key dates</i>
Fine-tune plan studies, including coordination with other BSIERP-Patch collaborators	Benoit-Bird, Heppell	February-March	Review annually as needed
Select Grad Students	Benoit-Bird, Heppell	February-April	
Contract Vessel	Benoit-Bird, Heppell	January-May	
Order nets, CTD	Benoit-Bird, Heppell	March-April	
Prepare protocols for data collection and order needed supplies	Benoit-Bird, Heppell	May	Review annually as needed
Conduct field studies	Benoit-Bird, Heppell, students, techs	July-August	Complete field studies in August each year 2008-2009
Finish species ID for those organisms not positively ID'd onboard	Heppell, student	September	
Energetic content analysis	Heppell, student	September	

Northern Fur Seals

<i>What</i>	<i>Who</i>	<i>Start (2008)</i>	<i>Other key dates</i>
Fine-tune plan studies, including coordination with other BSIERP-Patch collaborators	Trites	February-March	Review annually as needed
Travel to Seattle to coordinate Patch study with previous (2004-2007) work at the Pribilofs	Trites	March	
Select Grad student & Res. Assc.	Trites, Battaile	February-April	
Select seasonal field techs for St. Paul and St. George	Trites, Battaile	April-May	Annually 2008-2009
Secure housing for field work at	Trites, Byrd,	March	Annually 2008-2009

the Pribilofs	Irons, Kitaysky		
Order data loggers	Trites, Battaile	April	
Prepare protocols for data collection and order needed equipment and supplies	Trites, Battaile, Nordstrom	March-May	Review annually as needed
Train field personnel	Battaile, field techs	July	June each year 2008-2010
Conduct field studies, capture, tag, retrieve tags and consolidate data	Battaile, Nordstrom, field techs	July-September	Complete field studies in September each year 2008-2010
Data Analysis	Trites, Battaile, Nordstrom	July-July	Expect annual results by end of year 2008-2009

Seabird and Mammal Surveys

<i>What</i>	<i>Who</i>	<i>Start (2008)</i>	<i>Other key dates</i>
Coordinate with other BSIERP-PDS collaborators	Kuletz, Benoit-Bird, Heppell	February-May	Review annually as needed
Hire graduate student	Kuletz	April	Nathan Jones, grad. Student (CA); trained at sea on BSIERP cruise
Purchased equipment and supplies	Kuletz	May-June	With help from Jones
Prepare protocols for data collection	Kuletz	May	Review annually as needed
Obtained permits to allow collection of kittiwakes and murrelets at sea	Kuletz	June	Submitted proposal to IACUC
Conducted seabird/marine mammal surveys in conjunction with prey studies.	Kuletz (surveys conducted by N. Jones)	July-August	Complete field studies in August each year 2008-2009
Coordinated with colony-based seabird crews to provide forage locations of tagged birds	Kuletz, Roby, Irons	July-August	Locations sent to fish PIs were used to guide adaptive transects
Collected TBMU, BLKI for diet study (partly supported with BSIERP funds)	Kuletz (collected by Jones)	July-August	86 Carcasses frozen, waiting processing
Edited and prepared survey data for preliminary examination	Kuletz	September-October	Work with Jones (grad student) and Labunski (FWS)
Prepare progress report	Kuletz	September	Submit by Oct 1

Seabirds (UAF)

<i>What</i>	<i>Who</i>	<i>Start (2008)</i>	<i>Other key dates</i>
Fine-tune plan studies, including coordination with other BSIERP-Patch collaborators	Kitaysky	February-March	Review annually as needed
Travel to Japan to coordinate Patch study with previous	Kitaysky	March	

(2004-2007) work at the Pribilofs			
Select Grad Students	Kitaysky	February-April	
Select seasonal field techs for St. Paul and St. George	Kitaysky	March-May	Annually 2008-2009
Secure housing for field work at the Pribilofs	Byrd, Trites, Irons, Kitaysky	March	Annually 2008-2009
Order data loggers	Kitaysky	March	
Prepare protocols for data collection and order needed equipment and supplies	Kitaysky	March-May	Review annually as needed
Have protocols reviewed by other seabird colony team members	Kitaysky	April	Review annually as needed
Coordinate field approaches to avoid conflicts	Kitaysky, grad student	April	Review annually as needed
Train field personnel	Kitaysky, grad student	June	June each year 2008-2010
Conduct field studies	Kitaysky, grad student, field techs	July-August	Complete field studies in August
Start lab analyses of blood samples	Kitayskaia, grad student	September	Expect annual results by end of year 2008-2009
Summarize available data on SIA, stress, and diving	Kitaysky, Kitayskaia, grad student	December	Annually 2008-2009
Supply data to data manager	Kitaysky, grad student	January	Annually
Complete NPRB progress reports	Kitaysky, grad student	October 1	Semi-annually 2008-2010
Report to communities of St. Paul and St. George	Kitaysky, grad student	TBD	2009-10
Complete publications	Collaborative among various PIs	January 2010	Continue thru 2012

Project Summary:

The goal of our study is to undertake a coordinated fine-scale study of birds and mammals, and their forage base to determine the consequences of spatial patterns (patches) on predator-prey dynamics. We will thereby establish mechanisms that control the abundance and distributions of top predators in the Bering Sea, and provide models with data to predict how and why these species respond to changes in the physical and biological environment.

Our research is addressing the BSEIRP hypothesis that 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. We are also testing the hypothesis that central place foragers will shift their diet, foraging locations or rookery locations to increase foraging opportunities (based on differential foraging success).

Progress Summary:

Walrus. We met our planned milestones, except for collecting fewer blubber samples than planned. We deployed 10 of 12 satellite radio-tags on walrus within the St. Lawrence Island polynya from the Healy in March and the data have been compiled and decoded (Figs. 1 and 2). A services agreement was established between USGS and Eskimo Walrus Commission to facilitate blubber collection from walrus during the spring hunt. We planned to have up to 60 samples collected among Gambell and Savoonga hunts, but only 17 samples were collected. This was apparently due to poor ice conditions for hunting walrus in Savoonga and suboptimal sampling from Gambell hunts. A contract was established between USGS and Dalhousie University for analysis of lipid and fatty acid content of the samples. The blubber samples will be shipped to Dalhousie University this month (September).

The NPRB patchy dynamics support covers participation by one PI at the annual NPRB meeting and associated patch dynamics PI meeting, which occurred as planned for our supported milestone.

Benthos. We met our planned milestone to collect benthic prey samples south of St. Lawrence Island during the early spring 2008 BEST cruise on the USCGC Healy at various spatial scales (3-5 nm, 10 nm, 20 nm) and potentially regionally (50-100 nm scale) (Fig. 1). In addition, we are making progress with our additional milestone to prepare retrospective prey field data sheets for the northern Bering Sea for data collected in 2006 for comparison with the previous tagged walrus collections by co-PI Chad Jay. We are also in the process of sorting samples collected on the Healy early spring cruise for our collaborative predator-prey patch dynamics future analyses. Sediment grain sizing has been completed and will be submitted to the BEST data archive in October.

Forage Fish. During the past year, we have successfully accomplished all of the major goals of the at-sea component of the Patch Dynamics Study. We recruited 2 graduate students who will conduct thesis research as part of the study, one of whom participated in the first research cruise. We successfully accomplished all of the goals leading to the first 28-day research cruise and completed the first field season. All fish have been identified to species and analysis of the samples and the acoustic and CTD data has begun. An Access® database for sampled fish catch is being created. We will also be creating a fish species identification document for the seabird colony teams.

Seabird and Mammal Surveys. We successfully placed a graduate student / seabird observer, Nathan Jones, with the prey/oceanographic crew on board the F/V Frosti, to survey within a 200 km radius of St. Paul Island. Mr. Jones worked closely with the prey PIs and crew, and completed 212 transects within the study area, averaging about 8 km each. Mr. Jones also successfully collected 86 birds (black-legged kittiwakes and thick-billed murre). These carcasses were frozen and shipped to the Alaska Maritime National Wildlife Refuge until final arrangements can be made for processing and tissue collections. Data from the seabird/marine mammal surveys has been edited and is ready for final processing.

Northern fur seals. The major goals were accomplished. Dr. Brian Battaile and graduate student Chad Nordstrom were hired, and a successful summer field work was carried out on St. Paul Island from early July to late September. Much of the work plan for this reporting period focused on logistics and laying the ground work for the summer field work, such as procuring needed living supplies and accommodations, as well as forming the team of scientific personal and gathering the necessary equipment to do the research (tags, field equipment, etc).

The summer field season occurred from early July to late September and consisted primarily of deploying and retrieving CTD tags, to determine the oceanographic conditions experienced by foraging females with pups, and GPS and fine scale 3D accelerometer/compass tags to determine the spatial and temporal foraging patches used by the same females. A total of 2 CTD tags, 28 GPS tags and 15 3D accelerometer/compass tags were deployed on 28 females. As of Sept 21, 2 CTD, 26 GPS and 10 3D tags have been recovered with 4 3D tags permanently lost. Two GPS and 1 3D tag are still deployed. A total of 33 foraging trips have been recorded from the 26 retrieved tags. Data analysis with most of the

recovered GPS tags has been completed and mapped using GIS software. Trips have ranged between 4.5 and 13 days, ranging from 132 to 400km from the rookery (Fig. 3). Data analysis with the CTD and 3D tags is just beginning and expected to take many more months due to the considerable size and complexity of the data collected by these tags.

Seabird and Mammal Surveys. Seabird/mammal surveys conducted in conjunction with prey studies will allow us to examine the association between seabirds and prey at the patch scale. Diet studies of birds collected at the patch scale will validate the link between seabird and prey associations, and will define seabird diet and seabird response thresholds relative to prey abundance. Three tissue samples will also be taken from each collected bird for stable isotope analysis (whole blood, liver, and muscle). This is necessary to integrate immediate and longer time-frame diet composition. Stable isotope analysis of seabird tissues (04.62), by integrating seabird diet over a longer time frame, will link the fine-scale process studies of the Patch Dynamics Study to the broad-scale observations of BSIERP (04.36).

Seabirds (UAF). Overall we met our major goals for the field sample collection (see Table 1 for summary of obtained samples). Analytical analyses of collected samples and diving data are in progress. The goals of the BSIERP colony work on St. George and St. Paul colonies this year were deployment of time-depth recorders (TDR's) and accelerometer loggers, collection of diet samples, collection of blood samples, banding, and measurements on black-legged kittiwakes (BLKI) and thick-billed murres (TBMU). Blood samples will be used for sexing, stable isotope analysis, and assays for the steroid hormone corticosterone. In addition, blood was drawn for non-BSIERP projects as well, though some of the other efforts are NPRB funded (e.g. the telomere study by R. Young). We were also responsible for some diet sample collection, blood sample processing, and banding and measuring the birds we worked with. All banding of BLKI and TBMU was done with bands provided by the Refuge. All birds were captured with a noose pole.

All our loggers were deployed on TBMU. Logger attachment went well and we never saw a bird we had marked where the logger had fallen off. We attached loggers to the breast of the bird, so any loggers not recovered in the field season will be molted off in the autumn. On St. George I., out of a total of 32 deployments we had 12 nest abandonments by a tagged individual. All four deployments of accelerometers (mass ~17 gram) and eight deployments of CEFAS loggers (mass ~5 gram) were not successful – birds abandoned their nests. All other individuals (equipped with Cefas loggers) retained their chicks and we were able to recapture them to retrieve a logger. On St. Paul I., only CEFAS loggers were deployed – out of a total 20 deployments we had 8 nest abandonments by a tagged individual, 12 tagged individuals that retained their chicks were recaptured and loggers retrieved. Our BLKI diet samples were regurgitation, lavage, or a combination sample. The TBMU diet samples were obtained through lavage. Diet sampling was very successful with BLKI on St. George I. With BLKI on St. Paul I. and TBMU on both colonies the diet sampling was less successful – majority of birds had empty stomachs and only very few samples seemed to contain any visible remains of prey. Blood samples were primarily taken with heparinized syringes, but sometimes with needles and heparinized capillary tubes. The both techniques worked very well, with the heparinized syringes being especially successful with TBMU. No bird was bled over 1% of its body mass. Banding and measuring were also successful.

We also collected samples for several graduate projects. All captured birds were sampled for telomere analyses. Common murre blood samples were taken for population genetics study. Planktivorous least auklets were captured for diet samples (regurgitations) and bled for stress and stable isotope signatures.

Preliminary results for stress levels in thick-billed murres captured for logger deployment on St. Paul I. provide an explanation for why logger loss was relatively frequent in 2008. Specifically, stress hormones at deployment of loggers were higher in individuals that subsequently abandoned their chicks (and loggers were lost) compared to those in individuals that were re-captured (and loggers were retrieved) (Fig. 4). Thus, a relatively low rate of logger retrieval was not a result of some methodological problems but rather reflected poor foraging conditions for piscivorous murres in the shelf region this year.

Lessons learned and project adjustments:

Walrus and benthos. In planning field contingencies, we were prepared to use three different methods to approach walrus for tagging – use the *Healy* to approach within ½ mile of walrus groups and make a final approach by foot, use the onboard helicopter to land on ice and make a final approach by foot, or launch a small boat to make approaches. Walrus were not encountered often and occurred in small groups. This required substantial search effort and all but one tagging approach was accomplished from the helicopter. To minimize weight and maximize flight endurance, we usually flew with only two tagging crew. We expect that this may be the primary method for walrus reconnaissance and approaches next year.

Due to the higher than anticipated ice extent in March 2008 we requested a longer, 3 week cruise for the patch dynamics walrus-benthic prey study in March 2009, which was recommended by the BEST/BSIERP Science Advisory Committee. With this extended time we can readjust station locations pending ice extent and walrus locations in a timelier manner.

Forage Fish. Field data strongly suggests nocturnal feeding by at least one of the focal bird species, suggesting that further sampling at night is warranted. This year, we conducted at least 2 transects in each of our 3 sampling zones at night and performed direct day/night comparisons in the slope region where the birds appeared to be going at night. We anticipate dedicating more time to night sampling next year and are working with the at-sea bird group to facilitate nocturnal observations of the birds.

Seabird and Mammal Surveys. Travel costs in 2008 were higher than estimated at the time the proposal was submitted. Increased costs were due to airline cost increases, more than anticipated travel delays in Dutch Harbor, and fees for extra baggage and shipping of collecting supplies and carcasses. It was necessary to hire the observer prior to the PDS season, to allow for training on another vessel with an experienced observer. For 2009, we hope to retain Mr. Jones, because of his experience and success with the project, and to insure data quality and reduce costs. We all gained valuable experience in transferring information from the tagged birds to the Frosti crew, which should streamline this component in 2009.

Northern fur seals. While considerable effort was put towards determining the best places and times to deploy and retrieve tags, as well as the methods of capture and tagging prior to the start of the field season, some unexpected problems, as well as successes, occurred over the course of the summer. The location of N. Reef rookery was expected to be an ideal location for employing the early season (July) capture and recapture methodology but not for late season methods. Because of this, we deployed fewer tags than initially expected in anticipation of very difficult recaptures. While recaptures proved to be very difficult and impossible for some tagged females during the early season, the remaining females were easily recaptured using the late season techniques in August. The use of the N. Reef location in the late season deployments also allowed us to avoid the S. Reef area traditionally used by NMML for telemetry studies. This suggests that in the 2009 field season, we can deploy our full complement of telemetry tags in the early season, allow for the tags to remain deployed for multiple foraging trips, and wait to use the mid-late season recapture methods for tag retrieval.

We experienced some tag loss mid season (August). The tags we glued on in July were difficult to remove resulting in added stress and irritation for the animal. Consequently we modified the amount of epoxy used to secure the tags, which resulted in the loss of 4 of the 3D tags, but no loss of GPS tags, which were wrapped in cloth tape and adheres to the epoxy quite nicely. Consequently, we modified the September tag deployments to apply more glue around the EDGES of the 3D tags, resulting in no tag loss. We also experimented in wrapping a 3D tag in cloth tape (similar to the GPS and CTD tags) and await the return of that tag. We are confident that tag loss will be low in the next field season from the lessons learned this season. We are also confident that the logistical groundwork laid this year will result in a smooth 2009 field season, and that the lessons learned in St. Paul will be easily transferred to the work planned for Bogoslof Island in 2009.

Seabirds (UAF). Travel, housing, and transportation costs in 2008 exceeded what we had budgeted. To cope with the financial shortages, we secured additional funding for student support, and significantly reduced costs of the equipment (loggers) by sharing equipment with our colleagues from Japan. Furthermore, involvement of the UAF students (their thesis projects conceptually and logistically integrate well with the Pribilof Patch Dynamics study) allowed us to expand the scope and capabilities of the project without additional costs to NPRB. Specifically, Rebecca Young's project on changes in life expectancy in relation to nutritional stress during reproduction and ageing will allow us to relate changes in foraging conditions to survival processes in seabirds breeding on the Pribilofs. A second study by Ine Dorresteijn's on stress and diets of planktivorous least auklets will provide a link between our project and BSERP-BEST projects focusing on zooplankton responses to temporal and spatial variability in the Bering Sea. Chris Barger's project on the molecular ecology of common murrens would link the mitochondrial haplotype of an individual to its success in foraging, diet and nutritional stress. This will provide information for a comparative study of thick-billed and common murrens breeding at the same colonies, and will also provide novel results on how the genetic landscape of a piscivorous predator would change in response to climate variability in the Bering Sea.

Although we were able to cope with increased costs for housing and transportation on our field sites in 2008, we will face this same issue in 2009. It will be essential to discuss this issue with NPRB during the PIs meeting in October 2008.

Integration activity:

All of the PIs involved in the Patch Dynamic Study will participate in the BSIERP PI meeting in Girdwood next month.

Walrus and benthos. The Walrus tracking data from 2008 fieldwork will be provided to the BSIERP Data Manager in November. PI Grebmeier has had discussions with Georgina Gibson at IARC to send retrospective water column and benthic data from one time-series site in the walrus-benthic prey patch dynamics area south of St. Lawrence Island to assist development of a subroutine in the biophysical coupled model she is preparing. Note that the M8 biophysical mooring, maintained by Phyllis Stabeno/PMEL, was placed in the general location of our longest time-series benthic "hot spot" site SW of St. Lawrence Island and all benthic data, and associated hydrographic data for this site are being prepared in data sheets and will be supplied for the modeling effort.

Forage Fish. The first steps towards integration of the Patch Dynamics Study data began with strong collaboration between the at-sea bird and the at-sea forage fish components of the study. We fully integrated our sampling and worked together to develop adaptive surveys that met the goals of both teams. In addition, we worked with the bird and fur seal tagging teams while at sea to allow us to adapt our sampling areas to regions used by tagged animals. We provided ID images of species of forage fish caught to the land-based bird observers for identification of prey brought back to the colony. Further integration is expected over the next months as all teams begin their data analyses.

Seabird and Mammal Surveys. This project depends on securing vessel space for one observer on the prey sampling vessel, and on working closely with the OSU PIs and crew. Analysis of survey data and of seabird diet will be done in conjunction with the OSU component. It will also rely on data collected during the broad-scale BSIERP and seabird studies. Survey data is currently being processed for inclusion in the North Pacific Pelagic Seabird Database, and these files will be provided to the BSIERP data manager. We will be working closely with the forage fish team during the preliminary analyses of at-sea data, and to plan for the 2009 field season.

Northern fur seals. Data from previous tracking of northern fur seals was shared with the seabird and forage fish researchers to assist in developing an at-sea sample design. Additional coordination occurred via a PI teleconference on July 8, 2008 PI at the start of the field season. Seabird researchers and fur seal researchers were housed together on St. Paul Island which led to a good sharing of information and

understanding of what each group was doing. Data analysis will occur through the fall and winter, and results will be shared with other team members as they become available.

Seabirds (UAF). Samples and data analyses will be conducted during the fall and winter, results for stress, stable isotopes and murre diving will be shared with other researchers. Preliminary results for nutritional stress levels in thick-billed murres sampled during late July – early August on St. Paul I. were already shared with other team members. These results suggest that 2008 was a food-poor year for piscivorous birds breeding in the shelf region (Fig. 5). Collections of samples for assessing changes in food availability (via stress hormones) were conducted on weekly basis and simultaneously with the at sea surveys, which will allow us an integration of the index of food availability with measures of fish and seabird distributions in the vicinity of the Pribilofs in 2008.

Education and Outreach:

Walrus and benthos.

- Alaska Public Radio Network. April 9, 2008. Tagged walrus teaching scientists about Bering Sea. <http://aprn.org/2008/04/09/tagged-walrus-teaching-scientists-about-bering-sea/>
- Plenty magazine. 2008. The walrus and the researcher: Tracking walruses and what they eat sheds light on the changing Bering Sea ecosystem. <http://www.plentymag.com/features/2008/04/walruses.php>
- PI Lee Cooper gave an invited public presentation in Dutch Harbor, Alaska on March 12, 2008 to the general public on the overall objectives of the cruise
- November 2007: PI Grebmeier made a public presentation in Baton Rouge as part of a Polar Palooza IPY event, including presentation of northern Bering Sea data (<http://passporttoknowledge.com/polar-palooza/pp04m.php>)
- We hosted onboard Healy a British Broadcasting Corporation Natural History Unit film team that obtained footage for use in BBC Frozen Planet natural history series (see http://en.wikipedia.org/wiki/The_Frozen_Planet) and an independent film team producing a documentary on climate change in the Bering Sea (http://www.florentinefilms.org/inroduction/THIN_ICE.htm)
- A professional photographer, Mr. Christian Morel from France, also documented the scientific research activities as part of an International Polar Year project during the cruise that will freely make available high-definition images to increase public understanding of polar research issues (<http://www.ourpolarheritage.com/en/accueil.php>)
- A middle school science teacher from Anchorage, Mr. Craig Kasemodel, participated in the scientific work and communicated results back to his classes through the PolarTREC (www.polar-trec.com) program with both NSF and NPRB support (<http://www.polar-trec.com/bering-ecosystem-change>)
- Ms. Nora Deans, BEST-BSIERP Outreach Manager participated in the scientific work and maintained a ship log throughout the cruise that is posted on the BSIERP web page (www.bsierp.nprb.org).
- June 2008: Co-PI Cooper made an invited presentation in Annapolis, MD for the Integration and Application Network of the UM Center for Environmental Science, including state and federal agency people. The talk is available on-line at <http://ian.umces.edu/seminarseries/>
- June 2008: Grebmeier gave an invited plenary talk at the Ny Alesund Climate Change Symposium before a number of high-level European Union government officials. http://www.kingsbay.no/index.php?option=com_content&view=article&id=245&Itemid=179
- Co-PI Cooper contributed to a New York Times article on walruses (May 20, 2008) and provided resources including Alaska Science Center Walrus research website for the New York Times Topics page on walruses (<http://topics.nytimes.com/top/reference/timestopics/subjects/w/walruses/index.html>)
- *Alaska Science Center Walrus Research*: <http://alaska.usgs.gov/science/biology/walrus/index.html> showing animated walrus tracking in the northern Bering Sea 2008
- *UMCES Arctic website*: <http://arctic.cbl.umces.edu> containing cruise report, video imaging, links to outreach activities associated with NPRB research

Forage Fish. A brief write up and pictures of the at-sea component of the Patch Dynamics study was posted by Carolyn Rosner on the NPRB website.

Northern fur seals. Andrew Trites gave two radio interviews about the Patch Dynamic Study with BJ Kibbe (KUHB St. Paul) and with Elizabeth Anrould (NPR Anchorage).

Seabird and mammal surveys (FWS). Nate Jones (graduate student, California State U. Moss Landing Marine Lab) will be giving a public lecture in Santa Cruz, CA in November. He will talk about the PDS and seabirds in particular.

Seabirds (UAF). Public lectures by Kitaysky and Young were given to scientific communities in Japan and to a local community at St. George Island.

Table 1. Summary of field samples collected on St. Paul and St. George Islands during July-August 2008. Targets for each category were 30 individual samples at each location.

SPECIES	LOCATION	BLOOD SAMPLES* (# individuals sampled)				DIET SAMPLES* (# individuals sampled)	LOGGERS	
		HORMONES	STABLE ISOTOPES	DNA	TELOMERE		DEPLOYED	RETRIEVED
TBMU	St. Paul I.	73	74	64	59	45	20	12
BLKI	St. Paul I.	41	41	37	40	38		
TBMU	St. George	65	65	60	60	26	32	19
BLKI	St. George	63	63	62	66	47		

* - include samples collected by/for the collaborating BSERP projects

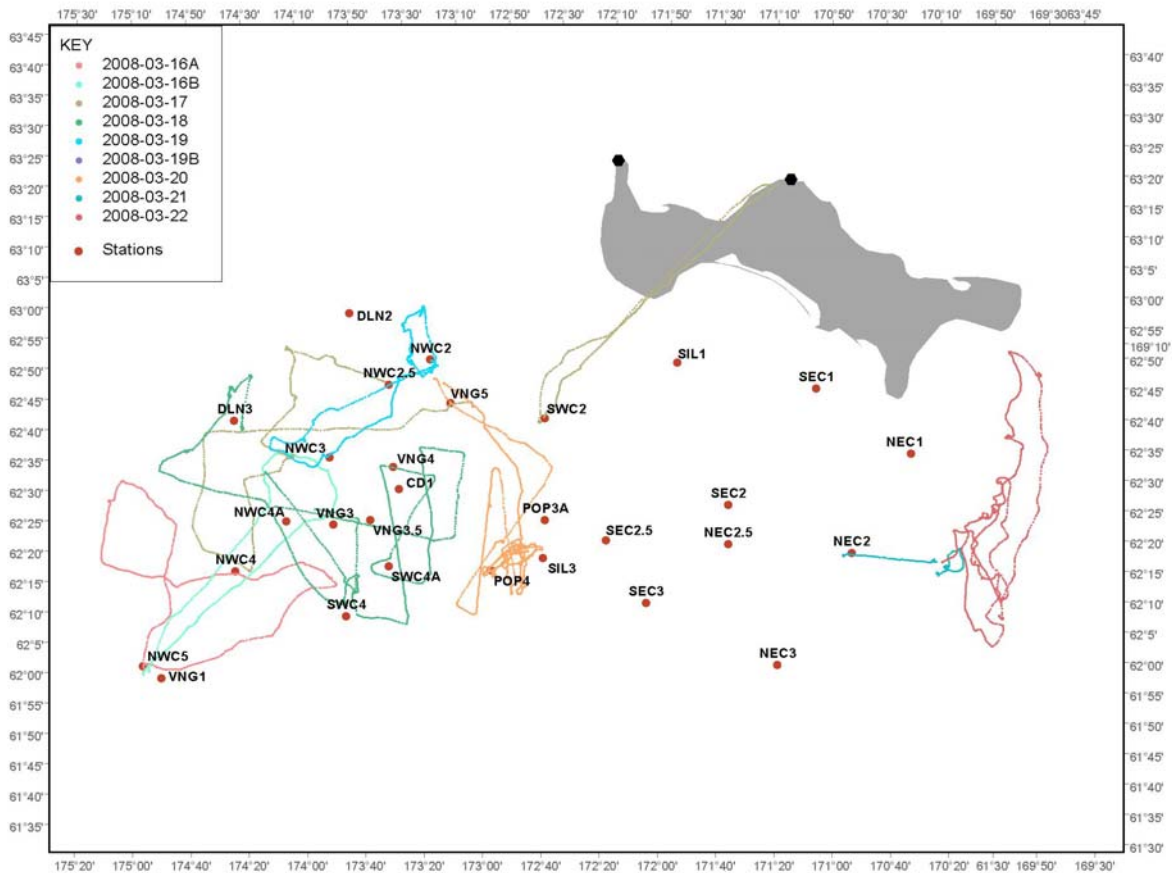


Figure 1. Walrus and spectacled eider reconnaissance flights (lines) and benthic sampling stations (dots) from the USCGC *Healy* within the St. Lawrence Island polynya, March 2008.

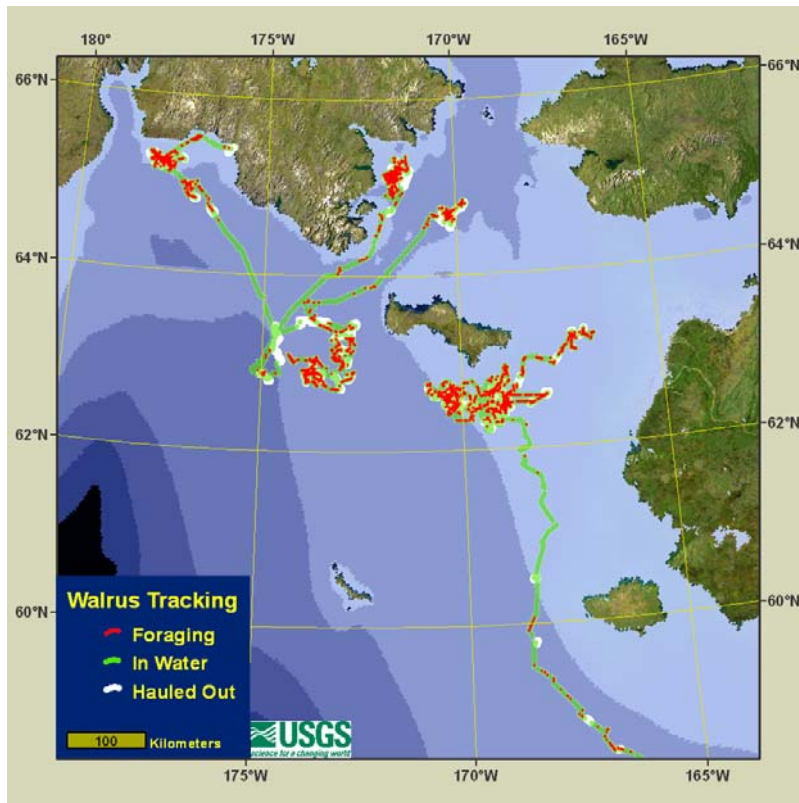


Figure 2. Movements of adult male and female walrus (n=10) radio-tagged by crossbow in March during the 2008 BSIERP-BEST research cruise aboard the USCGC *Healy*.

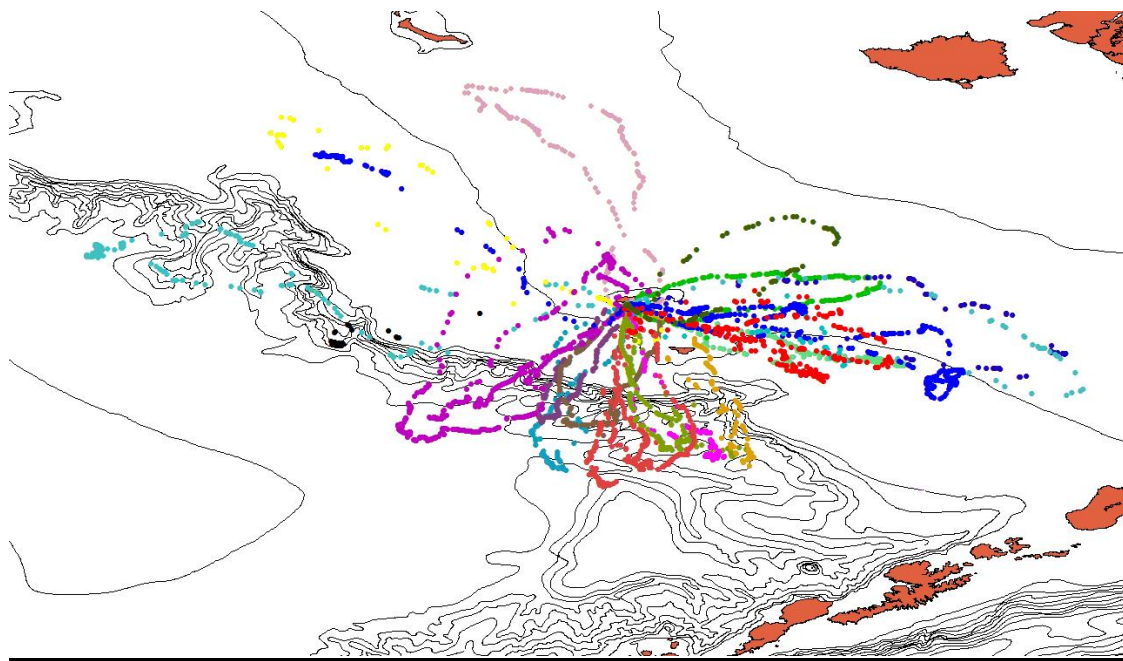


Figure 3. Movements of female northern fur seals (n=26 animals) equipped with GPS tracking tags deployed from July to September 2008 at Reef Rookery, St. Paul Island. Each color represents a unique individual. Some fur seals made more than one foraging trip.

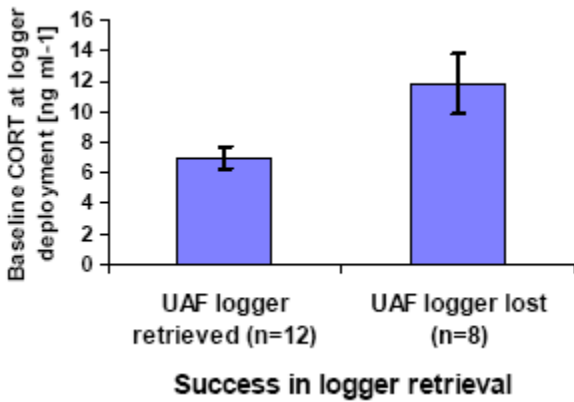


Figure 4. Success of logger retrieval in relation to stress levels (mean, SE) of thick-billed murres at deployment. St. Paul I. August 2008.

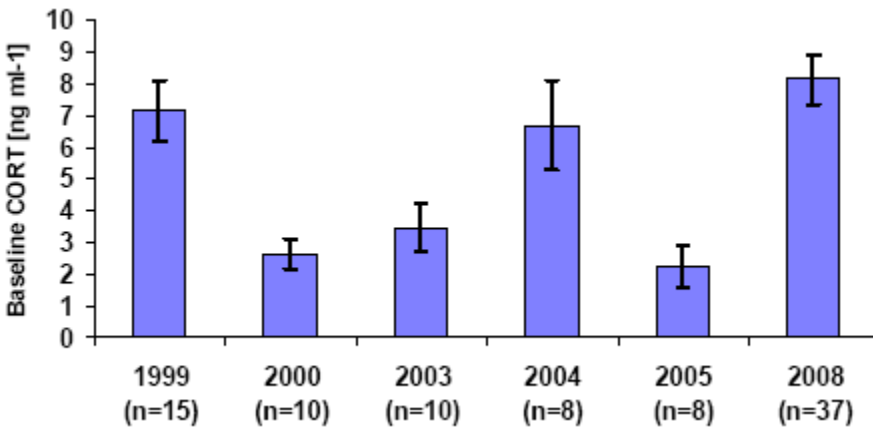


Figure 5. Inter-annual comparisons of food availability (as reflected in secretion of stress hormones – high stress indicates low food availability and vice versa; mean, SE) of thick-billed murres. Each year breeding birds were sampled (sample sizes shown in parenthesis) during late July-early August on St. Paul Island. 2008 was a poor-food year for thick-billed murres breeding on St. Paul.

Next year's Work plan (2009-2012 Tasks, Assignments, Timeline):

Walrus and benthos. _BSIERP B67 Walrus prey patch dynamics in the St. Lawrence Island polynya
 Chad Jay, chad_jay@usgs.gov, 907-786-7414; Jackie Grebmeier, jgrebmei@cbl.umces.edu

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates</i>
Order radio-tags	Jay, NPRB	December	2007-2008
Plan/prepare for field work in March	Jay, Fischbach, Trites	Jan-Feb	2008-2009
Field radio-tagging from Healy	Jay, Fischbach, Trites, Pungowiyi	March	2008-2009
Establish services agreement with EWC for blubber collection during spring hunt	Jay	April	2008-2009
Blubber sample collection Savoonga and Gambell	Hunters, FWS, EWC, Fischbach, Jay	May	2008-2009
Compile and decode telemetry data	Fischbach	July	2008-2009
Contract with Dalhousie University for analysis of lipid and fatty acid content of blubber samples	Jay, Iverson	July	2008
Ship blubber samples to D.U.	Fischbach, Jay	August	2008-2009
Progress report to NPRB	Jay, Grebmeier, Trites	October	Semi-annually 2008-2010
Supply telemetry data to data manager	Fischbach, Jay	November	2008-2009
Continue current (2008) and retrospective (2006) benthic data set analyses from SLIP region for walrus-prey study, including bivalve L/W and caloric content study	Grebmeier, Cooper	ongoing	2008-2010
Submit cruise and benthic data to required NSF CADIS site; link to BSIERP site	Grebmeier, Cooper	September	2008-2010
Benthic data collections-spring Healy cruise (HLY0901)	Grebmeier, Cooper, Jay	March	2009
Report on activities to Eskimo Walrus Commission	Jay, Grebmeier, Trites, Iverson, Fischbach, Pungowiyi	December	Annually 2007-2012
Report to communities of Savoonga and Gambell	Jay, Grebmeier, Trites, Iverson, Fischbach, Pungowiyi	TBD	2009-2010
Supply lipid analysis data to data manager	Fischbach, Jay	February	2009-2010
Complete publications	Collaborative among various PIs	January	2010-2012

Forage Fish. BSIERP B67, Forage Fish Patches Pribilof Islands, Kelly Benoit-Bird, 541-737-2063, kbenoit@coas.oregonstate.edu

<i>What</i>	<i>Who</i>	<i>Start (2008)</i>	<i>Other key dates</i>
Energetic content analysis	Heppell, student	September	
PI meeting	Heppell	October	
Start basic analysis of acoustic data	Benoit-Bird	October	
Analyze CTD data	Benoit-Bird, student	October	
Analyze chlorophyll filters	Benoit-Bird, student	October	
Contract Vessel	Benoit-Bird/Heppell	November	
Integrate net tow, energetic, and acoustic data	Benoit-Bird, Heppell	February	
Fine-tune plan studies, including coordination with other BSIERP-Patch collaborators	Benoit-Bird, Heppell	February-March	Review annually as needed
Supply data to data manager	Benoit-Bird, Heppell	April/May	Annually
Conduct field studies	Benoit-Bird, Heppell, students, techs	July-August	Complete field studies in August each year 2008-2009

Northern fur seals. BSIERP B67, Fur seal foraging and patch dynamics, Andrew Trites, 604-822-8181, a.trites@fisheries.ubc.ca

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates</i>
2008 field season Data analysis	Battaile, Nordstrom, Trites	January 1-December 1	
Secure housing for 2009 Pribilof field season	Trites	January-	
Purchase CTD and replacement 3D tags for 2009 field season	Battaile, Nordstrom, Trites	January to May	
Hire research assistants for 2009 field season	Trites, Nordstrom	January to May	
Attend 2009 NPRB Alaska Marine Science Symposium and BSIERP PI meeting	Trites, Battaile	January	
Review and update protocols for 2009 field season	Battaile, Nordstrom, Trites	January to June	
Train field personal	Battaile, Nordstrom, Trites	June- July	
Organize and procure supplies and logistics for 2009 field season	Nordstrom, Trites	March-June	
Conduct field studies, capture,	Nordstrom,	July-September	

tag, retrieve tags and consolidate data	Research assistants		
2009 field season Data Analysis	Battaile, Nordstrom, Trites	July-December 31	Ongoing
Supply data to data manager	Battaile, Nordstrom, Trites	January	Annually
Complete NPRB progress reports	Battaile, Nordstrom, Trites	April 1, October 1	Semi-annually 2008-2010
Report to communities of St. Paul and St. George	Trites	TBD	2009-10
Complete publications	Collaborative among various PIs	January 2010	Continue thru 2012

Seabirds (UAF) BSIERP B67, Seabird Diving, Stress & Stable Isotopes - Pribilof Islands, PI- Kitaysky, 907 474-5179, ffask@uaf.edu

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates</i>
Stress hormone analyses	Kitaiskaia	August-December	Annually 2008-2009
Stable isotope analysis	Dorresteijn, Barger, Young, Kitaiskaia	September-December	Annually 2008-2009
DNA-sexing of kittiwakes and murrens	Barger	October-December	Annually 2008-2009
Select seasonal field techs for St. Paul and St. George	Kitaysky	March-May	
Secure housing for field work at the Pribilofs	Byrd, Trites, Irons, Kitaysky	January-March	
Order data loggers	Kitaysky, NPRB	October-January	
Revise protocols for data collection and order needed equipment and supplies	Kitaysky	March-May	
Have protocols reviewed by other seabird colony team members	Kitaysky	April	
Coordinate field approaches to avoid conflicts	Kitaysky, grad students	April	
Train field personnel	Kitaysky, grad students	June	
Conduct field studies	Kitaysky, grad student, field techs	July-August	Complete field studies in August
Summarize available data on SIA, stress, and diving	Kitaysky, Kitaiskaia, grad students	December	Annually 2008-2009
Supply data to data manager	Kitaysky, grad students	January	Annually 2008-2009

Complete NPRB progress reports	Kitaysky, grad student	October 1	Semi-annually 2008-2010
Report to communities of St. Paul and St. George	Kitaysky, grad student	TBD	2009-10
Complete publications	Collaborative among various PIs	January 2010	Continue thru 2012

Seabirds (USFWS) BSIERP B67, Seabirds At-Sea, Kathy Kuletz, kathy_kulet@fws.gov, 907-786-3453

<i>What</i>	<i>Who</i>	<i>Start (2008)</i>	<i>Other key dates/items</i>
Submit Annual Progress Report and update Work Plan	Kuletz	September-October 2008	Provide at-sea component to Trites for PDS report
Liaison with other BSIERP & PDS collaborators	Kuletz, Irons, Byrd, Roby, Kitaysky. Trites	October 2008 September 2009	Side meetings during October 2008 PI meeting.
Work with graduate student and contractor to process and summarize survey data; submit to BSIERP data manager	Kuletz, Jones	October - November	Annually; Submit data to BSIERP data manager as it is processed. (by December)
Arrange for processing of birds collected in 2008; contracts for stomach and tissue analyses;	Kuletz, Roby, Byrd, Kitaysky	October- November	Do proximate composition analysis on subset by December 2008; apply for additional funds if continued.
Exchange data with prey survey PIs to begin analysis of seabird-fish data	Kuletz, Benoit-Bird, Heppell	November - December	Discuss analytical approaches during Oct. 2008 PI meeting
Data analysis and providing summaries to collaborators	Kuletz, Benoit-Bird, Heppell, Trites, Irons, Roby, Byrd, Kitaysky	Jan-March 2009	Work with graduate student. Annual, 2008-2010
Coordinate with PIs & biologists on the PDS plans for 2009 field effort. Prepare logistics for at-sea surveys	Kuletz, Irons, Roby, Byrd, Kitaysky, Heppell, Benoit-Bird, Trites	January – May 2009	Work with Jones in planning. Prepare & review protocols for data collection, seabirds collections (if applicable)
Secure permit and NPRB approval for seabird collections at sea.	Kuletz	Feb -April 2009	Prepare IACUC papers and proposal for review.
Conduct at-sea surveys in conjunction with prey surveys. Collect birds if approved.	Kuletz, Jones, Benoit-Bird, Heppell	July-August 2009	
Examine seabird response (foraging, productivity) to changes in prey base. Work on publications.	Kuletz, Benoit-Bird, Heppell, Jones, Irons, Roby, Byrd, Kitaysky	January, 2010	Collaborative; Continue 2009-2012