

**Bering Sea Integrated Ecosystem Research Project: Semiannual Progress Report for B63**

**Project #: B63**

**Title:** BSIERP Seabird Telemetry - Pribilof Islands

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**Contract Period and Amount of Funding:**

15 April 2008 to 31 March 2010: \$599,917

**Report Period:**

1 March 2008 to 30 September 2008

**Report Date:**

30 September 2008

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### Proposed timeline and milestones within report period:

- Prepare detailed protocols for data collection and order needed equipment and supplies; Irons & Paredes; April-May.
  - Design and testing of innovative GPS casing for a flying/diving seabird
  - Write protocols for attachment of tags (GPS data loggers, time-depth recorders [TDRs], wet/dry sensor tags) and downloading methods.
- Have protocols and plan of work reviewed by other seabird on-colony team members; Byrd, Kitaysky, Roby; May-June.
- Coordinate field approaches to avoid conflicts; Byrd, Irons, Kitaysky, Roby; April
- Train field personnel; Irons, Roby, Paredes; June-July.
- Conduct field work; Paredes, Orben, Roby; July-September.
  - Deploy GPS data loggers, TDRs, and conductivity tags on 30 Black-legged Kittiwakes and 30 Thick-billed Murres at St. George Island and St. Paul Island.
- Send blood samples to contractor; Paredes; September.
- Summarize available data. Prepare NPRB semi-annual progress report; Paredes, Irons, Roby; September.

**Project Summary:** Our goal is to compare the foraging behavior, at-sea habitat use, and foraging distribution of two piscivorous seabirds, Black-legged Kittiwakes (surface/plunge-dive feeder) and Thick-billed Murres (pursuit-diving feeder), nesting on the Pribilofs Islands. We used state-of-the-art GPS data logger technology to track breeding seabirds during at-sea foraging trips, as well as TDRs and wet/dry sensor tags to assess activity budgets and diving behavior at-sea.

We seek to test the hypothesis that climate warming and sea ice retreat from the southern portions of the Bering Sea will have a greater impact on seabird nesting success and population growth rates on St. Paul Island (STP) than on St. George Island (STG), because of the proximity of St. Paul Island to the historical southern limit of Bering Sea pack ice. Further, we hypothesize that seabirds nesting on St. George Island will be buffered more from the negative effects of climate change because of proximity to the productive Bering Sea shelf break. We will address the following BSIERP hypotheses:

2. Climate and ocean conditions influencing circulation patterns and domain boundaries ... will affect ... prey-concentrating features and thus foraging success of seabirds and marine mammals (bottom-up). Specifically:
  - a. Changes will displace predictably located prey (hot spots) necessary for success of central place and hot spot foragers.
  - b. Central place foragers will shift their diet or colony locations to increase foraging opportunities.
3. Conditions will increase zooplankton production, resulting in more piscivorous fish (top-down [Oscillating Control Hypothesis] with possible trophic consequences:
  - a. Competition with piscivorous fish for forage species will lead to declines in fur seals, murres, and kittiwakes.
  - c. Changing conditions will affect fish and fishery distributions, local fishing pressure, and overlap and competition with other upper trophic predators.

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d. Fishing will reduce top-down control of forage species ...combined with predation and competition between piscivorous species, will result in.... a climax community dominated by arrowtooth flounder (similar to the Gulf of Alaska).

### **Progress Summary:**

D. Irons designed and pressure-tested the first GPS casing for a diving/flying seabird and we wrote the related protocols for logging/downloading and attachment based on other seabird studies. In May, we met with the other BSIERP/NPRB on-colony seabird field crew members to coordinate field approaches, sharing of equipment and housing/transportation logistics. We prepared an integrative protocol of all seabird field activities and people's roles in the field to avoid conflicts, which was revised by each seabird colony member and provided to all field teams. All on-colony project PIs and field teams met at St. Paul Island (STP) in early July, where personnel were trained over 5 days (i.e., capture techniques, tag attachment methodology, bleeding protocols, stomach lavage procedures, etc.) and bird plots were designated and allocated among teams.

Overall, the field season was very challenging, but successful; suitable active and accessible nests for capturing and tagging the two study species were in short supply on both islands, breeding adults were abandoning their nests (apparently due to low food availability), tags were not working properly (difficulties downloading to computer and brief battery life), and breeding seabirds frequently took unexpectedly long foraging trips. Nevertheless, we succeeded in obtaining 18 at-sea GPS tracks and activity budgets for Black-legged Kittiwakes nesting on each of the two Pribilof Islands, out of 21-23 tag deployments per island. Foraging locations differed between islands; most STP kittiwake foraging trips were in the nearshore around STP, while a few foraged on the shelf to the north of STP and a few took long-distance foraging trips to the southwest beyond the shelf break. The latter was the most common type of foraging trip for kittiwakes nesting on St. George Island (STG), however, while a few foraged on the shelf to the northeast of STG and even fewer foraged in the nearshore around STG. There was no overlap in the foraging tracks of Black-legged Kittiwakes nesting on the two islands, and there was no indication that kittiwakes were focusing foraging effort at hotspots.

Thick-billed Murres presented an additional challenge; breeding adults had difficulties acclimatizing to tag deployment, either the GPS/TDR tag combination or the GPS tag alone. On both islands, we recovered only 2 of 5 sets of GPS/TDRs (40%) that were initially deployed on murres, and that only following a 5-6 day period when the bird was absent from nest. In contrast, we retrieved 8 of 13 (62%) and 17 of 21 (81%) TDRs deployed on murres at STP and STG, respectively. TDRs deployed on murres were much smaller than the GPS data loggers and were attached to a leg band that was then applied to the bird. In contrast, the GPS data loggers were taped to the back feathers of the bird. Based on the recovered TDRs, the maximum dive depth for the murres was 135 m. We subsequently re-designed the casing for the GPS data loggers that were to be deployed on murres and changed the method of attachment on the back so as to minimize buoyancy and drag (see attached picture). After testing the new method using dummy GPS data loggers, we deployed five GPS data loggers on late-breeding murres on STG and successfully recovered all five. These murres made short foraging trips south of STG during the day, and they made longer trips east and southeast to the Pribilof Canyon at night. The short foraging trips appeared to be solely for chick provisioning, and this supposition was supported

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by observations at the colony during the day. We obtained 10 days of observational data of adult nest attendance, foraging trip duration, and chick diet composition for tagged and untagged murre nesting on both islands. Time spent at the colony for both members of a murre breeding pair was very short (less than 10 min), which suggests that food supply was not favorable (Piatt et al. 2007). In conjunction with personnel with BSIERP Project B65, we used stomach lavage techniques to help collect diet samples from birds captured on-colony for data logger attachment, and we obtained blood samples from these same birds for measurements of stable isotope ratios, stress hormone levels, and for sexing each bird (a component of BSIERP Project B67). Blood samples have been sent to the laboratory of Dr. A. Kitaysky at UAF for analyses.

**Lessons learned and project adjustments:** We knew this project would be challenging; there is a reason no one has successfully conducted such a study as ours. With the technology recently developed, however, we were optimistic that we could achieve our goals. We also learned that having enough active, accessible nests of Black-legged Kittiwakes and Thick-billed Murres can be a constraint on both of the Pribilof Islands; even though there are millions of seabirds nesting there, we were limited by the number of chick-rearing adults that we could access in order to deploy data loggers. The reasons for this are that most kittiwakes and murres are nesting on high, inaccessible cliffs that cannot be readily climbed to capture adults and deploy GPS units. Also, in addition to the new Seabird Telemetry Study (B63), there are two ongoing seabird research and monitoring projects on both islands, and each project requires captured birds, thus enhancing the challenge of identifying suitable nests to meet study objectives. We learned that the tags we used were near the size limit for these seabirds. We learned that Black-legged Kittiwakes and Thick-billed Murres are more likely to temporarily or permanently abandon their nests after tag deployment if the colonies are used for multiple research activities, or if the breeding adults are captured during the early chick-rearing period. We spent additional days on the islands at the end of the field season searching for new potential study areas that are not part of the AMNW Refuge monitoring program, where we can capture breeding adult kittiwakes and murres for data logger deployment. We have located a couple of new sites that we hope to use on STG in 2009 and 2010. The situation on STP is still problematic, however, because only a few small new study sites were found. Consequently, we are planning in 2009 to capture the mates of the birds that we captured this year. We plan to make a trip to Otter Island (8.5 km SW of STP) to check whether it may serve as a possible alternative location for our studies in 2009-2010. We also learned that in years of low food availability (like 2008), murres are less likely to cope with the effects of instrumentation, but tagging is possible. We are confident that the new GPS data logger casing and method of attachment that we developed this summer will allow us to obtain a larger number of murre GPS tracks in 2009, as we proposed for 2008. We also learned that the GPS data loggers need some adjustments so that downloading in the field is more reliable and longer bird tracks can be obtained for murres (the battery life was much shorter for the diving murres compared to the surface-feeding kittiwakes). We are in close contact with the GPS data logger engineers to find solutions to these problems so field work next year can run more smoothly.

### **Integration activity:**

We worked in collaboration and cooperation with three other BSIERP Projects: B65 (Seabird Colony-based Study), B67 (Patch Dynamics Study), and B77 (Bogoslof Patch Dynamics Study).

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Specifically, our field personnel on St. George Island and St. Paul Island worked closely with B65 personnel on the two islands to help collect data on-colony to assess reproductive success, diet composition, colony attendance, and foraging behavior of both Black-legged Kittiwakes and Thick-billed Murres. In addition, these two B65 personnel helped our study (B63) coordinate with on-going studies of seabird numbers and productivity at St. George and St. Paul islands, conducted by the Alaska Maritime National Wildlife Refuge, U.S. Fish and Wildlife Service. Field personnel with the Seabird Telemetry Study (B63) also coordinated with the Seabird Stress component (A. Kitaysky, PI) of the Patch Dynamics Study (B67; A. Trites, lead PI) to collect blood samples from adult kittiwakes and murres on both islands to assess overall condition. We also coordinated with the at-sea component (K. Benoit-Bird, S. Heppell, K. Kuletz, PIs) of the Patch Dynamics Study (B67) during July and August 2008. B63 personnel identified potential feeding areas for Black-legged Kittiwakes (mostly) and Thick-billed Murres nesting on St. George and St. Paul islands, using the GPS data logger tracks and provided the coordinates to the crew of the *F/V Frosti* for their adaptive sampling of forage fish abundance and distribution. In addition, the At-Sea Seabird component (N. Jones, field tech; K. Kuletz, PI) of the Patch Dynamics Study (B67) collected information on at-sea distribution, foraging behavior, and diet composition that will prove invaluable in interpreting the GPS data logger tracks of kittiwakes and murres. Finally, we worked closely with Ann Harding, the field leader for the Seabird Telemetry component of the Bogoslof Patch Dynamics Study (B77), to conduct the reconnaissance of the Bogoslof Island field site and plan for the seabird telemetry work that will be conducted there in 2009. Ann visited the Seabird Telemetry field crew on St. George Island to receive training in the use of the GPS data loggers and to assist with the field work.

The two Seabird Telemetry crews on the Pribilof Islands -- **Rosana Paredes, Nathan Banfield, and Caroline Poli** on St. George Island, ably assisted by **Ann Harding**; and **Rachael Orben, Ana Santos, and John Warzybok** on St. Paul Island, ably assisted by **Alexis Will** -- did an absolutely fabulous job of collecting data on the foraging distribution of kittiwakes and murres nesting on the Pribilofs. They frequently had to work under adverse conditions with temperamental new technology, but they were always determined to overcome the obstacles and collect completely novel foraging tracks. They collectively deserve all the credit for the success of this first field season, especially the two crew leaders: Rosana Paredes and Rachael Orben. Without these "dream teams" in the field, there would have been little to show for this first field season, which happened to be a year of low food availability and mediocre nesting success for both kittiwakes and murres on the Pribilof Islands.

In July, NPRB staff Thomas Van Pelt and Carrie Eischens visited St. Paul Island, and participated in and documented our field activities. We have participated in all PI conference calls. David Irons and Dan Roby are planning to attend the Girdwood PI meeting in October.

### Education and Outreach:

B63 personnel have appeared in the local Summer Newsletter on St. George Island and crew members were interviewed by the local radio station on St. Paul Island. Local people have talked with us on the streets and shown a lot of interest in our research. As requested, we plan to give public presentations of the 2008 results from B63 at the City Hall of St. George Island and in the School District during 2009.

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**Next year's Work plan :** Please see below the update of our plan of work for 2009.

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2009-2012 Tasks, Assignments, Timeline

<i>What</i>	<i>Who</i>	<i>Start ( 2009)</i>	<i>Other key dates</i>
Replace/fix GPS data loggers lost or damaged during 2008	<b>Irons, Roby, Paredes</b>	January	
Test GPS and TDR data loggers	<b>Irons, Paredes</b>	February – March	
Select seasonal biologists for St. Paul and St. George field crews	<b>Irons, Roby and Paredes</b>	March	Annually 2009-2010
Secure housing for seasonal biologists on the Pribilof Islands	<b>Irons, Roby, Paredes</b>	March	Annually 2009-2010
Review and update 2008 protocols for data collection in 2009 and order needed equipment and supplies	<b>Irons, Roby, and Paredes</b>	March-April	2009-2010
Have protocols reviewed by other seabird on-colony team members	<b>Byrd, Irons, Kitaysky, Roby</b>	April	Review annually as needed
Coordinate field approaches to avoid conflicts during field data collection	<b>Byrd, Irons, Kitaysky, Roby</b>	April	Review annually as needed
Train field personnel at field sites	<b>Irons, Roby, Paredes</b>	June	June each year 2009-2010
Conduct field studies and collect data in field	<b>Irons, Roby, Paredes, seasonal field biologists</b>	July-August	Complete field studies in August each year during 2009-2010
Send diet and blood samples to contractor	<b>Byrd, field biologists</b>	September	Expect annual results by end of year 2009-2010
Summarize available data	<b>Irons, Roby, Paredes</b>	October	Annually 2009-2010
Supply data to data manager	<b>Irons, Roby, Paredes</b>	November	Annually
Complete NPRB progress reports	<b>Irons, Roby, Paredes</b>	1 October 1 April	Semi-annually 2009-2012
Report to communities of St. Paul and St. George	<b>Irons, Roby, Paredes</b>	TBD	Annually 2009-2012

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Complete and submit publications	<b>Collaborative among various PIs</b>	January 2011	Continue thru 2012 January 2011
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