

Project #: B67

Title: BSIERP Patch Dynamics Study

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

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Contract Period and Amount of Funding:

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

Report Period:

1 October 2008 through 31 March 2009

Report Date:

8 April 2009

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 | 2007-2008 |
| Prepare for March fieldwork | Jay, Fischbach, Trites | Jan-Feb | 2008-2009 |
| Field radio-tagging from Healy | Jay, Fischbach, Trites, Pungowiyi | March | 2008-2009 |
| Benthic macrofaunal and sediment data collections-spring Healy cruises (HLY0801 and HLY0901) | Grebmeier, Cooper, CBL/UMCES | March | 2008-2010 |
| Progress report to NPRB | Jay, Grebmeier, Trites | October, April | Semi-annually 2008-2010 |
| Supply telemetry data to data manager | Fischbach, Jay | November | 2008-2009 |
| Report on activities to Eskimo Walrus Commission | Jay, Grebmeier, Trites, Iverson, Fischbach, Pungowiyi | December | Annually 2007-2012 |
| Supply lipid analysis data to data manager | Fischbach, Jay | February | 2009-2010 |

Forage Fish

| <i>What</i> | <i>Who</i> | <i>Start (2008)</i> | <i>Other key dates</i> |
|---|-------------------------------|----------------------|-------------------------|
| Start basic analysis of acoustic data | Benoit-Bird | October, 2008 | |
| Analyze CTD data | Benoit-Bird, student | October, 2008 | |
| Finish species ID for those organisms not positively ID'd onboard | Heppell, student | September, 2008 | |
| Energetic content analysis | Heppell, student | September, 2008 | |
| Attend 2008 BSIERP PI meeting | Heppell | October, 2008 | Annually |
| Attend and present at 2009 AMSS | Benoit-Bird, Heppell, student | Jan 2009 | Annually |
| Complete NPRB progress reports | Benoit-Bird, Heppell, Co-PI's | March 2009 | Semi-annually 2008-2010 |

Northern Fur Seals

| <i>What</i> | <i>Who</i> | <i>Start (2008)</i> | <i>Other key dates</i> |
|--|-------------------------------|----------------------|------------------------|
| Plan studies, including liaison with other collaborators | Trites, Battaile | January to May | |
| Purchase tags for 2009 field season | Battaile, Nordstrom, Trites | January - May | |
| Hire research assistants for 2009 field season | Trites, Battaile | January - 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 - June | |
| Secure housing for seasonal biologists in the Pribilofs | Trites, Byrd, Irons, Kitaysky | March | Annually 2009-2010 |
| Supply data to data manager | Battaile | January | Annually |
| Data Analysis | Trites, Battaile | On going | Annually |

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 | March-April | Nathan Jones, (Starts in July, trained in 2008) |
| Purchase equipment and supplies | Kuletz | March-June | Replace supplies as needed |
| Prepare protocols for data collection | Kuletz | March-June | Review annually as needed |
| Obtain permits to allow collection of kittiwakes and murre at sea | Kuletz | March-June | Submit proposal to NPRB and IACUC in April |
| Process carcasses of birds collected at sea in 2008 | Kuletz, Jones, Roby | October - March | Stomach samples sent in Nov 2008, results in Dec 2008. |

| | | | |
|--|--------|---------------|---|
| (TBMU & BLKI); send stomach and tissue samples to contractors for analysis. (partly supported with BSIERP funds) | | | SIA tissue and feather samples sent in March 2009, results expected by June 2009. |
| Edit and submit survey data | Kuletz | October-March | Submitted to NPPSD in Feb; preparing for NPRB in April. |
| Prepare progress report | Kuletz | March | Submit by April 1 |

Seabirds (UAF)

| <i>What</i> | <i>Who</i> | <i>Start (2008)</i> | <i>Other key dates</i> |
|---|------------------------------------|----------------------|--------------------------------------|
| Analyses of stress hormones | Kitaiskaia, | September'08 | March'09 |
| Analyses of stable isotopes | Kitaiskaia, graduate students | September'08 | March'09 |
| Develop protocols for analyses of diving records | Kitaysky, Watanuki (collaborator) | September'08 | March'09 |
| Summarize available data on SIA, stress, and diving | Kitaysky, Kitaiskaia, grad student | October | Reported @ PIs meeting in January'09 |
| Supply data to data manager | Kitaysky, grad student | | April'09 |
| Complete NPRB progress reports | Kitaysky, grad student | April 1 | April 1, 2009 |

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 BSIERP 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 & Benthos. Walrus radio-tags were ordered and five additional radio-tags were contributed in-kind by USGS for deployment in 2009. A total of 17 radio-tags were deployed on walruses in March 2009 within the region of the St. Lawrence Island polynya (9 males, 8 females). This completes the two-year radio-tagging objective. In addition to tagging walrus, we collected 69 scat samples from 18 haulouts for dietary analysis.

Data from walruses radio-tagged in March 2008 and lipid content measures from walruses sampled from the St. Lawrence Island harvest in May 2008 will be delivered to the data manager in April 2009. Summaries of these data were presented to the Eskimo Walrus Commission in Anchorage in February 2009. Plans are underway to collect blubber samples from the walrus harvest in May for lipid content measures, which will conclude the second and last of the two-year sampling objective.

We met our planned milestone to collect benthic prey samples south of St. Lawrence Island during the early spring 2009 BEST cruise on the USCGC Healy at various spatial scales (3-5 nm, 10 nm, 20 nm) and regionally (50-100 nm scale). Benthic infaunal samples (4 van Veen grabs/station) were collected during March 2009 at ~30 stations during the cruise. Samples were packaged and preserved for sorting back at our laboratory in Maryland. In addition, sediment was collected to determine sediment grain size, and organic carbon and nitrogen content on land. Surface sediment chlorophyll was determined shipboard. We also made 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 95% finished sorting samples collected on the 2008 Healy early spring cruise for our collaborative predator-prey patch dynamics study. Sediment grain sizing has been completed for both HLY0801 and HLY0802 and will be submitted to the BEST data archive once final calculations of percent phi size are made.

We will begin analysis of 2006, 2008, and 2009 data within the next few months with assistance from resource selection modeling consultants contracted in-kind by USGS. Our greatest challenge will be to match the spatial and temporal resolutions associated with walrus foraging locations, benthic biomass, and sea ice features within the St. Lawrence Island study area. In addition, we need to identify the suite of benthic infauna that are a “proxy” for areas of high carbon deposition and associated benthic biomass that will increase the prey field base for the higher trophic level consumers in the region (walrus and spectacled eiders).

Forage Fish. We have been focused on sample analysis, data analysis, and presentation of the data collected from our cruise (July 12th to August 8th). Samples for which species identification was not confirmed on board the vessel were sent to larval fish experts at the Alaska Fisheries Science Center, who identified our unknown samples. Fish sampling proximate analyses (lipid, protein, total caloric content) protocols were finalized, and sample analysis is ongoing. We also assisted with the diet analysis and proximate analysis of the collected-at-sea seabird samples.

Databases for both directed sampling (trawl) and acoustic mapping have been created. We have also been conducting initial spatial analysis of physical and biological oceanographic parameters, acoustic and trawl-based maps of prey distributions. Further analysis will include similar spatial maps of total caloric content of prey. Results of the initial analyses were presented at the 2009 Alaska Marine Science Symposium in January.

Seabird and Mammal Surveys. The USFWS re-hired the same graduate student / seabird observer, Nathan Jones, to continue the PDS study in 2009. Nate will work with the prey/oceanographic crew on board either of two PDS vessels, the *F/V Frosti* or the *F/V Goldrush*, to conduct surveys in the combined Pribilofs-Bogoslof study area. In 2009, Nate will be one of two observers and the two PDS vessels will rotate among the two sites. In 2009 Mr. Jones successfully collected 86 birds (black-legged kittiwakes and thick-billed murres). These carcasses were processed by Mr. Jones and Dan Roby’s lab in October 2008. Stomach samples from the birds were shipped to Kathy Turco in Fairbanks for analysis, and this data has been reviewed and summarized. Muscle, liver, and a secondary feather sample from each bird were also taken and were shipped for stable isotope analysis to the Northern Arizona University SIA lab. Results from the SIA analysis are expected by June 2009. Data from the seabird/marine mammal surveys were edited and processed and were submitted to the North Pacific Pelagic Seabird Database. The data will also be submitted to NPRB in April 2009..

Northern fur seals. Field assistants have been hired for the 2009 field season, and data loggers have been ordered along with all major field equipment needed on Bogoslof and the Pribilof Islands. The available data and metadata were submitted to NPRB and we are awaiting the possibility of more data to be extracted by the tag makers from the loggers we recovered that failed to communicate with the data download software. Analysis of data collected in 2008 was presented at a Patch Dynamics Study workshop in January 2009. Data analysis of the three dimensional dive profilers has been slow due to delayed development of customized software for analysis. However it should be available upon

completion of the 2009 field season when the majority of our data are collected. Data from two SMRU CTD instruments test trialed during summer 2008 were uploaded to the secure NOAA Pacific Marine Environmental Laboratory (PMEL) servers. This marks the beginning of the collaboration between UBC and Phyllis Stabeno (PMEL) to assist with data interpretation. Securing housing for 2009 has proven to be difficult on St. Paul and has yet to be finalized.

Seabirds (UAF). Overall we met our objectives for analytical analyses of collected samples. We finished all the planned hormonal and stable isotope analyses of samples collected in 2008. We have also completed stable isotope analyses of thick-billed murre's blood samples collected in the south-eastern Bering Sea during 2003-2007. Stable isotope analyses of black-legged kittiwakes' samples collected during 2003-2005 in the south-eastern Bering Sea are in progress, as are statistical analyses of diving data and compilation of obtained data for submission to the BSIERP data manager.

Lessons learned and project adjustments:

Walrus and benthos. The polynya south of St. Lawrence Island was extensive in 2009 due to sustained strong northerly winds; and the radio-tagged walruses mostly occupied the eastern and western sides of the polynya. Analysis of these data with benthic samples and available ice data has not yet begun. We have recognized the need to acquire sea ice imagery of the resolution necessary for resource selection analysis of walrus foraging. These products have not been acquired and analyzed yet and may require a moderate level of effort and expertise that was not originally anticipated.

A mean fat density of 78.6 (7.1 SD) was found from 17 walruses sampled in the spring 2008 harvest on St. Lawrence Island. The relatively small sample size will make comparisons to other years difficult. There will be an increased effort by the USFWS-EWC bio-sampling program to meet the desired sample size of 30 samples from each of Gambell and Savoonga this spring (2009).

We have nearly completed all the sorting of HLY0801 samples (95%), and will statistically analyze the data for community composition and correlations with environmental data. However, some preliminary statements can be made in relation to the location of tagged walruses in 2008. The dominant infauna on the western side of the study region where walruses were feeding included nuculanid, tellinid and nuculid bivalves. By comparison, in the eastern region of our study area where walruses were tagged, the infauna was dominated by maldanid polychaetes and trochid gastropods. Another interesting finding is that tellinid bivalves (*Macoma calcareo*, *Macoma moesta*) appear to be increasing in abundance in the study area compared to a decade ago. Analysis of our benthic time-series sites occupied during these cruises should provide some comparative insight on any changing environmental factors influencing the resurgence of this larger Arctic bivalve.

Due to known equipment limitations, we could not collect the deep-dwelling bivalves that walrus are known to feed on. We are not aware of any equipment that can penetrate deep enough in the sediments to collect these deep-dwelling bivalves. Thus, we are using a proxy of most probable bivalve biomass for these larger bivalves by using the biomass of the dominant, small bivalves in the region that walrus are also known to consume.

Forage Fish. Our primary adjustment is informed from our 2008 at-sea sampling and results from the diet analysis of seabirds collected at sea. Based on diet and behavior patterns of sea birds, for 2009 we will focus a substantially larger amount of effort on night-time sample collection.

Seabird and Mammal Surveys. Laboratory contracts for stable isotope analysis were higher than estimated at the time the proposal was submitted. Because only 86 of the anticipated 120 birds were collected in 2008, the full cost of analysis was just within budget. FWS contracting procedures took longer than anticipated due to personnel turnover and problems with the bidding labs incorrectly estimating full costs of delivery. This delayed SIA analysis by nearly six months. We will avoid this delay in 2009 by initiating contracts for SIA and stomach analysis in June or July, and finalizing contracts

no later than August, when we know the number of samples that require analysis. We expect to increase efficiency of survey data collection and bird collections by retaining the same graduate student that worked on the PDS in 2008. Our experience in 2008 will also enable us to more efficiently transfer information on tagged foraging birds to the prey sampling vessels. Based on the 2008 diets of collected birds and on behavioral evidence of nighttime foraging by birds, we will attempt more late evening or early morning collections in 2009. We will also explore options that allow for nighttime surveys of birds.

Northern fur seals. Preliminary analysis of the 2008 fur seal data showed that fur seals fed over large areas of the Bering Sea (ranging about 200 km from St. Paul Island), but did not reveal any preferred feeding locations or hot spots. Our two biggest challenges have been the need to develop appropriate spatial statistical software, and the need for more reliable instruments. A statistician working for the UBC Marine Mammal Research Unit has been working with some of the tracking data collected from northern fur seals and will be guiding our analysis. We also expect to have more reliable data loggers in 2009 and held discussions with Wildlife Computers about our needs. They have been receptive to our request and are building them for us.

Seabirds (UAF). Preliminary results suggest that 2008 was a food-poor year for piscivorous murre and kittiwakes breeding on the Pribilofs. Specifically, nutritional stress (as reflected in blood levels of corticosterone) was higher in kittiwakes breeding on the Pribilofs compared to Bogoslof, and compared to kittiwakes experimentally fed ad libitum on the Middleton Island. Nutritional stress levels in thick-billed murre breeding on the Pribilofs were also elevated compared to our historical data for the Pribilofs and compared to birds breeding on Bogoslof in 2008. Murre breeding on St. George Island were less affected by a food shortage compared to those breeding on St. Paul Island. Preliminary analyses of diving profiles further suggest that there was a seasonal increase in a maximal diving depth of thick-billed murre breeding on both colonies. This seasonal increase in the maximal diving depth was positively correlated with increasing levels of nutritional stress in murre breeding on St. George Island.

Stable isotope signatures of birds' blood cells suggest that in 2008 the diet compositions of kittiwakes and murre were different between birds breeding on St. Paul and St. George Island. Inter-annual comparisons of Carbon-13 signatures also suggest that the diet compositions of thick-billed murre are more similar between the colonies during years with late dates of winter ice retreat (i.e. 2004 and 2008), and tend to be more distinct during years with early dates of ice retreat (i.e. 2003 and 2005). Our results suggest that during cold years with late winter ice retreat, thick-billed murre breeding on St. Paul Island rely on prey originated in the ocean basin (as reflected in depleted C13 signatures of birds' blood). In contrast, during warm years with early dates of winter ice retreat, St. Paul thick-billed murre are likely to rely on prey originated in the shelf regions of the Bering Sea (as reflected in enriched C13 signatures of birds' blood).

Air transportation for all components of the Patch Dynamics Study could be affected by Mount Redoubt volcanic activity. We may therefore need to allow extra travel days (with associated costs) and may be forced to adjust start times.

Integration activity:

PIs involved in the Patch Dynamic Study participated in the BSIERP PI meeting in Girdwood in October 2008. The PI's met again in January 2009 prior to the Alaska Marine Science Symposium. This one-day workshop included graduate students, post doctoral fellows, and research associates — and was focused on presenting results from 2008 and discussing coordination of research in 2009.

Walrus and benthos. PI's Jay, Cooper and Grebmeier attended the Girdwood meeting with other BSIERP researchers and PIs Jay and Cooper met with other Patch Dynamics members during a PI meeting in Anchorage in January 2009, prior to the Alaska Marine Science Symposium.

Forage Fish. PI Heppell participated in the October, 2008 PI meeting in Girdwood, AK. PI's Heppell and Benoit-Bird, as well as graduate student Whitman participated in, presented at, and shared data, syntheses, and ideas with other BSIERP PIs and participated in the BSIERP PI meetings at the 2009 Alaska Marine Science Symposium

Seabird and Mammal Surveys. Outside of the patch dynamic study, we collaborated with a graduate student working in the Pribilof Islands by providing survey data, maps, and a commitment to writing portions of a publication on foraging ecology of Least Auklets nesting on the Pribilof Islands.

The seabird and mammal survey portion of the patch dynamic study 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 was processed and submitted to 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. Our survey data was included in the poster prepared for AMSS by Benoit-Byrd and Scott Heppell, PIs for the prey component of the PDS. The PI met with other PDS and BSIERP PIs during the October 2008 PI meeting, and the AMSS in January 2009.

Northern fur seals. In addition to participating in the PI meetings, we will be further integrating our field work with that of the seabird studies. Field collaboration with the seabird crews on both Bogoslof and the Pribilof islands will increase day to day collaboration in 2009 and will integrate more fully day-to-day living. Some fine tuning of tagging schedules will also occur to maximize data collection and minimize disturbance to the animals. Collaborations with Wildlife Computers have accelerated development of a new 3 dimensional dive profile logger and we have switched to a much smaller CTD.

Seabirds (UAF). We also shared our findings with other members of the Patch Dynamics project and broader audience during NPRB meetings in Girdwood and Anchorage. Our results on stress hormones in kittiwakes and murrens indicate that piscivorous top-predators breeding on the Pribilofs in 2008 were food-limited. This allows other components of the project to interpret their findings on forage patch dynamics in the context of "poor" foraging conditions in the vicinity of colonies in 2008. Furthermore, our measurements of changes in food availability (via stress hormones) and foraging behavior (via deployment of data-loggers) were conducted almost continuously and simultaneously with the at-sea surveys, which will allow an index of food availability (available to collaborators now) and diving profiles (work in progress) to be integrated with measures of fish and seabird distributions in the vicinity of the Pribilofs in 2008. Finally, inter-annual comparisons of stress and diet compositions (as reflected in stable isotope signatures of birds' blood) based on relatively long-term time series (some started in 1999) will also allow us to link observations made in 2008 to inter-annual changes in oceanography.

Education and Outreach:

Walrus and benthos. Lee Cooper provided a briefing in January 2009 to the local community members of Savoonga as well as to the Nome community about our patch dynamics study. USGS also provided a brief to the Eskimo Walrus Commission in February 2009 on last year's radio-tagging and blubber sampling efforts and our sampling anticipation for this spring. In addition, the walrus and benthic sampling teams were interviewed by Environmental Science and Technology journal, National Public Radio, ABC News, Polar TREC (Teachers & Researchers Exploring & Collaborating), and International Polar Year 2007-08 "On Thin Ice" regarding the walrus-benthos patch dynamics study during the Healy09-01 cruise in March 2009. A poster was also presented at the AMSS (Jay, C.V., J.M. Grebmeier, A.S. Fischbach, A.W. Trites, and L.W. Cooper. 2009. Spatial patterns of walruses and their benthic prey near St. Lawrence Island). PI Grebmeier gave an invited talk on the northern Bering Sea ecosystem at the international 2009 Arctic Science Summit Week in Bergen, Norway at the end of March 2009.

Forage Fish. We have not done any education and/or outreach for this project as of yet. We have a wide variety of digital images from the 2008 BSIERP patch dynamics cruise, some of which have already been provided to NPRB for outreach and publicity purposes. Others are available upon request.

Northern fur seals. Posters were presented on our research at the Alaska Marine Science Symposium in January 2009. (Battaile et al. 2009. Diving behavior of northern fur seals from St. Paul Island; Trites et al. 2009. Bering Sea Integrated Ecosystem Research Program: Patch Dynamics Study 2008). A presentation focused on fur seals and the patch dynamics study has been prepared for the Tribal Government of St. Paul Island. PI Trites has been invited to discuss our research with members of the community during Bering Sea Days in April.

Seabird and mammal surveys (FWS). Preliminary results from the at-sea component of the PDS were presented in a poster at the AMSS in January 2009 (Jones et al. 2009, At-Sea Distribution and Abundance of Three Central Place Foragers Around the Pribilof Islands).

Seabirds (UAF). Posters were presented at the Alaska Marine Science Symposium in January 2009.

Work Plans (2009-2012 Tasks, Assignments, Timeline):

Walrus and Benthics, 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>When</i> | <i>Other key dates</i> |
|---|---|----------------|-------------------------|
| Plan/prepare for field work in March | Grebmeier, Cooper (NSF funding) | Jan-Feb | 2010 |
| Field radio-tagging from Healy | Jay (pending NPRB support) | March | 2010 |
| Benthic macrofaunal and sediment data collections-spring 2010 ship TBD) | Grebmeier, Cooper | March | 2010 |
| Submit 2008-2010 field collected benthic data to NSF BEST CADIS archive (core funding), co-linked to BSIERP data center | Grebmeier, Cooper | April-March | 2009-2011 |
| Submit relevant archived benthic data and/or cross-link to already submitted data at NSF EOL/UCAR site | Grebmeier, Cooper | April-March | 2009-2010 |
| Continue bivalve L/W and caloric content study, retrospective and current field collected data analysis | Grebmeier, Cooper | ongoing | 2008-2010 |
| Progress report to NPRB | Jay, Grebmeier, Trites | October, April | Semi-annually 2008-2010 |
| Supply telemetry data to data manager | Fischbach, Jay | November | 2009-2010 |
| Report on activities to Eskimo Walrus Commission | Jay, Grebmeier, Trites, Iverson, Fischbach, Pungowiyi | December | Annually 2007-2011 |
| Attend BEST-BSIERP PI meeting | Grebmeier, Cooper, Jay | October | Annually 2008-2010 |

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> |
|---|---------------------------------------|----------------------|--|
| Complete NPRB progress reports | Benoit-Bird, Heppell, Co-PI's | March, October 2009 | Semi-annually 2008-2010 |
| Finalize vessel charter for B67 (and B77) | Benoit-Bird and Heppell | April, 2009 | |
| Prepare protocols for data collection and order needed supplies | Benoit-Bird, Heppell | May, 2009 | Review annually as needed |
| Load gear and ship supplies to Alaska | Benoit-Bird, Heppell, students, techs | June, 2009 | |
| Conduct field studies | Benoit-Bird, Heppell, students, techs | July-August, 2009 | Complete field studies in August each year 2008-2009 |
| Analysis of acoustic data | Benoit-Bird | Ongoing, 2009 | |
| Analyze CTD data | Benoit-Bird, student | October, 2009 | |
| Finish species ID for those organisms not positively ID'd onboard | Heppell, student | September, 2009 | |
| Energetic content analysis | Heppell, student | Ongoing, 2009 | |
| Attend 2009 BSIERP Principal Investigators meeting | Benoit-Bird, Heppell | October, 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> |
|---|--|----------------------|------------------------|
| Plan studies, including liaison with other collaborators | Trites, Battaile | January to May | |
| Purchase tags for 2009 field season | Battaile, Nordstrom, Trites | January - May | |
| Hire research assistants for 2009 field season | Trites, Battaile | January - 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 - June | |
| Train field personal | Battaile, Nordstrom, Trites | June- July | |
| Organize and procure supplies and logistics for 2009 field season | Battaile, Trites | March-June | |
| Conduct field studies, capture, tag, retrieve tags and consolidate data | Battaile, Nordstrom, Research assistants | July-September | |

| | | | |
|--|------------------------------------|-----------------------|-------------------------|
| 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 Dutch Harbor / Unalaska | 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> |
|--|---|---------------------|------------------------|
| Compile and submit 2008 data on stress & stable isotopes | Kitaysky | March-April | April 2009 |
| Stable isotope analysis of black-legged kittiwake blood samples collected at the Pribilofs during previous years (2003-2005) | Kitaiskaia | April | September'09 |
| Secure housing for field work at the Pribilofs | Byrd, Trites, Irons, Kitaysky | April-May | |
| Coordinate logistics of field camp on Pribilofs | Byrd, Trites, Irons, Kitaysky | April-May | |
| Order data loggers and field supplies | Kitaysky, Young, Dorresteijn | April-June | |
| Revise protocols for data collection | Kitaysky, Young, Dorresteijn | April-May | |
| Have protocols reviewed by other team members | Kitaysky, Barger | April-June | |
| Coordinate field approaches to avoid conflicts | Byrd, Trites, Irons, Kitaysky | April-June | |
| Train field personnel | Kitaysky | June | |
| Conduct field studies: deploy dataloggers, collect blood and diet samples | Dorresteijn, Young, Youngren, field tech | July-August | September |
| Complete NPRB progress reports | Kitaysky, Dorresteijn, Young, Youngren | October 1 | |

Seabirds (USFWS) BSIERP B67, Seabirds At-Sea, Kathy Kuletz, kathy_kuletz@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 | Provide at-sea component to Trites for PDS report |
| Liaison with other BSIERP & PDS collaborators | Kuletz, Irons, Byrd, Roby, Kitaysky, Trites | October - September | Meetings during October PI meeting, 2009-2011. |

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| Work with graduate student and contractor to process and summarize survey data; submit to BSIERP data manager | Kuletz, Jones | October - March | Annually; Submit data to BSIERP data manager as it is processed. (by March) |
| Arrange for processing of birds collected at sea; contracts for stomach and tissue analyses. | Kuletz, Roby, Byrd, Kitaysky | August - December | Do proximate composition analysis on subset; apply for additional funds if continued. |
| Exchange data with prey survey PIs for analysis of seabird-fish data | Kuletz, Benoit-Bird, Heppell | November - December | Continue annually, 2009-2012 |
| Data analysis and providing summaries to collaborators | Kuletz, Benoit-Bird, Heppell, Trites, Irons, Roby, Byrd, Kitaysky | Jan-March | Work with graduate student. Annually, 2009-2011 |
| 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 | Annually 2008-2009 |
| 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 |