

Project #: B65

Title: Seabird Colony-based Studies, 04.37

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

G. Vernon Byrd and Heather M. Renner [PI change from Byrd to Renner at end of reporting period]

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Contract Period and Amount of Funding:

1 October 2007 to 30 September 2009
\$224,724

Report Period:

1 April 2009 to 30 September 2009

Report Date:

1 October 2009

Lead Author of Report:

John Warzybok

Proposed timeline and milestones within report period:

2009-2012 Tasks, Assignments, Timeline (note PI change at end of report period)

<i>What</i>	<i>Who</i>	<i>Start (2009)</i>	<i>Other key dates</i>
Plan studies, including liaison with other BSIERP collaborators	Irons, Kitaysky, Kuletz, Roby	February	During Alaska Marine Science Conference
Select seasonal biologists for St. Paul and St. George	Renner	March	Annually 2009-2010
Secure housing for seasonal biologists in the Pribilofs	Renner	March	Annually 2009-2010
Revise detailed protocols for data collection and order needed equipment and supplies	Renner, other AMNWR staff	March-April	Annually 2009-2010
Have protocols reviewed by other seabird colony team members	Renner, Irons, Kitaysky, Roby	April	Review annually as needed
Coordinate field approaches to avoid conflicts	Renner, Irons, Kitaysky, Roby	April	Review annually as needed
Make a preliminary trip to the Pribilofs to confirm housing, select study areas, and inform local people of planned work	Renner, possibly others	June	As needed 2009-2010

Initiate contracts for prey remains identification	Renner, Kuletz	April	Annually
Train field personnel	Renner, AMNWR staff	June	June each year 2009-2010
Conduct field studies	Renner, AMNWR staff, seasonal field biologists	June-September	Complete field studies in early September
Send diet and blood samples to contractor	Renner, field biologists	September	Expect annual results by end of year 2009-2010
Summarize available data	Renner, AMNWR staff, field biologists	October	Annually 2009-2010
Supply data to data manager	Renner	November	Annually
Complete NPRB progress reports	Renner	December	Semi-annually 2009-2012
Report to communities of St. Paul and St. George	Byrd, Renner, AMNWR staff	TBD	Annually 2009-2012
Complete publications	Collaborative among various PIs	January 2011	Continue thru 2012

Project Summary: The goal of this project is to determine the effects of inter-annual variations in environmental conditions and prey availability on diet composition, body condition and adult survival of breeding Black-legged Kittiwake and Thick-billed Murre on St. Paul and St. George Islands in the Pribilof Islands.

This project addresses the following BSIERP hypotheses:

2b: Reduced cold pool extent will increase overlap of inner domain forage fish and outer domain piscivores.

2d: Sporadic reversals to cold conditions (e.g., 1999) will have strong effects on the sub arctic community and result in increased inter-annual variability in abundance and pelagic productivity of piscivorous fish, seabirds and marine mammals.

3a: Competition with abundant, piscivorous fish species for forage species will lead to a decline in murre, 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). By reducing the prey base of forage fish, whales not only reduce the amount of forage fish available to other predators, but also their quality (lipid content).

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:

2009 field work

Due to an extremely poor breeding year we fell short of our banding goals for black-legged kittiwakes. All other planned milestones for this project were met. We banded a total of 26 kittiwakes on St. Paul. Of these birds only two had alpha-numeric bands attached for use in the adult survival portion of the study. An additional eight alpha-numeric bands were added to birds that were recaptured to recover geolocators deployed in 2008. All other kittiwakes captured in 2009 were fitted with geolocators to be recovered in 2010 as part of B63. A total of 83 thick-billed murres were banded on St. Paul of which 59 received either alpha-numeric or color bands to determine survival. The remaining murres were either fitted with geolocators (as part of B63) or released without an auxiliary marker (poor potential for re-sighting). We banded a total of 43 adult kittiwakes on St. George. Of these birds 18 received alpha-numeric bands. An additional 9 alpha-numeric bands were placed on birds that had been banded previously. We banded a total of 89 murres of which 49 received alpha-numeric bands. Additionally, 10 birds that had been banded in previous years were fitted with alpha-numeric bands for the survival study. We succeeded in collecting blood samples suitable for stable isotope analysis from 55 kittiwakes and 110 murres on St. Paul and 78 kittiwakes and 139 murres on St. George. Thirty samples will be analyzed from each species on both islands. In addition, we collected 36 diet samples from kittiwakes (28 regurgitations and 8 from water-offloading) and 50 diet samples from murres (all water-offloading) on St. Paul. On St. George, 31 diet samples were obtained from kittiwakes (28 regurgitations and 3 from water-offloading) and 56 samples were collected from murres (water-offloading).

Prey identification from 2008 seabird diet samples

Only one contractor is available in Alaska to identify prey in seabird diet samples, so results are received several months or more after the field season. Therefore we report results from the 2008 diet samples here.

A total of 47 kittiwake diet samples were collected from St. Paul and 54 from St. George during the 2008 field season. Of these, 15 (32%) samples from St. Paul contained no prey items and 13 (24%) from St. George were empty. Analysis of diet samples containing prey items (St. Paul n=32; St. George n=41) found fish remains (excluding offal) present in 66% of kittiwake samples from St. Paul (n=21) and 71% from St. George (n=29). For both islands, myctophids were the most common vertebrate prey item, occurring in 25% of samples from St. Paul (n=8) and 71% from St. George (n=29). Additionally, on St. Paul, sandlance occurred in 19% of kittiwake samples (n=6) but was absent from St. George samples. Squid, unidentified gadids, sandfish, greenling and unidentified fish accounted for the remainder of vertebrate prey. Various invertebrates were found in 47% of samples from St. Paul (n=15) and 46% from St. George (n=19). The most commonly occurring invertebrates in St. Paul samples were snails (22%, n=7) and amphipods (16%, n=5). Amphipods were present in 22% of the samples from St. George (n=9) while snails were found in only 7% (n=3). Additionally, offal was found in 22% of samples from St. Paul (n=7) and 17% from St. George (n=7).

For murres, 42 diet samples were collected on St. Paul and 52 were collected on St. George during the 2008 season. Of these samples, 13 (31%) from St. Paul and 24 (46%) from St. George lacked any discernable prey remains. Of the samples that contained prey items (St. Paul n=29; St. George n=28) fish remains were found in 90% of samples collected on St. Paul (n=26) and 93% from St. George (n=26). On St. Paul, walleye pollock occurred most frequently (24%; n=7) followed by eelpout (21%; n=6) and squid (17%; n=5). Squid (57%; n=16) dominated murre diet samples from St. George with walleye pollock present in 29% (n=8). Eelpout was only present in one sample from St. George. Invertebrates were found in 34% of the samples

from St. Paul (n=10) with mollusks occurring most frequently (24%; n=7). Invertebrates were only found in one St. George sample and consisted entirely of euphausiids. Analysis of diet samples collected during this report period will take place in the fall and early winter with results expected to be returned by January 2010.

Stable isotope analysis of seabird prey items

144 samples of fish and zooplankton (10 species) were selected for stable isotope analysis as representative prey items for kittiwakes and murre. The samples were collected at various stations on the 2008 at-sea surveys (48 inner shelf, 54 outer shelf and 42 slope) and processed by Luke Whitman at Oregon State University, before being shipped to Northern Arizona University for analysis. The samples were then analyzed to determine the stable nitrogen ($\delta^{15}\text{N}$) and carbon ($\delta^{13}\text{C}$) isotope ratios for comparison to blood and tissue samples collected from birds on the colony.

Lessons learned and project adjustments: Due to the close integration with the telemetry (B63) and patch dynamics (B67) projects, we learned that there are simply not enough accessible breeding birds to meet everyone's sample size requirements, particularly in a year of poor reproductive success. As such, fewer birds have been color-banded for the survival study than had been hoped since priority was given to deployment of over-winter geolocators. For those birds that have been individually marked, we believe that band re-sighting efforts should begin earlier in the season before kittiwakes have built up significant nests that obstruct the view of their legs. This could potentially be accomplished by the USFWS seabird monitoring crew that arrives on island in late May.

Data from the first season of sampling suggested that water-offloading was not necessary to collect diet samples from kittiwakes. We learned that almost all birds will regurgitate upon capture if they are carrying food. Subsequent stomach-pumping of birds that did not regurgitate confirmed that those individuals had empty or nearly empty stomachs. Therefore, water-offloading of kittiwakes was phased out during the season to eliminate unnecessary stress on the birds. We also further refined our water-offloading technique to include the use of a 500 μm testing sieve and flexible, plastic shelf liner in lieu of a five gallon bucket to facilitate collection and processing of the samples while in the field. This method minimized sample transfer, reduced the risk of sample loss, was much easier to transport, and allowed the samples to be completely processed and sealed while at the sampling site requiring no further work at the end of the day.

Integration activity: Data on reproductive parameters (clutch size, hatching success, fledging success, reproductive success) and nesting chronology were collected for kittiwakes and murre on both islands. These data were collected by USFWS field biologists according to established AMNWR monitoring protocols and will be applied to BSIERP project B65. Many birds captured for this project were fitted with data loggers and those data are part of BSIERP project B63 (seabird telemetry). In addition, blood samples from several birds captured on both islands as part of this study will be analyzed for stress hormones as part of BSIERP project B67 (patch dynamics).

Education and Outreach: In April 2009, Andrew Trites and Vernon Byrd presented summaries of 2008 findings and 2009 research plans both to the Tribal Government of St. Paul Island in a meeting organized by Samantha Zacharof and Phil Zavidil (TEK group) and to members of the community as part of the Bering Sea Days celebration. . Vernon Byrd also briefed the U.S. Coast Guard commanding and executive officers at St. Paul and provided material on BSIERP to the Loran Station. Brie Drummond participated in two presentations to a science camp on St. George in July 2009.

Next year's Work plan: Below is our work plan for the coming year:

BSIERP Project B65, Seabird Colony-based Studies, Heather Renner, heather_renner@fws.gov, 907-226-4623

2010-2012 Tasks, Assignments, Timeline

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