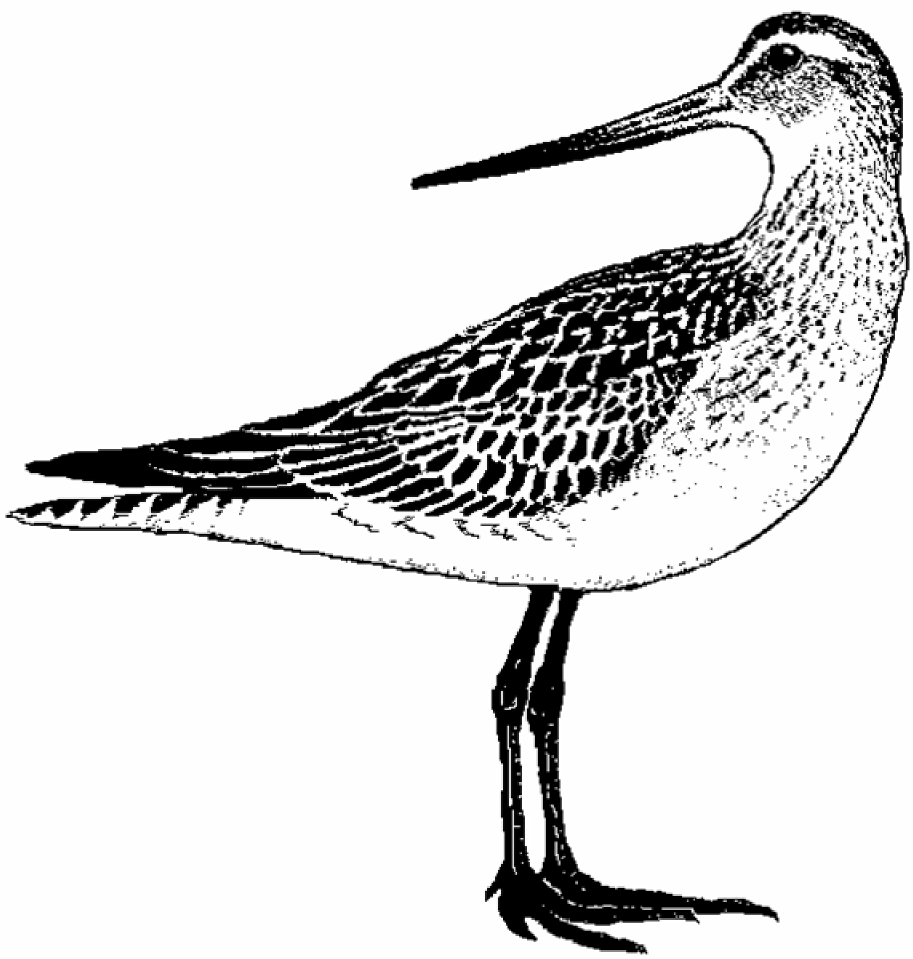
Alaska Shorebird Group

Summaries of ongoing or new studies of Alaska shorebirds during 2007



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Compiled and edited by Joe Liebezeit for the Alaska Shorebird Group. Anyone wanting additional information about these studies should contact the individual(s) noted at the end of each project summary.

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A note from the compiler:

Welcome to the 2007 summary report of ongoing or new studies of Alaska shorebirds. This is the sixth consecutive report put together by the Alaska Shorebird Group. In this document I compiled summaries for 35 studies highlighting many interesting projects including some ground-breaking research. By now we are all familiar with the exciting story of the Bar-tailed Godwit (bird E7) which has received well-deserved press. This birds' 11,000 km non-stop flight from Alaska to New Zealand is truly one of the most amazing migrations of any animal in the world. This is one of many fascinating summaries you can read in this report. I'm sure you will be impressed by the breadth and quality of studies of Alaska's shorebirds.

Among the 35 projects there were a total of 88 investigators involved in these projects, 27 of which participated in more than one project. Rick Lanctot contributed the most individual projects with 11 and Bob Gill was second with six. Women led eight of the total studies (23%) and accounted for 32% of the total investigators. Government agencies led most of the studies (16 of the 35; 46%). Academic institutions came up second leading 13 of the 35 projects (37%). For government agencies this included the U.S. Fish and Wildlife Service (n = 10), the U.S. Geological Survey (n = 5), and the U.S. Forest Service (n = 1). Lead academic institutions included the University of Alaska – Fairbanks (n = 6), Brigham Young University, Kansas State University, Montana State University, Moscow State University, Oregon State University, the University of Nevada, and the University of Science and Technology of China. The remaining six principal investigators represented non-government organizations including the Wildlife Conservation Society (n = 2), Audubon Alaska, Max Planck Institute for Ornithology, Prince of William Sound Science Center, and Wetlands International – Oceania.

In 2007 at least 11 of the 35 studies (31%) had some component of Avian Influenza [H5N1] sampling involved. The majority of the Alaska-based studies were conducted in three regions of the state including the Arctic Coastal Plain, Prince William Sound, and the Alaska Peninsula (20 of 25; 80%). Ten studies were conducted entirely or largely overseas at Alaska shorebird wintering grounds or at stopover points along their migration routes. These studies ranged far and wide and included nine different countries / territories.

I would like to acknowledge George West and Maksim Dementyey who graciously allowed the use of their superb artwork in this document. George West's contributions are on the front cover and on pages 6, 10, 13, 15, 19, 21, 24, 30, 35, 37, and 42. Makim's are on pages 4, 26, and 32. Finally, I would like to thank Bob Gill for compiling the first four annual summaries and for Rick Lanctot for compiling the 2006 report. We look forward to many more years of fruitful research on Alaska's shorebirds.

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WINTER ECOLOGY OF BUFF-BREASTED SANDPIPERS IN BRAZIL: MORPHOMETRY AND SEXING – *Almeida et al.*

Investigators: Juliana Bosi de Almeida and Lewis W. Oring, University of Nevada, Reno; Iara F. Lopes and Silvia N. Del Lama, Universidade Federal de São Carlos, Brazil; and Richard Lanctot, U.S. Fish and Wildlife Service

As part of a broader study on the winter ecology of Buff-breasted Sandpipers, we determined the applicability and accuracy of using a discriminant function analysis of morphometric variables to identify the sex of individual birds that were captured at wintering and breeding areas. Buff-breasted Sandpipers were captured at Parque Nacional da Lagoa do Peixe and Estação Ecológica do Taim, Rio Grande do Sul State, Brazil, during the boreal winters (October – March) of 2001-2004, and at Prudhoe Bay, Alaska, during the summers of 1991 – 1994. Captured birds were sampled for blood, aged by wing coloration patterns, and had their tarsus, exposed culmen, head and culmen combined, and wing measured. We also measured museum specimens of birds collected in North America that had been sexed by inspection of gonads (n = 68).

The sex of 235 birds (including 6 previously sexed museum specimens) from the wintering grounds was determined molecularly using fragments of the CHD gene (amplified with primers P2 and P8), whereas the sex of birds from the breeding grounds (n = 78) was based exclusively on their display behavior and attachment to nesting sites (only females incubate eggs). Of the 235 wintering birds, 201 birds were measured and aged. In this species, males are larger than females, although the degree of sexual size dimorphism varied among the parameters measured. Hatch year and after-hatch year birds captured on the wintering grounds were similar in size after controlling for sex. We also observed differences in the distribution of these morphometric parameters when comparisons were made between birds sampled in Brazil and those in North America.

Discriminant functions derived from a Brazilian subsample of birds (n = 150) had very small posterior error-rate estimates (≤ 1) and an accuracy of 90% or greater when applied to two validation data sets, one of breeding birds (n = 78) and one on a second subsample of wintering birds caught in Brazil (n = 74). Discriminant functions derived from measurements taken from North American museum specimens were on average less accurate in predicting the sex of birds belonging to the two validation data sets. We conclude that the discriminant function analysis is an accurate and useful tool to determine sex of Buff-breasted Sandpipers and that functions derived from measurements of live birds are more accurate than functions derived from measurements of museum specimens. We plan to publish the functions with higher accuracy in a peer reviewed journal.

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CHANGES IN BREEDING BLACK OYSTERCATCHER NUMBERS IN SITKA SOUND, ALASKA - *Andres*

Investigator: Brad Andres, U.S. Fish and Wildlife Service

In 1940, J. Dan Webster, as part of his Cornell University's Master of Science degree, studied Black Oystercatchers breeding in Sitka Sound, Alaska. During his investigations, he surveyed the sound's shoreline between Fred's Creek and Kita Island to estimate the breeding-season population. He also documented territorial and nesting pairs and recorded characteristics of the nest sites he discovered. Results of the work yielded a population of 38 breeding pairs and 26 non-breeding birds in the study area. In 1994, Webster returned to Sitka Sound to quickly re-survey his study area and found a dramatic decrease in the population of breeding oystercatchers (only 4 pairs). He was not able, however, to measure any shoreline environmental variables that might have caused the decrease in oystercatcher numbers. In 2007, I, along with Bob Christensen and Corrie Bosman, re-visited nest sites surveyed by Webster and measured environmental characteristics of former and current nest sites.

As Webster predicted, we found a reduction of 31 pairs of Black Oystercatchers nesting in Sitka Sound. Of 22 sites occupied in 1940, only 4 were used by nesting oystercatchers in 2007. Additionally, we only observed 2 birds not associated with territories in the sound. Several factors appear to have wrought the changes we observed. Near town, many new houses have been constructed on rocks that were formally used by breeding pairs. On the north side of the sound, rogue logs have washed ashore and have eliminated nesting habitat. Farther seaward, however, nest sites and feeding areas appear to be able to support oystercatchers, and the lack of breeding birds is perplexing. The influence of increasing numbers of Bald Eagles and, perhaps, Common Ravens on long-term population dynamics of oystercatchers is unknown. Comparing photos of nest rocks Webster took with those we snapped suggests that plant succession has not eliminated nesting habitat in much of Sitka Sound. A parsimonious and satisfactory explanation for the decline in breeding Black Oystercatchers in Sitka Sound remains elusive.

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DUNLIN MOVEMENTS BETWEEN ALASKA AND ASIA: DOCUMENTING THE POTENTIAL FOR ARCTICOLA DUNLIN TO BE EXPOSED TO H5N1 AVIAN INFLUENZA VIRUS – *Barter et al.*

Investigators: Mark Barter, Wetlands International – Oceania, Richard Lanctot, U.S. Fish and Wildlife Service, and Robert Gill, U.S. Geological Survey

There is serious concern that migratory waterbirds may transfer highly pathogenic H5N1 avian influenza (HPAI) from the non-breeding grounds in Asia, via the Alaskan breeding grounds, into continental North America. To determine the possibility of *arcticola* Dunlin transferring HPAI from East Asia to Alaska, information is needed about the temporal and spatial distribution of the subspecies in the East Asian non-breeding region and the likelihood of the species coming into contact with HPAI.

Initial banding, and subsequent resighting and recovery (i.e., captures) data were sought from national organizations, banding groups and individuals known or believed to have worked with Dunlin in their nonbreeding and breeding range within East Asian Australasian Flyway. Data included the number of dunlin marked in some way at particular locations, and resightings or recoveries of birds that were dyed, banded, marked with only colored leg-flags (designating country where banded but not individuals), or colored leg-flags and bands (designating individual birds). A table and a series of maps were generated to show movements of *arcticola* dunlin between various countries and different parts of Alaska. Documenting movement patterns was hampered by the relative lack of sighting effort in mainland China and South Korea, and also along potential migration routes in Far East Russia. The locations of the HPAI outbreaks in the countries where Dunlin spend the non-breeding range were also mapped. Dunlin likely come into contact with HPAI in the Yangtze floodplain when large numbers of Dunlin congregate in the Yellow Sea before northward migration. Assessment of the potential for Dunlin to come into contact with HPAI is restricted by the almost certain "under-reporting" of outbreaks in mainland China and the fact that information on outbreaks in Taiwan are not listed by the World Animal Health Organization. Our conclusions should improve as more resighting data become available from the non-breeding and migration areas during the upcoming winter and associated migration periods.

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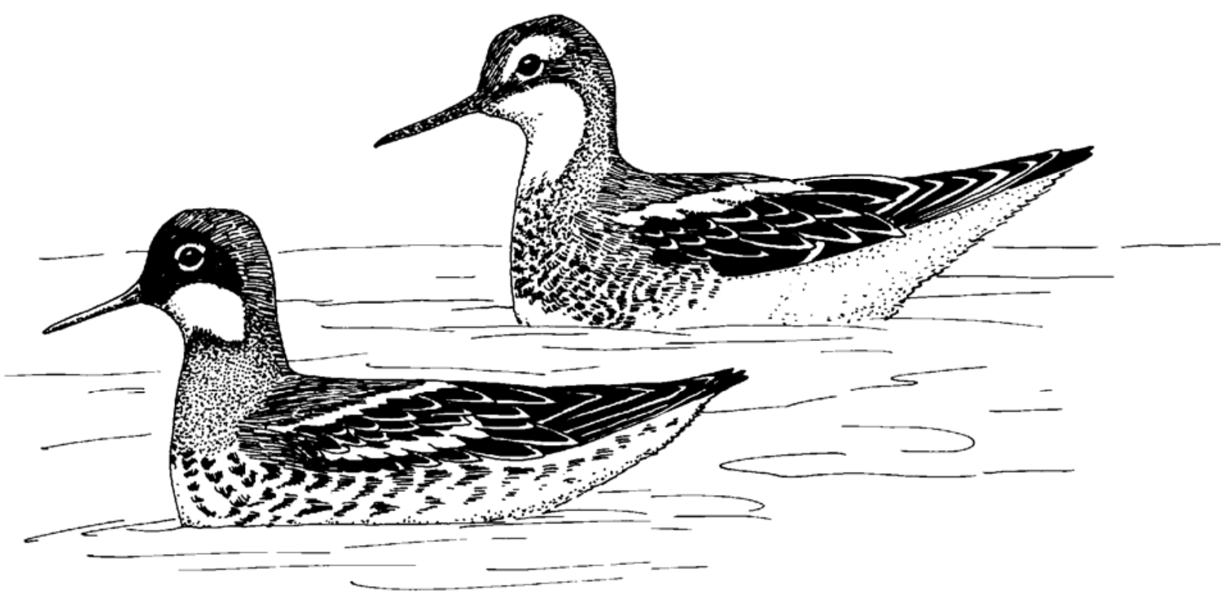

***AVIAN INFLUENZA SURVEILLANCE ON THE COPPER RIVER DELTA ALASKA IN 2007** – Bishop et al.*

Investigators: Mary Anne Bishop, Prince William Sound Science Center; John Takekawa and Sam Iverson, U.S. Geological Survey San Francisco Bay Estuary Field Station; Joseph Dudley, SAIC Corporation; Michael Lodes, CombiMatrix Corporation.

During 2007 spring migration, cloacal and pharyngeal swabs were taken from 80 shorebirds mistnetted at Hartney Bay, on the western Copper River Delta. In all, we sampled 76 Western Sandpipers (*Calidris mauri*) and four Least Sandpipers (*C. minutilla*). We focused on Western Sandpiper because this species had previously been identified as a potential carrier of the highly pathogenic avian influenza (HPAI). Cloacal and pharyngeal samples were sent to University of California at Davis Wildlife Health Center for viral isolation. At the Prince William Sound Science Center laboratory we used antigen test strips on fresh cloacal samples of shorebirds. The ability of these tests to detect low titers of virus in wild birds, however, is not known. A research microarray was used to screen a subsample of avian influenza samples in cooperation with CombiMatrix Corporation.

Our study demonstrated that there is significant potential for coupling state-of-the art technologies like antigen strip tests and microarray chips for obtaining surveillance results. Development of these systems could prove vital in efforts to reduce the impact of highly pathogenic avian influenza outbreaks on wildlife, commercial poultry, and human health. This work was performed under the auspices of the Center for Innovative Technology's Institute for Defense and Homeland Security in support of the Department of Defense and Air Force Research Laboratory.

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***RUDDY TURNSTONE AND BLACK-BELLIED PLOVER STUDIES AT WOOLLEY LAGOON, SEWARD PENINSULA, ALASKA** – Bruner and Bruner*

Investigators: Phil and Andrea Bruner, Department of Biology, Brigham Young University Hawaii

Our 2007 field season (9-21 June) marked our fourth year investigating the breeding biology of Ruddy Turnstones. During this time we also monitored our Alaska banded turnstones at two wintering sites in Hawaii. To date we have individually color-banded 20 adult turnstones and 16 chicks in Alaska along with three adults in Hawaii.

The turnstone hatch at our study site in 2007 began on 18 June and was 80% completed by 20 June. Long-tailed and Parasitic Jaegers in flocks as large as 75 birds were a constant threat. Red Fox were also regularly observed in the area. Despite these challenges we lost only one nest. The exceptionally aggressive attacks on predators by turnstones have been reported in the literature as a reason why other shorebirds often nest near turnstones in order to take advantage of the defense they provide. This aggressiveness can also have some negative effects as we have frequently observed male turnstones attacking and pulling feathers from turnstones on adjoining territories, especially when tending their chicks.

We had our first record of Ruddy Turnstone mate retention in 2007. This pair was initially banded in 2004. The female first returned in 2006 and used a nest made by another pair in 2005. Her mate that year was her 2004 neighbor's chick. Her 2004 mate returned to the study site for the first time in 2007 and they established a new nest 50 ft. from her 2006 nest and 350 feet from their original 2004 nest.

A second 2004 male also returned for first time in 2007. This male has been observed at Kona, Hawaii every winter from 2004 to 2007. He did not over-summer at Kona in 2005 or 2006. Assuming he bred in those years it was not at our study site. A 2005 male returned in 2007 to his breeding territory for the third consecutive season. Each year he had a new mate which we subsequently banded. His breeding territory covers a linear distance of 600 ft. and is the longest turnstone territory at our study site.

During the 2007 field season we also took blood and feathers from adults and chicks to begin a long-term extra pair mating study. The results of this initial effort are still under investigation at the Alaska Science Center USGS Molecular Ecology Laboratory.

Our second year of testing for egg recognition by nesting Black-bellied Plover found that all 5 males would not sit on the smaller wooden decoy Ruddy Turnstone eggs but all 3 females sat and apparently did not recognize that their eggs had been replaced. One nest contained 3 eggs plus a rock the size of an egg. The fourth egg was sitting 6 in. from the nest. The male refused to sit on the decoy eggs but quickly sat on the 3 eggs and rock at the conclusion of the test. Over the two year test period 7 out of 9 males refused to sit on the decoy eggs whereas all 7 females tested have readily sat. We intend to continue this experiment by testing the males just prior to hatching. We hope to see if their long investment in incubation will overcome their resolve to not sit on unfamiliar eggs.

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THE ABUNDANCE AND DISTRIBUTION OF DUNLIN IN EASTERN CHINA AND THE POTENTIAL FOR THEM TO COME INTO CONTACT WITH CARRIERS OF AVIAN INFLUENZA – Cao and Barter

Investigators: Lei Cao and Mark Barter, University of Science and Technology of China, Hefei, Anhui Province, People's Republic of China

There is serious concern that migratory waterbirds may come into contact with highly pathogenic H5N1 avian influenza (HPAI, in contrast to low pathogenic avian influenza abbreviated as LPAI) in China during the non-breeding season and carry the virus to their Alaskan breeding grounds, with subsequent transfer via other species to continental North America.

The Dunlin (*Calidris alpina*) is an ideal species for studying the potential spread of HPAI as the *arcticola* subspecies breeds in Alaska and spends the non-breeding season in East Asia. Little is known about the distribution of the subspecies in East Asia, but the presence of large numbers of *arcticola* in China can be inferred from population estimates in the non-breeding areas and there have been re-sightings of Alaskan-flagged Dunlin at Chongming Island in the Yangtze River estuary and the recovery of a Chongming Island-banded bird in Alaska.

Recent analyses have shown that Guangdong is the epicenter for HPAI and that the virus is endemic in domestic poultry in southern China. Reported instances of HPAI are widespread across eastern China, and HPAI has been found in a number of waterbird species. LPAI has been recorded from 17 waterbird species that occur commonly in eastern China and is particularly prevalent in the *Anatidae*.

Surveys were conducted along the coasts of Shandong, Jiangsu and Zhejiang Provinces, and in the Huai River floodplain. Previous surveys had covered the Yangtze River floodplain, part of the Huai River floodplain and the Jiangsu coast.

The major conclusions from an analysis of the data from our waterbird surveys, augmented by additional information from other sources, and reported HPAI instances are:

1. the Dunlin non-breeding population in eastern China is estimated to be 490,000 birds, with about 20% occurring at inland wetlands;
2. Dunlin are distributed widely along the Chinese coast from Guangdong in the south to Hebei in the north, and in the middle reaches of the Yangtze River;
3. major Dunlin concentrations occur in northern and central Jiangsu, central Fujian and at a number of wetlands in the Yangtze floodplain;
4. Dunlin occur in a number of areas where HPAI has been reported, particularly in the middle reaches of the Yangtze River and coastal Guangdong;
5. the Dunlin distribution overlaps significantly with that of the ten most common Anatidae species residing in eastern China within which LPAI is prevalent or which have been identified as posing a relatively high risk of spreading HPAI; and
6. Flocks of domestic geese, ducks and chickens are commonly encountered in wetland areas throughout the regions where Dunlin occur providing opportunities, particularly in inland regions, for transmission of HPAI and LPAI via the fecal-oral route.

It is recommended that:

1. Dunlin should be sampled for AI viruses at inland sites where there are large concentrations of Anatidae potentially carrying LPAI. It would be desirable to extend this program to Guangdong as this region is believed to be the HPAI epicenter. Blood samples should be taken at the same time for genetic analysis to add to information on the geographic distribution of the different subspecies;
2. Surveys for Dunlin should be conducted in the coastal and sub-coastal regions of Guangdong and neighboring Guangxi. This will complete the coastal survey of the coastline of south-east China;
3. A study should be conducted on the non-breeding ecology of Dunlin in China, with emphasis on understanding what determines their inland distribution and movements between coastal and inland areas. The study should also include an assessment of the degree to which Dunlin and Anatidae share habitats at inland wetlands; and
4. Systematic information should be collected on the distribution and numbers of domestic duck and geese flocks at inland wetlands.

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Tundra-Nesting Shorebirds in Relation to Landscape Transformation and Climate Change – *Coutsoubos et al.*

Investigators: Nathan Coutsoubos and Falk Huettmann, University of Alaska Fairbanks, Richard Lanctot, U.S. Fish and Wildlife Service, and Andrew Brissette, Bridgewater State College

In June and July 2007, we continued a dissertation research program started in 2005 on tundra-nesting shorebirds in relation to ongoing local-scale landscape transformation and climate change. Work was conducted 5-12 km south of Barrow and involved studies at a recently constructed landfill, at a water-level manipulated wetland in the Barrow Environmental Observatory, and at old transect sites established in the 1970s.

The North Slope Borough began constructing a new, modern landfill during the winter of 2004/2005. Construction was completed in July 2007 and waste transfer began soon after. This construction project provides an ideal opportunity to determine how local birds respond to a landfill prior to and during landfill use. Ten transects (8.5 km total) were established near the landfill (stratified by distance and direction). Distance sampling surveys were conducted along these transects weekly during the territory establishment, nest initiation and incubation periods of the breeding cycle, from 9 June to 6 July, 2007. Individual avian detections (single or clusters) numbered 1166 from 32 species, including 621 shorebird detections of nine species. The most common shorebirds (unadjusted counts) were Red Phalarope (204 detections, 291 individuals), Pectoral Sandpiper (117 and 148), Dunlin (121 and 141), and Long-billed Dowitcher (65 and 76). This and similar information collected in previous years will allow us to assess changes in shorebird distribution and abundance as the landfill grows. We also measured parental attendance at 12 shorebird nests located in and near the landfill, using within-nest temperature probes. This information may provide mechanistic evidence of how landfill construction disturbance affects nesting shorebirds.

Additionally, we carried out another year of surveys in a 60-ha wetland, whose water levels will be manipulated over the next several years, to mimic the predicted effects of global climate change on tundra hydrology (the Barrow Biocomplexity Project). This year, construction of project infrastructure neared completion. Surveys were conducted twice weekly on three separate 300m transects during the shorebird nesting season, 10 June to 6 July. A total of 442 avian detections (single or clusters) were recorded belonging to 21 species, including 222 shorebird detections of 7 species. The most common shorebirds (unadjusted counts) were Red Phalarope (61 detections, 109 individuals), Dunlin (52 and 58), and American Golden-Plover (45 and 56). Analysis of these survey data should provide experimental evidence of the local effects of a warming climate and consequent altered hydrology on shorebirds.

Finally, we continued with a second summer of surveys on four 1000m tundra transects first surveyed in the late 1970s as part of a baseline monitoring project. Surveys were conducted weekly from 11 June to 6 July. In total, 467 avian detections were recorded involving 20 species, including 224 shorebird detections of seven species. The most commonly encountered shorebirds (unadjusted counts) include Red Phalarope (62 detections, 99 individuals), Pectoral Sandpiper (53 and 64), Dunlin (44 and 50), and Long-billed Dowitcher (30 and 46). A comparison of data collected in the 1970s and now will demonstrate whether the distribution and abundance of local shorebird populations have changed over time. Data analysis is able to proceed using both the analytical techniques of the late 1970s and modern distance sampling methods, providing a robust comparison of then and now.

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EXPERIMENTAL EVIDENCE OF CLUTCH REPLACEMENT IN DUNLIN (CALIDRIS ALPINA ARCTICOLA) ON ALASKA'S NORTH SLOPE – *Gates et al.*

Investigators: H. River Gates and Richard Lanctot, U.S. Fish and Wildlife Service; Audrey Taylor, University of Alaska Fairbanks; and Liliana Naves, U.S. Fish and Wildlife Service and Alaska Department of Fish and Game

Arctic breeding shorebirds are suspected of laying replacement clutches sporadically if the first nest is lost. However, it remains virtually unknown how often Arctic shorebirds replace lost clutches as no quantitative study has examined this issue. We investigated the propensity of Dunlin (*Calidris alpina arcticola*), a monogamous Arctic breeding shorebird, to lay replacement clutches by experimentally removing the first clutch of eggs. We captured 20 Dunlin pairs, marked both adults (except one male; females were marked with color bands and radio transmitters while males were only marked with color bands) and collected their first clutches during early incubation (14-19 June 2007). Nests were initiated between 4-11 June and were collected (n = 19) or naturally depredated (n = 1) an average of 6.7 days into incubation (range=3 -10 d). Of the 20 pairs, 17 females (85%) initiated a replacement clutch after experimental collection of their first clutch. One additional female was located via aerial telemetry but was never found to be associated with a replacement clutch nest. The two remaining females were not detected past the removal of the first clutch. Fifteen females that laid a replacement clutch were found with their original mate and laid their replacement clutch on average 232 m from their initial clutch (range 70-398 m). Conversely, one female laid her second clutch 7.2 km away and did not keep her original mate. Due to the lack of color bands on her original mate, one replacement clutch female's mate fidelity could not be confirmed. Field efforts conducted during the replacement clutch hatching period led to the discovery of two males whose initial females had not been detected past the removal of the first clutch. These males were acting broody and were suspected of having a brood with a new mate. One male was not color-marked (due to the nest being depredated before capture of male) and could not be followed to see if it renested, and one male was not detected after the first clutch was collected. The average number of days from first clutch collection to initiation of the replacement clutch was 6.7 days (range 3-15 d).

The high rate of replacement clutch laying we found in this study calls into question assumptions commonly used when estimating shorebird productivity and population size. These issues may, for instance, lead to overestimates of population size when employing Arctic PRISM procedures. Our results indicate that Dunlin, and perhaps other Arctic breeding shorebirds, have a high propensity to lay replacement clutches. This suggests that some Arctic breeding shorebirds species may not be limited by food availability, physiological constraints and breeding season length as previously suspected. Studies focusing on the affects of nest loss timing, mating system and levels of predation on replacement laying and ultimately on brood survival are needed to obtain a better understanding of shorebird breeding ecology.

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USGS ALASKA SCIENCE CENTER SHOREBIRD AVIAN INFLUENZA MONITORING EFFORTS **–** *Gill, R. et al.*

Investigators: Bob Gill, Dan Ruthrauff, and Lee Tibbitts, USGS

In a continuation of previous efforts, the USGS Alaska Science Center Shorebird Project targeted a group of shorebird species for the presence of the Asian H5N1 subtype of highly pathogenic avian influenza (HPAI) in 2007. Extensive efforts in 2006 allowed us to refine our sampling approach in 2007 and focus our sampling efforts on a subset of species at a few select sites. As a result, we collected approximately 15% fewer samples from live birds in 2007 compared to 2006, but our efforts were concentrated on a few high priority species. For the actual sampling process, we followed the recommendations of the Interagency Influenza Working Group and collected paired cloacal and oral-pharyngeal samples, thus effectively sampling each bird twice. Oral-pharyngeal samples were collected in favor of environmental samples (i.e., fecal samples), which were not collected in 2007. Our efforts were focused at sites along the coast of western Alaska during both the spring and fall migration periods, at locations and time periods when high priority species could most easily be sampled. We sampled birds at the Tutakoke River, Yukon Delta National Wildlife Refuge, from May 15–30, the Andreafsky Wilderness, Yukon Delta National Wildlife Refuge, from June 19–23, and Angyoyaravak Bay and the Tutakoke River again from August 21–September 22

We collected a total of 857 paired cloacal/oral-pharyngeal AI samples from 12 shorebird species between May and late-September 2007. Most of the samples (n = 812; 95%) were from three target species (Dunlin, Rock Sandpiper, and Sharp-tailed Sandpiper); the remaining samples were from five other target species (n = 19) and four non-target shorebird species (n = 26). Results from these sampling efforts were not available at the time of this submission.

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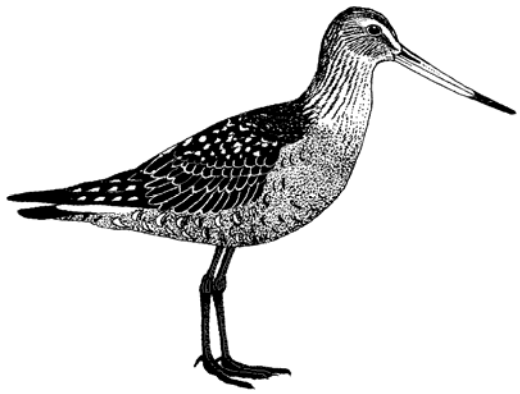

STATUS OF THE MARBLED GODWIT ON BLM LANDS ON THE ALASKA PENINSULA – *Gill, R. et al.*

Investigators: Bob Gill, Dan Ruthrauff, and Lee Tibbitts, USGS

Between 6 and 11 May 2007, personnel of USGS's Alaska Science Center continued aerial line transect surveys over known or suspected Marbled Godwit (*Limosa fedoa beringiae*) nesting habitat on the Alaska Peninsula. The investigation was funded by the Bureau of Land Management (BLM) as part of its evaluation of critical natural resources. These projects continue efforts commenced in 2004 to determine the breeding range and estimate the population size of Marbled Godwits in Alaska.

A similar helicopter-based survey effort in 2006 suggested that Port Heiden was the southern extent of the godwit's breeding range, but our northernmost detection in 2006 occurred along our northernmost transect line (see 2006 summary for methodology and results). Thus, in 2007 we flew additional transects to the north of those flown in 2006. Our northernmost detection in 2007 occurred approximately 32 km north of the village of Ugashik at 57.8° N. We extended transect coverage 5 km north of this detection to verify that we had likely confirmed the northern boundary of the breeding range. To further define the eastern extent of godwit breeding range, we conducted surveys along the eastern shores of Upper and Lower Ugashik lakes as well as up the Cinder River drainage, but we detected no godwits in these areas. Other observers (Susan Savage, pers. comm.), however, had previously detected limited numbers of Marbled Godwits in the Ugashik Lakes region. Taken together, the 2006 and 2007 survey efforts will allow us to significantly refine the breeding range of Marbled Godwits in Alaska.

The 2007 survey entailed 28 transects totaling 1,516 km on which we detected 194 godwits. We also detected up to 1,200 godwits—representing maybe 30–50% of the total population—utilizing intertidal mudflat habitats of Hook Lagoon, Cinder Lagoon, and Ugashik Bay during the same low tide periods. These observations raise intriguing questions about breeding chronology and territory fidelity, which in turn bear upon our ability to accurately detect birds during surveys of their breeding grounds. Future research efforts at these sites will address the magnitude and timing of these local movements. Additionally, we will utilize satellite telemetry to establish the timing and routes of southward migration and the non-breeding destination of this unique breeding population.

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***PACIFIC SHOREBIRD MIGRATION PROJECT** – Tibbets et al.*

Investigators: Bob Gill, Lee Tibbitts, Dan Ruthrauff, Dan Mulcahy, David Douglas, Colleen Handel, USGS; Brian McCaffery, U.S. Fish and Wildlife Service; Nils Warnock, PRBO Conservation Science; Phil Battley, Massey University.

In 2007 we used satellite telemetry to track the local and migratory movements of 16 Bar-tailed Godwits (*Limosa lapponica*), 15 Bristle-thighed Curlews (*Numenius tahitiensis*), and seven Long-billed Curlews (*N. americanus*). This is a continuation of a study initiated in 2005 to better define migratory pathways, non-breeding destinations, and habitats used by large shorebirds in the Pacific Basin. In early February, we captured Bar-tailed Godwits at roost sites on the North and South islands of New Zealand and attached backpack solar-powered PTTs to 8 males and surgically implanted battery-powered PTTs into 8 females. Most of the solar units failed early; however, we were able to track one male from New Zealand to the island nation of Yap, on to Okinawa, and finally to a suspected breeding area in the Anadyr River basin of eastern Russia. Most of the PTTs in the female godwits performed beyond expectations and provided unprecedented information on the movements of birds across several seasons (e.g., northward migration, breeding, post-breeding). Highlights included birds flying non-stop over 10,000 km from New Zealand to sites in China and South Korea, birds staging for several weeks in Mar-May at estuaries heavily degraded by human activities in the Yellow Sea region, birds flying non-stop over 7,000 km between Asia and Alaska, and finally, after weeks of staging on the mudflats off of Cape Avinof, birds completing yet another non-stop flight over 11,000 km back to New Zealand and other islands in the South Pacific. Unexpected findings included a bird apparently breeding 100s of km south of the known breeding range of godwits near Kvichak Bay and post-breeding birds making repeated flights between Cape Avinof and Port Heiden. The flights of the godwits captured the imagination of people around the world who were following the birds' exploits via extensive print and radio media coverage as well tracking the birds themselves on our website http://alaska.usgs.gov/science/biology/shorebirds/. People were especially intrigued when one of the birds E7 completed a round-trip flight in September back to the estuary in New Zealand that she had departed from six months earlier. This bird had flown approximately 29,500 km during this period.

In May, we attached backpack solar-powered PTTs to four male and three female Long-billed Curlews on breeding areas in Oregon and Nevada. During late June and early July, the birds departed breeding areas and flew 700–1,400 km to agricultural fields in the Central Valley, California (CA), and coastal wetlands along the Baja California (BC) and Sonora, Mexico. Most birds have remained in the same general areas since September; notable exceptions include one bird moving from fields near the Salton Sea, CA to ocean beaches near San Quintin Bay, BC, and another travelling from southwest of the Colorado River Delta, BC to agricultural fields in the lower river corridor. The solar PTTs on the Long-billed Curlews could potentially last for two years.

In June we surgically implanted battery-powered PTTs into eight male and seven female Bristle-thighed Curlews at their southern breeding area in the Nulato Hills in the Andreafsky Wilderness. Birds departed the Nulato Hills in July and spent the next few weeks in upland tundra habitats spread across the Kuskokwim River Delta and upper Alaska Peninsula near Egegik. The birds began their southward migration in early to mid-August, and taking similar routes south out of Alaska and west across the Northwestern Hawaiian Islands. This route was a distinctly different from that taken by satellite-tagged curlews in 2006 that were from the species' northern breeding area on the Seward Peninsula. All the birds in 2006 flew south and east out of Alaska and migrated to islands in the southeastern Pacific Basin, the Marquesas Islands, the Tuamotu Archipelago of French Polynesia, and Vostok in Kiribati. All the birds in 2007 migrated in non-stop flights of 4,650–8,525 km to the west central Pacific Basin, Lisianski Atoll, the Marshall Islands, Gilbert Islands, and Nauru. At the time of this writing, five of the PTTs are still transmitting.

In the near future we plan to use satellite telemetry to track the northward migrations of two populations of Bar-tailed Godwits, the New Zealand and western Australia populations, and track the southward migration of the population of Marbled Godwits (*L. fedoa*) that breeds on the Alaska Peninsula.

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BLACK OYSTERCATCHER SURVEYS IN THE WESTERN ALEUTIAN ISLANDS – *Gill, V.*

Investigator: Verena Gill, U.S. Fish and Wildlife Service.

In August 2007, we conducted skiff surveys in the Rat and Near Islands of the Aleutian Archipelago for Black Oystercatchers. In alternate years since 2003 we have been surveying Black Oystercatchers opportunistically while counting northern sea otters. The surveys involved a circumnavigation (100 m off-shore) of all islands. In the Near Island group we surveyed Attu, Agattu, Alaid, Shemya, and Nizki islands. As expected, no oystercatchers were observed at these sites. In the Rat Islands we surveyed the north side of Amchitka, all of Kiska, Little Kiska, and Rat; the western extent of the oystercatcher's known range. In the Rat Islands, the number of oystercatchers appeared to be either stable or increasing since last counted in 2005. Looking at our data since 2003 and data sporadically collected in the proceeding 4 decades it appears that the population has increased and this is likely due to the fox removal program conducted in the Aleutian Islands by the Alaska Maritime National Wildlife Refuge.

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***SEXING BLACK OYSTERCATCHERS IN THE FIELD** - Guzzetti et al.*

Investigators: Brian M. Guzzetti and Sandra L. Talbot, University of Alaska Fairbanks and US Geological Survey; David F. Tessler, Alaska Department of Fish and Game; Verena A. Gill, U.S. Fish and Wildife; Edward C. Murphy, University of Alaska Fairbanks

Sexing oystercatchers in the field is difficult because males and females have identical plumage and are similar in size. Although Black Oystercatchers (*Haematopus bachmani*) are sexually dimorphic, using morphology to determine sex requires either capturing both pair members for comparison or using discriminant analyses to assign sex probabilistically based on morphometric traits. All adult Black Oystercatchers have bright yellow eyes, but some of them have dark specks, or eye flecks, in their irises. We hypothesized that this easily observable trait was sex-linked and could be used as a novel diagnostic tool for identifying sex. To test this, we compared data for oystercatchers from genetic molecular markers (CHD-W/CHD-Z and HINT-W/HINT-Z), morphometric analyses, and categorization into one of three eye fleck categories: full eyeflecks, slight eyeflecks, and no eyeflecks. Compared to molecular markers, we found that discriminant analyses based on morphological characteristics yielded variable results that were confounded by geographical differences in morphology. However, we found that eye flecks were sex-linked. Using an eyefleck model in which all females have full eyeflecks, while males have either slight eyeflecks or no eyeflecks we correctly assigned the sex of 117 of 125 (94%) oystercatchers. Using discriminant analysis based on morphological characteristics, we correctly assigned the sex of 105 of 119 (88%) birds. Using the eye fleck technique for sexing Black Oystercatchers may be preferable for some investigators because it is as accurate as discriminant analysis based on morphology and does not require capturing the birds.

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***BREEDING SUCCESS, POPULATION TRENDS, SEASONAL ATTENDANCE, AND GENETIC DIFFERENTIATION OF BLACK OYSTERCATCHERS ON MIDDLETON ISLAND, ALASKA** – Guzzetti et al.*

Investigators: Brian M. Guzzetti and Sandra L. Talbot, University of Alaska Fairbanks and U.S. Geological Survey; Verena A. Gill, U.S. Fish and Wildlife; Edward C. Murphy and Eduardo Wilner, University of Alaska Fairbanks; David F. Tessler, Alaska Department of Fish and Game

The number of Black Oystercatchers (*Haematopus bachmani*) on Middleton Island, Alaska has increased from zero to over 700 in the years following the 1964 earthquake. Middleton Island now supports the largest known discrete breeding population with the highest known hatching success for the species. Middleton Island Black Oystercatchers also have significant morphological differences from Black Oystercatchers in other parts of Alaska. In the summers of 2004 and 2005 we monitored breeding success for a sample of pairs on the island and followed chicks through fledging. Adults at these sites were banded to determine site fidelity and survival, while genetic samples were collected for comparison of microsatellite allele frequencies to other breeding populations. We also conducted monthly island-wide censuses from April to August and visited the island twice in the off-season to determine winter residency.

A census was also taken in 2006 and band-resighting efforts continued through 2007. We found fledging success to be average compared to other sites in Alaska despite significantly higher hatching success. Despite overall low levels of variation at six microsatellite loci when compared to other species, Middleton Island Black Oystercatchers were found to be significantly differentiated from five other populations in Alaska and Canada. No other sites were differentiated from one another. Although the overall population size appears to be stabilizing, the number of territorial pairs has increased about 40% since 2002, but has not changed significantly since 2004. This indicates that most if not all available breeding habitat is occupied on the island.

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LOWER SOUTH FORK KOYUKUK RIVER: *A POSSIBLE STUDY SITE FOR* SOLITARY SANDPIPERS (TRINGA SOLITARIA CINNAMOMEA) *BREEDING IN NORTHERN INTERIOR* ALASKA - *Harwood*

Investigator: Christopher Harwood, U.S. Fish and Wildlife Service

When a scheduled point count survey of landbirds beyond the riparian corridor of the lower South Fork Koyukuk River in north-central Alaska (N66˚ 37' x W151˚ 35') had to be aborted on June 23-24, 2007, I opted to salvage the opportunity by conducting an impromptu quasi-Breeding Bird Survey (BBS) of the river in the field time remaining. Thirty-eight points were located approximately 0.5 river-miles from their nearest neighbor on generally opposite sides of the river. Unlike those of official BBSs, point counts were five minutes long (versus three) to balance the greater traveling time required between points (by paddling an inflatable kayak rather than by motorized boat). The area spanned approximately 25 river-miles. I recorded 45 species of birds, including six species of shorebirds (Semipalmated Plover, Lesser Yellowlegs, Solitary Sandpiper, Spotted Sandpiper, Least Sandpiper, and Wilson's Snipe) over two mornings.

The relatively high number of Solitary Sandpiper detections (10 on 38 point counts; seven detected during the survey between points; others recorded shortly upriver and downriver of route) encountered during the floating and/or surveying of the lower South Fork Koyukuk River was noteworthy. Indeed, detections on this survey rivaled those of BBSs in similar habitats in the lower Yukon and Kuskokwim river watersheds made by this observer in 1998-2002 (and from which the current population estimate for this subspecies was partly derived). Of particular interest was the detectability of this species late in June. Surveys dedicated to maximizing shorebird detections are generally timed for activity (singing, flight displays, etc.) early in the breeding cycle. The relative flurry of activity (including singing) documented here may coincide with the local hatching period. To what degree this species could be reliably detected at this site at a similar time (or other times, for that matter) in other years is unknown. Similarly timed BBSs from the lower Yukon and Kuskokwim river watersheds showed a positive correlation between detections for this species and increasing Julian date in June, but the influence of other route characteristics (e.g., habitat quality) was not explored.

Solitary Sandpipers are one of the least studied shorebirds on the continent. Given the small sample size which comprises what is known about the species' breeding biology (including early reproductive behavior), the possibility of the lower South Fork Koyukuk as a viable, productive study site warrants further investigation. Furthermore, the fact that this species uses Rusty Blackbird nests (among several other large passerines) offers a possible nexus to a troubled species for which current interest is particularly high.

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AVIAN INFLUENZA SAMPLING AND RELATED SHOREBIRD INVESTIGATIONS IN THE RUSSIAN FAR EAST, IN 2007 – *Huettmann et al.*

Investigators: Falk Huettmann, UAF Fairbanks; in collaboration with Yuri Gerasimov, Aleksey Antonov, Ekatarina Matsina, Alexandre Matsina, Igor Dorogoy and others.

Asia is known to be a potential reservoir for Avian Influenza (AI). Several scenarios of AI spread have been proposed regarding how pathogens could reach Alaska and North America. Shorebirds are usually found in habitats at the interface between terrestrial and marine ecosystems, a zone that is also where AI often has been detected. Shorebirds are global migrants, and thus, could contribute to the fast and global spread of AI and some of its highly pathogenic forms.

Many flyways still suffer from major data gaps, as well as a lack of readily available data and information of how shorebird migration occurs, where travel routes can be found, and how climate change and other human and natural effects interact. For science-based, adaptive management, such readily available information represents a key theme we are trying to fill in this project.

A project overview is given from over seven multi-year sampling sites in the Russian Far East for migratory shorebirds, and for species that link directly with Alaska (primarily Dunlin, but also Great Knot, Red Knot, Red-necked Stint and others). Online data are coming forward from this project presenting, for the first time, publicly available digital and geo-referenced morphometric and bird migration information. The databases follow international protocols and standardized metadata formats allowing connection to various web portals (GBIF, NIH, ORNIS) thereby providing information on the flyway to the wider international community. These data will be used for predictive, spatially explicit disease modeling in Alaska and the connecting Asian flyway.

Whereas most of the AI and lab analysis methods are still being explored, fine-tuned and being developed, initial findings from this international field study have already resulted in improved precision in defining shorebird flyways and in providing more detailed status assessments of bird species.

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***Counts and captures of Hudsonian Godwits and Whimbrels on Chiloé Island, Chile, 2007** – Johnson, J. et al.*

Investigators: Jim Johnson, Brad Andres, U.S. Fish and Wildlife Service; Jorge Valenzuela, Centro de Estudios y Conservación del Patrimonio Natural; Luis Espinosa, Union de Ornitólogos de Chile; Larry Niles, Conserve Wildlife Foundation of New Jersey; Mandy Dey, New Jersey Division of Fish and Wildlife; Humphrey Sitters, Wader Study Group; Mark Peck, Royal Ontario Museum

Chiloé Island, in southern Chile, is known to support some of the largest non-breeding populations of Hudsonian Godwits and Whimbrels along the eastern Pacific Coast. Biologists from Canada, Chile, England, and the U.S.A. are involved in a broad-based study to address some of the many gaps in our understanding of the non-breeding biology of these species.

We used a cannon net to capture 106 godwits and 93 Whimbrels. We attached an individually inscribed flag, a color band (indicating year and location of capture), and a U.S.F.W.S. metal band to each bird. We recorded the following biometrics: length of exposed culmen, length of head and culmen, length of the flattened and straightened wing, length of tarsus, and mass. We also recorded the state and score of primary molt of Hudsonian Godwits and Whimbrels, the breast molt index, the stage of growth of actively-molting breast feathers, and proportion of breeding plumage of Hudsonian Godwits. We collected a blood sample for use in genetics studies and the 9th secondary for future stable isotope analyses. The Chilean federal agency Servicio Agrícola y Ganadero collected cloacal samples to test for the presence of H5N1 avian influenza.

Remarkably, a Hudsonian Godwit we banded on Chiloé was resighted by S. Clawson and R. Russell on the Naknek River (58°38′24″N, 156°33′49″W), east of King Salmon, Alaska on 12 May 2007. This is the first known resighting record in Alaska of a Hudsonian Godwit banded in South America. Further resighting efforts along the flyways of both our study species will enhance our understanding of their migration strategies and large-scale connectivity between breeding and non-breeding grounds.

We also conducted ground counts of godwit and Whimbrels at known aggregation sites and randomly selected shoreline segments to generate a more complete estimate of these populations wintering at Chiloé Island. Surveys results indicate that an estimated 15,611 Whimbrels ($CI_{95\%}$ = 13,887 – 17,726) inhabit Chiloé Island, and 3,920 Whimbrels ($CI_{95\%}$ = 2,524 – 4,958) can be found along the adjacent mainland shorelines, resulting in a total of 19,531 Whimbrels ($CI_{95\%}$ = 16,411 – 22,684) inhabiting the region. We also counted 17,823 Hudsonian Godwits on Chiloé Island and 2,821 birds on the adjacent mainland. These counts increased published estimates for eastern Pacific coast populations by 18% for Whimbrels (30,400 individuals) and 49% for godwits (20,800). Bays and shorelines in the Chiloé Island region supported 99% of Hudsonian Godwits and 64% of Whimbrels estimated to occur on the eastern Pacific coast during the boreal winter. Whereas godwits aggregated in bays on the eastern side of Chiloé Island, Whimbrels were more dispersed along shorelines at densities of up to 7.4 birds / km. Bays in the vicinity of Chiloé's capital, Castro, provided important foraging and roosting habitat for wintering birds; these sites supported 52% and 7.3% of the eastern Pacific Coast populations of Hudsonian Godwits and Whimbrels, respectively.

We will continue our efforts on Chiloe in 2008. This year we will focus on resighting birds banded in 2007. We will also try to increase the number of individually marked godwits and Whimbrels, which will enable us to generate more accurate and precise estimates of local and regional scale movements, turnover rates, and demographic parameters. Furthermore, the continued handling of birds at different times throughout the year will aid a more complete description of molt schedule and patterns.

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EVALUATION OF GENETIC MARKERS FOR TRACKING VIRUS MOVEMENT ACROSS CONTINENTS AND AMONG/WITHIN DUNLIN SUBSPECIES – *Johnson, M. et al.*

Investigators: Matthew Johnson, Susan M. Haig, Thomas D. Mullins, Robert E. Gill, U.S. Geological Survey; Richard B. Lanctot, U.S. Fish and Wildlife Service; Pavel S. Tomkovich, Zoological Museum of Moscow University.

There is serious concern over the probability that migratory waterbirds might spread highly pathogenic avian influenza H5N1 (HPAI) from Asia to North America. For this to occur, infected, virus-shedding wild birds must cross the inter-continental boundary, and when these birds intermix with other wild bird populations, there must be successful intra- or inter-specific transmission of the virus. Dunlin (*Calidris alpina*) should be an ideal candidate species for modeling the potential spread of HPAI across continents because two subspecies that occur in Alaska (*C. a. pacifica* and *arcticola*) intermix in post-breeding flocks each fall before migrating to separate nonbreeding sites, one along the Pacific coast of North America and the other in East Asia. The *arcticola* Dunlin spend the nonbreeding season in East Asia, with three Asian breeding subspecies (*C. a.* s*akhalina, kistchinski, and actites*), where HPAI is prevalent and then travel to northern Alaska to breed. In contrast, *pacifica* dunlin winter along the Pacific Coast of North America where HPAI has not been detected and then travel to western Alaska to breed. The two Alaskan subspecies remain apart during the breeding season until they intermix in large roosting flocks during fall staging on the Yukon Delta. These facts provided us the incentive to develop molecular markers that would link breeding, migration, and wintering sites of Dunlin subspecies and document in detail the movements of Dunlin subspecies and populations, and thus the potential for populations to interact with other waterbirds in Asia that may have the virus.

In preliminary analyses, we used PCR to amplify seven microsatellite loci for 79 individuals from two subspecies, *C. a. arcticola* (3 breeding sites; Barrow, Prudhoe Bay, and

Canning River, Alaska; N=60) and *C. a. sakhalina* (breeding birds from Anadyr, Chukotka, Russia; N=19). We used Weir and Cockerham's estimate of F_{ST} (θ_{ST}) to estimate pairwise θ_{ST} (population differentiation) among subspecies and breeding areas (program FSTAT). Population assignment was evaluated using Bayesian-clustering methods (program STRUCTURE), and assignment or exclusion for individuals into their reference subspecies and breeding area were evaluated using a Bayesian approach (program GeneClass). High allelic diversity and low probability of identity suggested the seven microsatellite loci used were robust and would detect population structure if present. Pairwise θ_{ST} between subspecies (θ_{ST} = 0.009) and breeding areas (θ_{ST} range = 0.000–0.008) were low and non-significant indicating high gene flow between and within Dunlin subspecies. In addition, microsatellite Bayesian clustering and assignment tests revealed overall success of assignment of individuals to their respective breeding area was poor. Although the microsatellite markers used have high statistical power, high gene flow between breeding areas suggests limited potential for population/subspecies delineation of Dunlin using microsatellite analyses. In the upcoming year, we will expand our use of the microsatellite markers to the remaining three subspecies of Dunlin that reside in Beringia, and use mitochondrial DNA to investigate its usefulness in differentiating all five subspecies of Dunlin that breed in Beringia.

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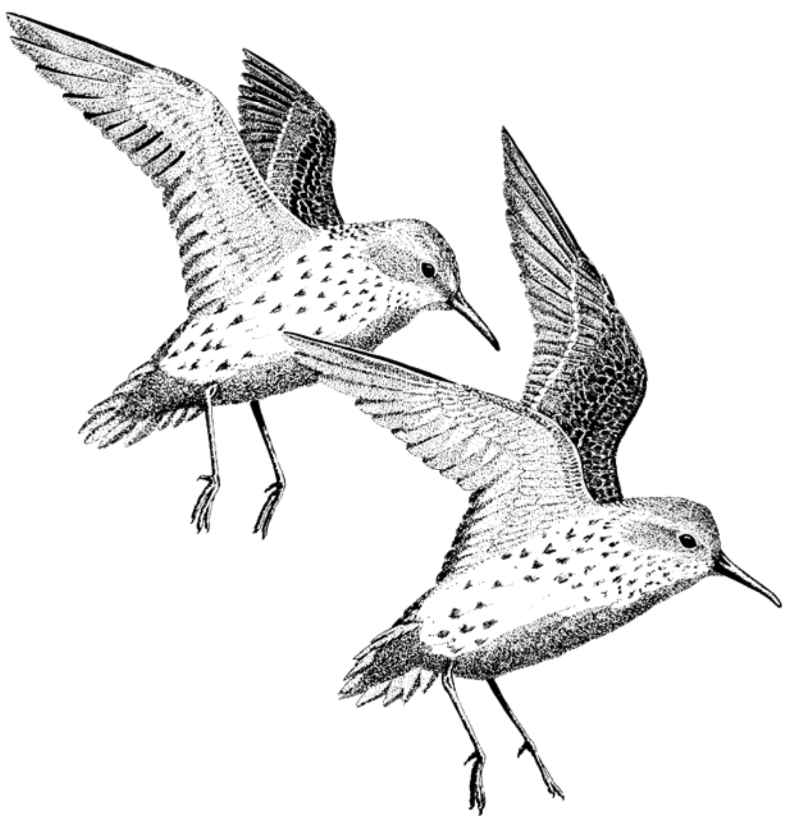

***INTER-SEASONAL MOVEMENTS, HABITAT USE AND MIGRATORY CONNECTIVITY OF BLACK OYSTERCATCHERS** – JOHNSON, M. ET AL.*

Investigators: Matthew Johnson, Susan M. Haig, U.S. Geological Survey; Richard B. Lanctot, Denny Zwiefelhofer, U.S. Fish and Wildlife Service; Michael I. Goldstein, USDA Forest Service; David F. Tessler, Alaska Department of Fish and Game; Peter Clarkson, Pacific Rim National Park Reserve of Canada.

The Black Oystercatcher (*Haematopus bachmani*) is a relatively large shorebird (500–700g) that occurs along North America's Pacific coast from the Aleutian Islands to Baja California with a global population size estimated between 8,900–11,000 individuals. The Black Oystercatcher is a species of high conservation concern throughout its range and is a USFWS focal species for priority conservation action. Conservation of Black Oystercatchers is hindered by a lack of information on their nonbreeding distribution, inter-seasonal movements, and habitat connectivity. In 2007, we began addressing these knowledge gaps by tracking Black Oystercatchers during fall migration to nonbreeding sites using satellite and VHF radio transmitters. Based on limited winter surveys, we suspected that post-breeding birds on Kodiak Island and those at more southern coastal sites (i.e., Vancouver Island, Washington, Oregon, and California) undergo short-distance migration and thus remain relatively close to their breeding areas. In contrast, winter surveys suggested that most oystercatchers breeding in Prince William Sound, Alaska, leave the region during winter, and all oystercatchers breeding on Middleton Island, Alaska, leave the island during the winter. Individuals from suspected resident populations on Kodiak and Vancouver Islands were fitted with conventional VHF transmitters (N = 18, nine/site) and birds from suspected migratory populations (Middleton Island, Prince William Sound, and Juneau Alaska) were fitted with satellite transmitters (N = 18, six/site).

All birds monitored in this study were captured at the nest during incubation (May–June) and subsequently fitted with either a backpack VHF transmitter (Kodiak Island, 5 females, 4 males; Vancouver Island, 7 females, 2 males, 1 unknown sex) or implanted with a satellite transmitter (Middleton Island, Prince William Sound, and Juneau Alaska, 3 males/females per site). We surveyed for birds equipped with VHF transmitters bi-monthly from the land, boat, and air, and satellite transmitters were programmed to transmit location data for six hours once every four days. Three oystercatchers removed their backpack harnesses (1 on Kodiak Island, 2 on Vancouver Island). Two oystercatchers implanted with a satellite transmitter died prior to migrating and another bird died after apparently completing migration (1 from Middleton Island, 2 from Prince William Sound). Two satellite transmitter batteries failed prior to or just after initiating migration (1 from Prince William Sound, 1 from Middleton Island), and in another case the satellite transmitter only transmitted for a single day after implantation and we are unable to account for this tagged bird (Prince William Sound).

We tracked 13 satellite tagged Black Oystercatchers during migration. Mean departure dates varied among sites with birds from northern breeding sites initiating migration earlier compared to more southern breeding birds. Mean departure date from Prince William Sound was 20 August 2007 (range = 7–29 August, N = 3), whereas mean departure date from Middleton Island was 11 September 2007 (range = 30 August–26 September, N = 5). Oystercatchers breeding in Prince William Sound and on Middleton Island did not undertake substantial movements prior to migration (all birds remained <10 km from nest sites prior to migration). In contrast, all oystercatchers breeding near Juneau initially moved 10–15 km north of their nest sites between 5–9 September, with subsequent mean departure dates from the greater Juneau area on 3 October (range = 14 September–27 October, N = 6). Mean arrival date to wintering sites also varied among breeding populations and followed the trend of northern breeding birds arriving earlier than more southern breeding birds (Mean arrival dates: Prince William Sound = 25 August, Middleton Island = 15 September, Juneau = 12 October). On average, birds from Prince William Sound migrated the furthest (mean straight line distance traveled = 1470 km, range = 1218–1664 km, N = 3) followed by birds from Middleton Island (mean straight line distance traveled = 1216 km, range = 1031-1479 km, N = 4), and Juneau (mean straight line distance traveled = 382 km, range = 130-1033 km, N = 6). Five satellite tagged birds are over-wintering in southern Alaska (on or near Heceta, Admiralty, and Duke Islands) and eight have settled in British Columbia among the numerous islets along the Pacific Coast as well as on Queen Charlotte and Vancouver Islands. In contrast, Black Oystercatchers breeding on Kodiak and Vancouver Islands do not appear to be migratory. We have not documented oystercatchers fitted with conventional VHF transmitters more than 20 km from their nest sites.

Preliminary results indicate variation in migration strategy among breeding populations of Black Oystercatchers. We documented long-distance migration in three populations (Middleton Island, Prince William Sound, and Juneau Alaska) and year-round residency in two others (Kodiak and Vancouver Islands). The Pacific coast of British Columbia was used by all migratory Black Oystercatchers and likely provides critical habitat for the species. In the upcoming year, we will examine space and habitat use during the nonbreeding season and biotic/abiotic factors potentially influencing observed variation in migration strategy among breeding populations.

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Pacific Golden-Plovers wintering at American Samoa: Migration, site fidelity, and other features – *Johnson, W. and Johnson, P.*

Investigators: Wally and Patricia Johnson, Dept. of Ecology, Montana State University; Roger Goodwill and Andrea Bruner, Dept. of Biology, Brigham Young University-Hawaii.

The islands of American Samoa (hereafter AS) are situated in the Southern Hemisphere and lie almost directly south of Alaska at a distance of approximately 8,500 km. From the global (great circle) perspective, it seems reasonable that Pacific Golden-Plovers wintering there would travel northward along the mid-Pacific Flyway to breeding grounds in Alaska. In an effort to demonstrate this, we banded and radio-tagged 30 plovers on the island of Tutuila (the major landmass in AS) over the period 28 March-5 April '07. All of these birds were territorial individuals wintering on the lawns of two church compounds, an athletic field, a park, a golf course, and a school. Post-capture, we monitored the birds until spring migration. As an adjunct to the AS sample group, we banded and radio-tagged 10 territorial plovers from 14-21 April '07 at Kualoa State Park on the northeast coast of Oahu, Hawaii. These birds also were monitored until spring departure.

Following migration, aerial monitoring for plover radio signals was conducted by cooperating biologists in Alaska. Unfortunately, the search was hampered by various problems (bad weather, mechanical breakdowns, etc.) with the result that coverage was less than we had anticipated. Only two radio-tagged plovers were found – a bird from Tutuila was detected near the village of Egegik on the Alaska Peninsula, and signals from an Oahu bird were heard to the west of Bethel. In previous telemetry studies of Pacific Golden-Plovers, we demonstrated major migratory linkage between Oahu and Alaska. The single AS bird near Egegik hints at a similar linkage over a much greater distance.

Based on disappearance of radio-tagged birds from their territories, spring migration from Tutuila began around 7 April with almost all plovers gone by 12 April. This exodus was about two weeks ahead of our Oahu site where migratory departure occurred from 25-27 April. The two groups had identical mean body mass of 180 g during their respective trapping periods which in each case preceded departure by only a few days. The great circle distance between AS and Alaska is about twice that from Hawaii to Alaska. The combination of a lengthy flight and early departure suggests that AS plovers are pausing somewhere en route. The Hawaiian Islands would seem to be the most likely place for stopovers. Spring aggregations occur there, but it is uncertain whether the birds in these flocks are from local wintering grounds, transients from farther south, or both. Though seemingly less plausible when one ponders the globe, it is possible that the mid-Pacific Flyway is not the primary migration route for AS plovers. Perhaps the latter mostly breed in Siberia and arrive there via an Asian route. Clarification of plover migratory pathways from AS will require additional radio-tagging coupled with intensive monitoring at key sites in both Hawaii and Alaska.

We visited both wintering areas (Tutuila and Kualoa Park) in late October well after fall migration to determine return rates of marked birds. Almost all of them were back on their former territories and rates were essentially identical at each location: Tutuila 83% (25/30 birds), Kualoa Park 80% (8/10 birds).

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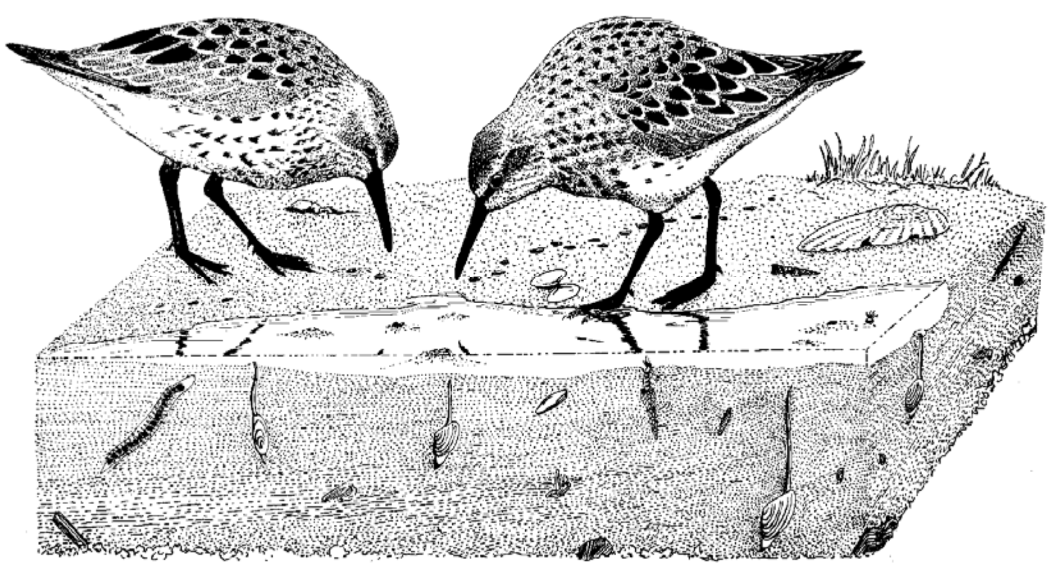

POST-BREEDING SHOREBIRD STUDIES ON THE ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA – *Kendall et al.*

Investigators: Steve Kendall, U.S. Fish and Wildlife Service, Audrey Taylor, University of Alaska, Fairbanks, and Stephen Brown, Manomet Center for Conservation Sciences.

Beginning in 2005, we participated in a cooperative effort to investigate use of coastal habitats by post-breeding shorebirds across the Arctic Coastal Plain (ACP) of Alaska. Preliminary work indicated that staging shorebirds depend on resources found in coastal areas to acquire fat necessary for southward migration. These areas are vulnerable to potential effects of offshore oil development in the eastern Beaufort Sea and to changing sea conditions associated with climate change. Reduced habitat quality or increased human disturbance at preferred staging sites could impact shorebird populations. Investigations on coastal habitats of the Arctic Refuge resulted in identification of several important staging areas and refinement of experimental protocols. The ACP wide study concluded in 2006, but we continued investigating post-breeding shorebird distribution, abundance, and movement in coastal areas of the Arctic Refuge.

In 2007 studies were conducted 18 July to 22 August from a camp based at the Canning River Delta and from a boat-based survey along the entire coast of the Refuge. To assess species abundance and distribution, ground-based and aerial surveys were conducted. During repeated surveys of ground-based transects at the Canning River Delta we found peak number of shorebirds in mid-August. Red-necked Phalaropes, Dunlin, Semipalmated Sandpipers, Pectoral Sandpipers, and Black-bellied Plovers were the most commonly observed species, respectively. However, the staging periods of these species varied temporally. One-time ground-based surveys were conducted on all major river deltas, repeating surveys done in August of 2006. The surveys were conducted earlier in 2007, beginning on July 25th. Because of this and lower water levels, we observed higher numbers of shorebirds on nearly all of the deltas, and a total of 4,469 individuals. By far the most common species was Semipalmated Sandpiper, followed by Black-bellied Plover, Pectoral Sandpiper, Dunlin, Red-necked Phalarope, American Golden-Plover, and Sanderling, with small numbers of six other species. To get a comprehensive view of the entire coast of the Arctic Refuge, aerial surveys were conducted during the 1st week of August. We also developed correction factors by conducting simultaneous aerial and ground surveys. This correction factor will be applied to 2005-2006 aerial survey data from across the ACP.

To quantify movement patterns (both within the staging period and relative to breeding location) and residency times of pre-migratory shorebirds at staging sites, birds were captured and marked with radio transmitters, color leg bands and/or paint at a breeding site on the Canning River Delta (approximately 13 km west of the post-breeding study site) and at Barrow and at the Canning River Delta staging area. Movements of birds were monitored by radio-telemetry and by conducting surveys to look for color marked birds. Radio tagged birds were also monitored at two sites on the Refuge using automated radio-tracking systems, during aerial surveys along the coast and during a float on the Canning River from near its headwaters to the coast. Radio telemetry data from 2005 and 2006, indicated that Semipalmated Sandpipers were migrating east and west along the coast of the Beaufort Sea to the Canning River Delta. Birds were also detected along the Canning River about 10 miles to the south of the delta. We hypothesized they may be using river corridors, especially the Canning River, to traverse the Brooks Range on their southward migration. In 2007, we radio tagged 24 breeding Semipalmated Sandpipers, two of which were detected at the staging site and two 10 miles upriver. None of 10 birds tagged in Barrow were detected. None of the 15 birds tagged at the staging site were detected up river, but 10 were detected for 1-3 days after tagging at the staging site. No radio tagged birds were detected during the float of the Canning River, but six Semipalmated Sandpipers were observed approximately 80 km south of the coast. Timing of the float may have been too late in the season, as most Semipalmated Sandpipers had left staging areas on the Canning River Delta prior to the time the crew was on the river.

We color banded or paint marked an additional 233 birds (15 breeding birds and 218 post-breeding birds), primarily Semipalmated Sandpipers, Dunlin, and Red-necked Phalaropes. We re-sighted 13 of these birds, mostly within five days of marking. One hatch-year Dunlin was captured and marked while still with adults on the tundra at the post-breeding site. This bird was observed 17 days later with a flock of Dunlin on the mudflats. We also observed an after-hatch-year Dunlin marked at the breeding camp, 44 days later staging at the post-breeding site.

In conjunction with this study, we collected samples from shorebirds to screen for the presence of avian influenza. Blood and feather samples were also collected for use in genetic and stable isotope analyses.

Work thus far has shown coastal areas of the ACP to be important for pre-migratory shorebirds, but left many questions unanswered. We hope to continue investigations in 2008 and beyond to better understand use of coastal areas across the Refuge.

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STUDIES ON SHOREBIRD BREEDING BIOLOGY AT BARROW ALASKA: BEHAVIORAL ECOLOGY OF PECTORAL SANDPIPERS, *Kempenaers et al.*

Bart Kempenaers, Raimund Barth, Elisabeth Bolund, Alexandra Hoffmann, Christina Muck, Holger Schielzeth, Silke Steiger, Kim Teltscher, Dr. Mihai Valcu, and Andrea Wittenzellner, Max Planck Institute for Ornithology

In 2007 we continued our field study on pectoral sandpipers in the same 2.6 km^2 area as in 2006 (71.32 N, 156.66 W). We captured (using mist nets or nest-traps) 176 adult individuals (123 males and 53 females) and all individuals were marked with a unique combination of color bands. We measured the tarsus, wing and culmen length of each captured bird and collected a small blood sample for hormone and genetic analysis. The color bands allowed us to re-sight each individual present on the study area on a daily basis. For each re-sighting, the individual's GPS position and a set of standardized behavioral measures were recorded. Only 37 males were observed in our study area for longer than 5 days (i.e. were residents). The relatively low number of pectoral sandpiper males (30% resident males, about 47% from the total number of resident males in 2006) and the reduced number of nests in our study area (31 nests, only 37% from the total number of nests in 2006) suggest that 2007 was a low density year for the pectoral sandpipers in Barrow. The overall hatching success (at least one hatched young per nest) was 65%, which is 20% less in comparison with 2006. This was due to a relatively high rate of predation (9 cases) and desertion (11 cases). A total of 42 small radio-transmitters where attached to 17 males and 25 females. This allowed us to continuously monitor a subset of birds using an automated activity recorder. Preliminary results suggest that the activity of pectoral sandpiper males is very high throughout the day and night and males seldom sleep before all females have started incubation.

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***REPRODUCTIVE ECOLOGY OF SHOREBIRDS: STUDIES AT BARROW, ALASKA, IN 2007** – Lanctot et al.*

Investigators: Richard Lanctot and H. River Gates, U.S. Fish and Wildlife Service; and Audrey Taylor and Nathan Coutsoubos, University of Alaska, Fairbanks.

In 2007, we conducted the fifth year of a long-term shorebird study at Barrow, Alaska (71.29°N, 156.64°W). The objectives of this study are to (1) collect baseline data on arrival date, nest initiation and effort, clutch and egg size, and hatching success of arctic-breeding shorebirds, (2) to establish a marked population of as many shorebird species as possible that would allow us to estimate adult survival, mate and site fidelity, and natal philopatry, and (3) to relate weather, predator and prey abundances to shorebird productivity. Data on demographic parameters are vitally needed to understand why many shorebird species are declining.

We located and monitored nests in six 36-ha plots in 2007. All six plots are the same as those sampled in 2005 and 2006. We used the same search intensity and methodology as between 2004 and 2006. The breeding density of all shorebird species on our study area was 52.1 nests/km^2 in 2003, 66.6 in 2004, 63.0 in 2005, 150.5 in 2006, and 88.9 in 2007 (overall average density across years was 84.2). Nest numbers in 2007 were above average compared to 2003, 2004, and 2005, but were far below the 2006 high. As in 2005 and 2006, our ability to find nests was probably enhanced by a fox removal program that allowed many nests to survive through to hatching (see below), giving us more time to find the nests. Lemming numbers were much lower in 2007 compared to 2006, and there were few to no jaegers and Snowy Owls nesting in the vicinity of Barrow.

In 2007, we recorded the highest breeding density of two of the four most abundant shorebird species that nest in the area during the five years of our study. These included Dunlin (19.0 nests/km^2) and Semipalmated Sandpipers (11.1). American Golden-plovers were also more abundant in 2007 than in any previous year with a density of 4.2 nests/km^2. Red Phalaropes and Pectoral Sandpiper nest density was ½ and 1/3 of the density found in 2007, with 27.3 and 13.4 nests/km^2. We had the same density of Long-billed Dowitchers (11.1) on our plots in 2007 as 2006. Interestingly, virtually all of the monogamous species present on our study area had the highest nest densities ever recorded, whereas the polyandrous and polygynous species had below normal numbers (based on our 5-year running average). A total of 192 nests were located on our plots and another 143 nests were found outside the plot boundaries. Nests on plots included 29 Pectoral Sandpiper, 59 Red Phalarope, 41 Dunlin, 24 Semipalmated Sandpiper, 24 Long-billed Dowitcher, 6 Red-necked Phalarope, and 9 American Golden-plover. Baird's Sandpipers, Buff-breasted Sandpipers, White-rumped Sandpipers, and Western Sandpipers were not observed on our plots in 2007. A large effort was spent locating Dunlin nests off plots as part of a continuing avian influenza sampling effort, and also for a clutch replacement experiment (see summary in this report; Gates et. al.).

The first shorebird clutch was initiated on 3 June and the last on the 2 July in 2006 (on or within 1 day for both dates in prior years). Peak initiation date was the 8 June and median initiation date was the 11 June; this is within 1-2 days of median dates in earlier years. Median nest initiation dates for the more abundant species were the 9 June for Dunlin, 8 June for Semipalmated Sandpipers, 10 June for Red Phalarope, and 14 June for Pectoral Sandpipers. These dates are either the earliest or tied with the earliest dates of nest initiation documented during our 5-year study. Predators destroyed only 11.1% of the nests in 2007 compared to 8.3% in 2006, 11.2% in 2005, 67.9% in 2004, and 42.6% in 2003. Across the more abundant species, hatching success (# hatching at least one young/total number of nests) was highest in Red-necked Phalarope (100%, $N = 9$), followed by Dunlin (92.9%, $N = 70$), Red Phalarope (84.6%, $N = 65$), Semipalmated Sandpipers (84.6%, $N = 39$), Long-billed Dowitchers (56.5%, $N = 23$), and Pectoral Sandpiper (84.4%, $N = 45$). These numbers are slightly lower than in 2006, but higher than in 2005 – the only other year with fox control. Nesting success during 2003 and 2004 without fox control averaged 28.2% compared to 82.7% between 2005 and 2007 with fox control. A comparison across study plots indicated that hatching success was greater than 90% in plots 5 and 6, greater than 80% in plots 1, 2, and 3, and equaled 79.2% on plot 8.

In 2007, we captured and color-marked 320 adults. These numbers are slightly lower than in 2006 but about 1.5 times higher than in 2005, and 2 to 3 times higher than 2003-2004. Sixty-two of these adults (38 Dunlin, 21 Semipalmated Sandpipers, 2 Red Phalarope, and 1 Pectoral Sandpiper) had been banded in a prior year. Adults captured included 129 Dunlin, 37 Pectoral Sandpipers, 72 Semipalmated Sandpipers, 30 Red Phalarope, 35 Long-billed Dowitchers, 13 American Golden-plovers, two Red-necked Phalarope, and one each of Buff-breasted Sandpiper, and Western Sandpiper. We captured and color marked 465 chicks in 2007. This was the second highest number captured but far below the number banded in 2007—a reflection of the far fewer Pectoral Sandpiper and Red Phalarope nests in the study area.

We continue to conduct ancillary studies as time allows. Avian influenza sampling was a prominent feature of our work in 2006 and 2007 – all captured birds were swabbed to test for the highly pathogenic H5N1 avian influenza virus. Nathan Coutsoubos (PhD candidate, University of Alaska, Fairbanks) completed the third field season of his PhD studies investigating how the construction of a landfill and the experimental flooding/draining of a wetland influence shorebirds (see his report). We also placed radio transmitters on 20 females Dunlin to help River Gates (prospective MS candidate, UAF) document rates of clutch replacement laying (see her report). Audrey Taylor (PhD candidate, University of Alaska Fairbanks) documented movements to postbreeding sites (see her report). Finally, we collected eggs from Dunlin as part of a collaborative project with Sarah Jamieson (PhD candidate, Simon Fraser University) to investigate whether shorebirds use endogenous or exogenous resources to produce eggs.

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Avian Influenza Sampling and Shorebird Surveys in the Teshekpuk Lake Special Areas of the National Petroleum Reserve – Alaska, in 2007 - *Lanctot et al.*

Investigators: Richard Lanctot, Jim Johnson, and Brad Andres, U.S. Fish and Wildlife Service; Stephen Brown, Manomet Center for Conservation Sciences; and Deborah Nigro, Bureau of Land Management

Serious concerns surround the probability that migratory waterbirds might spread highly pathogenic H5N1 avian influenza (HPAI) from Asia to North America. Five of the 26 high target avian influenza species are shorebirds that breed on the North Slope of Alaska. These include the *arcticola* subspecies of Dunlin, Pectoral Sandpipers, Long-billed Dowitchers, Ruddy Turnstones, and Buff-breasted Sandpipers. All five species have some or all of their population wintering in Southeast Asia where exposure to the HPAI is likely. In 2007, we focused our capture efforts on the Teshekpuk Lake Special Area of the National Petroleum Reserve – Alaska. This area is known to have population densities of many of these key species, and also being considered for oil and gas leasing.

We relied on one R-44 helicopter to transport four 2-person field crews to survey sites where they spent an 8-hr day searching for nests and capturing birds. The use of a helicopter allowed us to gather samples over a large geographic area, which we hoped would increase our chances of detecting the virus. Field crews captured displaying birds with mist nets and incubating adults with bow nets. All individuals had a metal band placed on their legs, and in the case of Dunlin, a unique set of color bands were placed on each bird. Birds were also weighed and measured so that we could determine age and sex (for some species). In addition, we recorded a fat index and the stage of molt for their flight and tail feathers. We also collected a blood sample for use in genetic and hormone studies, and one or more feathers for use in stable isotope studies. While at these sites, we also conducted rapid surveys of plots so as to develop maps depicting the distribution, diversity, and relative abundance of breeding shorebirds and other waterbirds in relation to their habitat use.

Field crews captured a total of 145 shorebirds (2 American Golden-plovers, 1 Black-bellied Plovers, 4 Buff-breasted Sandpipers, 43 Dunlin, 12 Long-billed Dowitcher, 47 Pectoral Sandpipers, 5 Red Phalarope, 4 Red-necked Phalarope, 4 Ruddy Turnstones, 21 Semipalmated Sandpipers, and 2 Stilt Sandpipers) at 40 sites between the 10 and 24 June. From these birds, 144 cloacal avian influenza swabs, 143 esophageal avian influenza swabs, 145 feather samples, and 144 blood samples were collected. To date, no positive cases of H5N1 avian influenza virus has been detected. Feathers from Dunlin and Pectoral Sandpipers are being used to assess movements of birds between breeding and wintering grounds using stable isotope markers. Blood samples collected from Dunlin are being used in a population genetic study and resightings of captured birds are helping to document migration pathways to Southeast Asia.

During the 40 rapid surveys conducted, a total of 711 shorebirds were recorded belonging to 17 species. The most commonly observed species were the Red Phalarope (150), Pectoral Sandpiper (129), the Red-necked Phalarope (104), Dunlin (172) and Semipalmated Sandpiper (87). A large number of other species were also observed but not tallied here. We plan to conduct preliminary analyses in the coming months, and will likely conduct a second year of surveys and avian influenza sampling in the Teshekpuk Lake Special Area in 2008.

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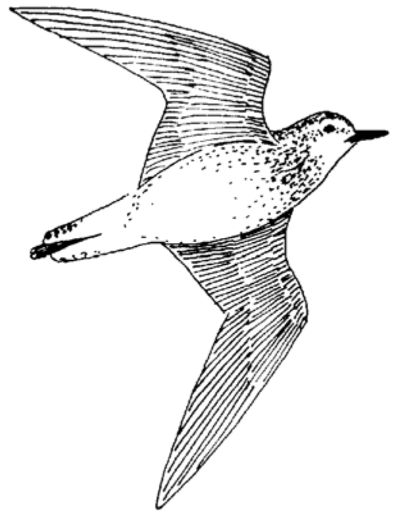

AVIAN INFLUENZA SAMPLING AND DOCUMENTING MIGRATION PATTERNS OF ARCTICOLA DUNLIN IN MAINLAND CHINA – *Lanctot et al.*

Investigators: Richard Lanctot, U.S. Fish and Wildlife Service, Zhijun Ma, Fudan University, and Hon Ip, U.S. Geological Survey

To ascertain whether Dunlin on their nonbreeding grounds might carry the highly pathogenic H5N1 avian influenza (HPAI) virus, we captured Dunlin (as well as other shorebird species) at two coastal and one inland site in China. Because four subspecies of Dunlin (i.e., *arcticola, kitschinski, actities, sakhalina*) that breed in the Beringia area migrate to Asia to winter, it is unknown where the Alaskan subspecies of Dunlin (i.e., *arcticola*) winter, and whether this subspecies mixes with the other subspecies. Thus any samples collected from Dunlin in Asia can not be definitively linked to Alaska (i.e., captured Dunlin may not migrate to Alaska). Nevertheless, sampling birds in areas where H5N1 outbreaks have occurred can answer the most basic question -- are shorebirds, particularly Dunlin, susceptible to acquiring the virus. We collected samples from 417 shorebirds of eight species. From the 361 Dunlin captured, we also collected 131 cloacal swabs, 239 blood samples, and 165 feather samples.

Difficulties in obtaining and shipping nitrogen vapor shippers typically used to store virus samples required that we save our avian influenza samples in 100% ethanol. This change made preserving full-length nucleic acids and viable viruses difficult, preventing in some cases definitive identification of the hemagglutinin and neuraminidase subtypes. Ethanol samples represented our best opportunity to test birds for avian influenza in difficult field conditions. Samples were transferred to the National Wildlife Health Center in Madison, Wisconsin, where each sample was tested for the presence of avian influenza by RNA extraction and tested by the Matrix RT-PCR test. Of an initial round of 99 samples (48 Dunlin, 39 Kentish Plover, 4 Red-necked Stint, 4 Temminck's Stint, 1 Greenshank, and 1 Spotted Redshank), ten samples likely were positive for some type of avian influenza virus. Two of these ten tested positive for the H5 subtype (one Dunlin and one Kentish Plover), but the poor sample quality prevented subtyping the neuraminidase component. Of the 94 Dunlin and 3 Kentish Plovers tested during the second round of analyses, only one Dunlin tested positive on the Matrix RT-PCR test, although it was not positive by the H5 or H7 RT-PCR test. All together, 11 of the 196 samples (5.6%) of the shorebird samples collected in China had some form of avian influenza virus, although none had the HPAI virus. This compares to a 0.13% detection rate in all shorebird species sampled in Alaska in 2006 (n = 3043; H. Ip, unpubl. data). Of the 1414 Dunlin sampled in Alaska in 2006, five (0.35%) tested positive on the Matrix RT-PCR test. 844 of the 1414 were also tested using virus isolation, and none of these were positive by the H5 or H7 RT-PCR test. Our results suggest the prevalence rates in China are much higher than the 0.5% infection rate in shorebirds sampled in northern Europe (n > 3000, Fouchier et al., 2003), but much lower than the 14.2% of shorebirds infected in the Chesapeake Bay region of northeast North America (n = 4,266, Krauss et al., 2004).

To begin to understand where subspecies winter, we hope to use blood samples collected from captured Dunlin in a mixed stock genetic analysis. The ability to do so, however, depends first on molecular ecology laboratory work geared towards separating individuals from known breeding subspecies (see M. Johnson et al. summary). Similarly, we are beginning to explore whether stable isotope signatures from feathers grown on the winter and breeding grounds can be used to determine where subspecies winter. We are also learning more about migration patterns by resighting marked birds away from their capture location (see Barter et al. summary).

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LONG-TERM MONITORING OF TUNDRA-NESTING BIRDS IN THE PRUDHOE BAY OILFIELD, NORTH SLOPE, ALASKA – *Liebezeit and Zack*

Investigators: Joe Liebezeit and Steve Zack, Wildlife Conservation Society

Since 2003, the Wildlife Conservation Society, in cooperation with BP, has monitored nest survivorship, nest predator abundances and other parameters that may influence nesting success of tundra-nesting birds in the Prudhoe Bay Oilfield on the Arctic Coastal Plain of Alaska. This on-going monitoring effort is being conducted to help better understand potential impacts to nesting birds from industry and in assessing the influence of climate change by examining long-term trends.

In 2007, we discovered and monitored 81 nests of 10 species from 10 June to 15 July on 12 10-ha study plots using both rope drag and behavioral nest search techniques. Lapland Longspur, Pectoral Sandpiper, Semipalmated Sandpiper, and Red-necked Phalarope nests accounted for the majority (80%) of those found. Among all species, 33 nests successfully hatched/fledged, 37 failed, and 11 nests were of unknown fate. Nest predation was the most important cause of nest failure (95%). Other sources of nest failure included abandonment (n = 1) and caribou trampling (n = 1). Overall nest density was 60.0 nests / km^2, noticeably lower than at this site in 2006 (101.6 nests / km^2) but comparable to 2003-05 estimates. Program MARK constant survivorship model (Mayfield) estimates of nesting success ranged from 0.14 to 0.63, for the four most common breeding species (n > 10), and overall daily survival rate for shorebirds and longspurs was markedly lower than in 2006 (0.977 ± 0.004 vs. 0.954 ± 0.008).

Lemming abundance at this site returned to low levels (0.002 lemmings / 30 min. count) from the higher levels observed in 2006 (0.085 lemmings / 30 min. count). Correspondingly, Pomarine Jaegers and Snowy Owls were rarely detected and, unlike the previous year, did not nest in the study area in 2007. Overall, ten species of potential nest predators were detected during timed surveys in 2007 with the most common being Parasitic Jaegers and Glaucous Gulls.

Snow melt and subsequent tundra exposure occurred earlier in 2007 than all previous years monitored. Snow melt was complete by 9 June in 2007 whereas the earliest estimate of snow melt completion in previous years was 13 June. Despite the early snow melt, nest initiation dates for most species were similar to 2006, though 2-3 days earlier than in other years studied.

We continued our multi-year efforts in using remotely activated camera systems to identify nest predators at active shorebird nests. This year we recorded one event of an arctic fox depredating a Red-necked Phalarope nest.

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***BREEDING BIRD DIVERSITY, DENSITY, NESTING SUCCESS AND NEST PREDATORS AT A STUDY SITE IN THE TESHEKPUK LAKE SPECIAL AREA, NORTH SLOPE, ALASKA** – Liebezeit and Zack*

Investigators: Joe Liebezeit and Steve Zack, Wildlife Conservation Society

Within the Arctic Coastal Plain region of Alaska, the Teshekpuk Lake Special Area in the National Petroleum Reserve – Alaska has been identified as a region of exceptional importance to wildlife including breeding shorebirds. Proposed expansion of oil development into this region may negatively impact these populations. However, no baseline studies have been conducted in the TLSA that evaluates the reproductive success for many of these species – a critical factor that is vital in understanding avian population trends. The Wildlife Conservation Society is investigating the importance of the TLSA as a breeding ground for migratory birds (focusing on shorebirds). Our objective is to collect baseline information on breeding biology of tundra-nesting birds, nest predator abundance, and other factors known to influence nest survivorship and to compare the nest survivorship results with other sites on the North Slope to help evaluate the importance of this region for breeding birds.

In 2007, WCS continued in the third year of this study conducting field work on 16 10-ha study plots near the SE shore of Teshekpuk Lake. We discovered and monitored 191 nests of 16 species from 11 June to 16 July using both rope drag and behavioral nest search techniques. Lapland Longspurs, Pectoral Sandpipers, Semipalmated Sandpipers, and Red Phalaropes accounted for the majority (65%) of those found. Among all species, 100 nests successfully hatched/fledged, 70 failed, and 21 nests were of unknown fate. Nest predation was the most important cause of nest failure (90%). Other sources of nest failure included abandonment and predation due to observers. Program MARK constant survivorship model (Mayfield) estimates of nesting success ranged from 29 to 71% ($n \geq 10$) and were relatively high for most species sampled (>50% for 6 of 8 species). Overall nest density was 100.1 nests / km^2, noticeably lower than at this site in 2006 (132.4 nests / km^2 and closer to the 2005 estimate of 90.7 nests / km^2).

Lemming abundance returned to low levels in 2007 contrasting with much higher numbers detected in 2006 (0.03 vs. 0.33 lemmings / 30min. count). Correspondingly, Pomarine Jaegers and Snowy Owls were rarely detected and, unlike the previous year, did not nest in the study area in 2007. Overall, eight species of potential nest predators were detected during timed surveys with the most common being Parasitic Jaegers, Long-tailed Jaegers, and Glaucous Gulls. The nesting success results from 2005-07 indicates high nest survivorship at Teshekpuk in seasons with both high and low abundances of lemmings.

Snow melt and subsequent tundra exposure occurred successively earlier at Teshekpuk (by up to 4 days) from 2005 to 2007. Correspondingly, nest initiation dates for most species were 2-3 days earlier at compared to previous years. This positive correlation between nest initiation and snow melt was also observed at the nearby Prudhoe Bay study site.

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PHYSICAL AND BIOLOGICAL HABITAT PREFERENCES OF BLACK OYSTERCATCHERS (HAEMATOPUS BACHMANI) IN WESTERN PRINCE WILLIAM SOUND AND KENAI FJORDS NATIONAL PARK, ALASKA* – *McFarland, Konar, and Goldstein

Investigators: Brooke McFarland, Brenda Konar, School of Fisheries and Ocean Sciences, University of Alaska Fairbanks; Michael I. Goldstein, USDA Forest Service.

Black oystercatchers (*Haematopus bachmani*) depend on the intertidal zone for foraging habitat. Identification of preferred habitat for these birds is critical for appropriate prevention and mitigation of disturbance to these areas. In western Prince William Sound (PWS) and in Kenai Fjords National Park (KEFJ), we sampled known black oystercatcher breeding sites (n = 33) paired with random non-breeding sites (n = 31) for physical habitat characteristics and intertidal biological community composition. We paired sites using NOAA's Environmental Sensitivity Index for shoreline types (PWS) and Shore-Zone Classification for shorelines (KEFJ). Physical habitat parameters measured were substrate, aspect, slope, distance to a freshwater source, distance to woody vegetation, connection to mainland, tidal width and rugosity (surface complexity) for high, mid and zero tidal heights. Intertidal biological community composition was assessed at each site using ten 0.25 m^2 quadrats along 100m transects at high-, mid- and zero-tide heights. Future analyses will include modeling local site characteristics and intertidal community from field data. A large-scale model incorporating all known black oystercatcher breeding sites in these areas, including additional parameters (e.g., summer sea-surface temperature, chlorophyll a concentration, modified effective fetch and distance to eelgrass/kelp bed where available) will also be developed. Model verification will occur in 2008.

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SHOREBIRD WORK DONE BY THE CORDOVA RANGER DISTRICT, CHUGACH NATIONAL FOREST – MEYERS

Investigator: Paul Meyers, U.S. Forest Service

Migration Science and Mystery, a Distance Learning Adventure: We coordinated a distance-learning program centered on shorebird migration. This program was part of a classroom science curriculum that used shorebirds as the basis of a biology program. The program targeted students in grades 5–8 all along the Pacific Flyway from the Western Sandpiper's wintering grounds in Panama to their last refueling stop in Cordova, Alaska. By using the Internet, students participated in virtual field trips to Panama Bay, Panama (November 2006); Bay of Santa Maria, Mexico (January 2007); San Francisco Bay, California (March 2007); Fraser River, British Columbia (April 2007); Stikine River Delta, Alaska (April 2007); and Copper River Delta in Cordova, Alaska (May 2007). At two locations—Santa Maria Bay and Copper River Delta—the project included live, electronic field trips. These were one-hour programs broadcast on television by satellite and webcast to classrooms across the western hemisphere. Researchers, scientists, and students presented information about migrating birds and students called or sent in their questions by e-mail. At the other stopover sites, students could participate in webcasts. Additionally, Alaska Governor Sarah Palin and Alaska Senator Lisa Murkowski joined the live satellite broadcast from the Copper River Delta. We estimate that approximately 500,000 viewers watched this program in the US and Mexico alone. Major partners included Ducks Unlimited, Prince William Network, US Fish and Wildlife Service, ProNatura, International Programs, Western Boreal Forest Initiative, Point Reyes Bird Observatory, Canadian Wildlife Service, Audubon Alaska, Prince William Sound Science Center, Cordova High School, Alaska Department of Fish and Game, Panama Audubon Society, and Tongass National Forest.

Black Oystercatcher Surveys: We surveyed 102 km (63.4 miles) of shoreline on Hinchinbrook, Hawkins, Observation, and Long Islands for black oystercatchers and other water birds from 1-14 June 2007. We encountered over 1288 individuals of 23 bird species. We observed 109 black oystercatchers and mapped 37 black oystercatcher nesting territories. Although we saw a large number of individuals, nest density was low (0.09 nests/km on Hawkins and 0.12 nests/km on Hinchinbrook). These densities are lower than those seen on Montague and Green Islands, but higher than on the nearby mainland. The low density probably reflects limited quality habitat, as this shoreline contains a high percentage of cliffs and mudflats. The majority of nests (64%) were found on gravel substrate.

Copper River Delta Shorebird Festival: Each year the City of Cordova hosts the Copper River Delta Shorebird Festival. The Cordova Ranger District participated by providing speakers, guides, and educational programs. Presentations included the Evolution and Ecology of the Copper River Delta, Birding 101, and Birding 102. Children's programs included Children's Birding Academy and children's activities. We also provided guides for field trips to Alaganik Slough. Approximately 420 people attended the Festival.

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***ALASKA PENINSULA SHOREBIRD INVENTORY** - Savage*

Investigators: Susan Savage, U.S. Fish and Wildlife Service; Lee Tibbitts, USGS Alaska Science Center

The 2007 field season completed the Alaska Peninsula/Becharof National Wildlife Refuge's participation in inventories of birds inhabiting lowlands of the Alaska Peninsula. Project goals include establishing baseline information on distribution and abundance of the region's breeding birds (with a focus on shorebirds). The sampling universe for the inventory encompassed all lowland areas (defined as lands <100 m in elevation) located between the Naknek River drainage and the tip of the Alaska Peninsula. A stratified random sampling design was used to select plots (n = 64; size = 5 x 5 km) and point transects were used to survey plots. For details see the 2004 project summary.

Between 16 - 26 May, teams of two observers spent 1-3 days at each of 10 plots located from south of Meshik Bay to Port Moller. Within these plots we sampled a total of 163 points on which we recorded 10 species of shorebirds totaling 720 individuals. We also recorded 10 species of avian predators, totaling 793 individuals. Besides shorebirds and avian predators, we recorded 16 species of landbirds (e.g., ptarmigan, passerines) and 19 species of waterbirds (e.g., loons, grebes, waterfowl, terns) on the point transects. An additional nine species (Canada goose, gadwall, golden eagle, harlequin duck, long-tailed jaeger, northern shrike, peregrine falcon, spotted sandpiper and trumpeter swan) were observed on plots, but not detected during a point transect. To date, we have surveyed 48 plots and 742 points and recorded information for 4,465 shorebirds and 2,796 avian predators. These data will be used to calculate species specific estimates of relative abundance and density and to assess habitat associations.

During plot visits, we found three nests of three species of shorebirds (Short-billed Dowitcher, Dunlin, Wilson's Snipe). We experienced a cold, late spring and the shorebirds appeared to arrive and initiate nesting later than average. We also found nine nests of three other species (Pacific Golden-Plover, Northern Shrike, Bald Eagle) and a bank swallow colony near the Big Sandy River. These Pacific Golden-Plover nests constitute a range extension for this species.

Based on data from all years, we continue to find Wilson's Snipe to be the most widely distributed shorebird, occurring on all but one of the 48 plots (98%). Least Sandpiper, Short-billed Dowitcher, Dunlin, and Greater Yellowlegs were also widely distributed, occurring on 90%, 88%, 75% and 65% of plots, respectively. Marbled Godwits, a species of conservation concern, were found on 17 plots (35%; none south of Meshik Bay).

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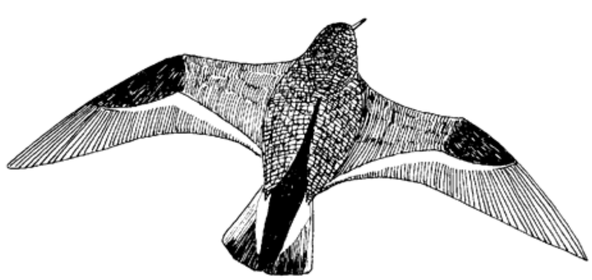

NEST CARE PATTERNS, NEST FAILURE, AND THE INFLUENCE OF NEST-AREA STIMULI ON BLACK OYSTERCATCHERS (*HAEMATOPUS BACHMANI*) BREEDING IN WESTERN PRINCE WILLIAM SOUND, ALASKA – *Spiegel et al.*

Investigators: Caleb S. Spiegel, Department of Fisheries and Wildlife, Oregon State University & USGS Forest and Rangeland Ecosystem Science Center; Susan M. Haig, USGS Forest and Rangeland Ecosystem Science Center; Michael I. Goldstein, USDA Forest Service Alaska Region

The Black Oystercatcher (BLOY) is a species of concern in U.S. and Canadian Shorebird Conservation Plans, and an indicator of intertidal ecosystem health. Detailed studies of factors which influence BLOY nesting behavior and reproductive success are important for better understanding its status and conservation needs. We monitored nest activity of BLOY during two seasons at Harriman Fjord, northwest Prince William Sound, AK, using digital video cameras and recorders. We documented common causes of nest failure, and are currently analyzing footage to understand how natural (e.g., predators, conspecifics, stochastic weather events) and human (recreation, research) stimuli in the nest area may influence nest care patterns, parental behavior, and reproductive success. Additionally, we are 1) examining the affects of environmental factors on nest care scheduling, and 2) determining whether parental contributions to nest care vary under proximate conditions. Results will contribute to a multi-year BLOY demography study being conducted by several cooperators including the U.S. Forest Service, Alaska Department of Fish and Game, Oregon State University, USGS Forest and Rangeland Ecosystem Science Center, U.S. Fish and Wildlife Service and University of Alaska Fairbanks. Here we summarize our methodology and preliminary findings.

From May - July 2005 and 2006 we recorded activity at a subset of 22 of 87 BLOY nests found and monitored at Harriman. Continuous nest recording (including darkness periods), began during early incubation (~7d post lay), allowing us to obtain behavioral and disturbance data on a very fine scale, rarely attainable using standard monitoring methods. Pairs were individually banded and molecularly sexed. We reviewed nearly 6,000 hours of footage using a standardized protocol to extract the following relevant data: Causes and timings of nest failure, individual incubation and early chick brooding bout timings, recess lengths, and causes of recesses. We also recorded all potential disturbance stimuli in the nest area (divided into 12 categories - e.g., conspecific, bird, mammal, human, etc.), approximate distance of stimuli from nest, and associated reaction of incubating adults.

Seven of 22 (32%) video nests failed, five from predation, and two from extreme tidal flooding. Both nest floods occurred during the same week in 2005. Although suspected flooding was documented in some non-video nests in 2006, incidence was slightly lower overall (26% vs. 39%), suggesting temporal variation in flood risk. Five egg predation events were captured on video, including three formerly undocumented BLOY nest predators in Harriman, black bear (*Ursus americanus*), marten (*Martes americana*), and Wolverine (*Gulo gulo*). American minks (*Mustela vison*) were the most frequent predator, consuming a nest each year. Minks and marten left few signs at nests, removing eggs whole. In at least two cases, predated nests were initially misidentified as flood failures before video was reviewed, reiterating the usefulness of video technology in studies of nest fate. All recorded nest failure events, except the black bear predation, occurred during darkness, which comprised only 12% to 17% of any 24-hr period during the study. Predation rates were similar between video and non-video monitored nests, after accounting for nest exposure time by removing non-video nests failing during the first few days (i.e., before we would normally place video; χ^2 = 0.8113, df = 1, P = 0.368). No nests were abandoned as a result of video cameras.

Data analyses are underway to examine the influence of environmental variables on incubation patterns. Using mixed modeling and information theoretic model selection we will soon be able to report environmental factors (tide cycle, day vs. night, nest cycle, seasonality, temperature, wind, precipitation) best explaining variation in bout and recess lengths, and overall constancy during incubation. Further, we will determine if there are sex-based differences in these incubation patterns, and to what degree they are affected by stimuli causing nest departure. Summary analyses have indicated that average bout length is shortened by disturbance events, that night bouts are longer than day bouts (often twice as long, possibly indicating a response to increased levels of nocturnal nest predation pressure), and that both temperature and tide cycle may have slight influences on attendance patterns. We are also conducting analyses to investigate how number, duration, distance, and type of potential disturbance stimuli effects incubation constancy, recess length, and nest success. Early findings indicate that incubating birds are most frequently disturbed from a nest by conspecifics, and certain interspecifics (e.g., perceived aerial predators), but that this may not greatly affect overall constancy, largely because the disturbed incubator is commonly replaced by the mate after a short period of time. Additionally, there is variation in tolerance to specific types of stimuli, and associated reactions between pairs. More work is needed to verify the validity of these preliminary results.

Since 2005, video footage has been used for public education. At U.S. Forest Service Glacier Ranger District a web-based public information program was created using footage from the study to inform the public about basic BLOY life history, and the threats BLOY face during reproduction in PWS. (http://www.fs.fed.us/r10/chugach/pages_district/glacier/GRDWildlifeWeb/Kiosk _Bloy_home.htm) We have also presented video at public wildlife events sponsored by the Audubon Society), to teach participants about BLOY reproductive behavior, and the importance of oystercatchers in coastal ecosystem conservation.

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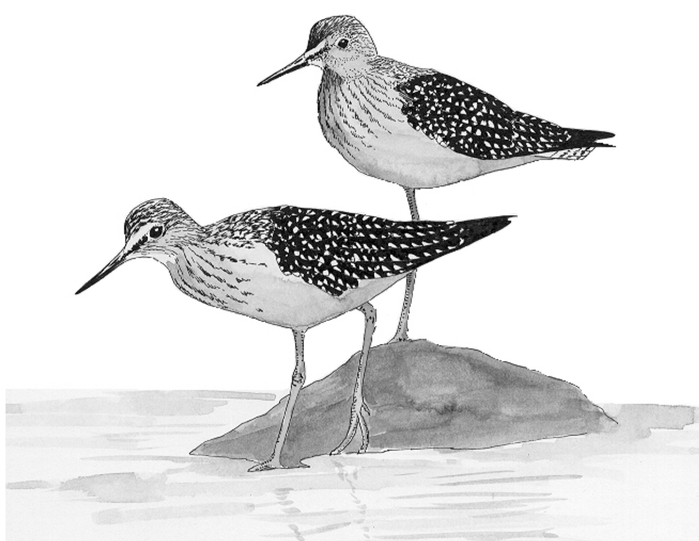

***IDENTIFYING THE IMPORTANT BIRD AREAS OF ALASKA** - Stenhouse*

Investigator: Iain Stenhouse, Audubon Alaska

The Important Bird Area (IBA) concept was developed in Europe in the 1980s by BirdLife International, and IBAs are now recognized around the world as a valuable tool in bird conservation. To date, over 12,000 IBAs have been identified in over 170 countries around the world.

To qualify as an IBA, sites must satisfy at least one of a series of strict criteria: they must support (1) species of conservation concern, (2) species with restricted ranges, (3) species with particular habitat requirements, and/or (4) species, or groups of species, which are vulnerable because they congregate at few sites. IBAs are usually discrete areas that stand out from the surrounding landscape as having local, continental or global significance for birds.

Over the course of 2006 and 2007, a total of 25 sites from across Alaska were identified as IBAs of state significance. This includes 12 sites identified as IBAs specifically on the presence of shorebird species of conservation concern, or large concentrations of migratory shorebirds. Most notable among these are the Copper River Delta and the Stikine River Delta.

After further review by the national IBA technical committee, most of these sites are expected to be recognized at higher levels, and be upgraded to IBAs of continental or global significance. It is also worth noting that some of the other sites, although identified as IBAs on the basis of their use by other taxa, regularly support shorebird species.

Overall, this brings the total number of IBAs in Alaska to over 140. The success of this project is highly dependent on the collaboration and cooperation of a range of partnering organizations and communities across Alaska. We thank all the dedicated individuals who have contributed to this truly global project in 2007.

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***ECOTOXICOLOGY OF MIGRATORY SHOREBIRDS** – Strum et al.*

Investigators: Khara M. Strum and Brett K. Sandercock; Kansas State University, Michael J. Hooper; Texas Tech University, Kevin A. Johnson; Southern Illinois University, Richard B. Lanctot; U.S. Fish and Wildlife Service

Migratory shorebirds traverse long distances during their annual movements and stopover habitat is critical to successful migration. As natural habitats are destroyed or changed, many shorebirds utilize alternative habitats that may increase their risk of exposure to potentially debilitating pesticides. We evaluated exposure to cholinesterase (ChE) -inhibiting pesticides in migrating shorebirds using turf grass farms in North America and non-breeding shorebirds using agricultural fields in South America. Shorebirds were sampled from reference sites with no known pesticide use and potential use sites where pesticides were recommended for pest control in each region. We collected plasma samples to assess variation in plasma ChE activity and evaluate pesticide exposure. Footwashings and feather samples were collected for chemical residue extraction.

During 2006, shorebirds were captured during spring and fall migration in Texas, Kansas and Nebraska and at the non-breeding grounds in Paraguay, Argentina and Uruguay. Capture locations included natural wetlands and grasslands in addition to altered habitats such as turf farms, rice fields and cattle pastures. In total, 431 individuals of 21 shorebird species were sampled in the Great Plains including 40 *Tryngites subruficollis,* 60 *Calidris pusilla,* 68 *C. minutilla,* and 37 *C. melanotos.* During the spring and fall migration, 174 and 258 individuals were captured in 3 and 2 states, respectively. The non-breeding capture effort in South America resulted in a total of 248 individuals of 12 species sampled in three countries including 47 *Pluvialis dominica*, 85 *C. fuscicollis*, 24 *T. subruficollis* and 42 *C. melanotos*.

Laboratory analyses were conducted on a subset of the individuals captured with adequate sample volume. In total, cholinesterase activity analyses were completed for 274 individuals of 18 species during migration and 218 individuals of nine species on the non-breeding grounds. Assays included absolute cholinesterase activity and specific assays for reactivation of OP and CB-inhibited enzymes. Results from a subset of birds captured on spring migration indicated a significant relationship between ChE activity and body size. Small-bodied species have higher ChE activity than large-bodied species. ChE activity increased during spring migration in three species but did not vary between sexes for non-breeding shorebirds. Preliminary evaluation of ChE for pesticide exposure indicated that Buff-breasted Sandpipers may be encountering OP or CB pesticides on the non-breeding grounds. These results must be verified by extraction of residues from footwashings and feather samples.

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DISTRIBUTION, MOVEMENTS, AND PHYSIOLOGY OF POST-BREEDING SHOREBIRDS ON ALASKA'S ARCTIC COASTAL PLAIN – *Taylor et al.*

Investigators: Audrey Taylor and Abby Powell, AKCFWRU, University of Alaska Fairbanks; Richard Lanctot, U.S. Fish and Wildlife Service, Migratory Bird Management; Steve Kendall, U.S. Fish and Wildlife Service, Arctic National Wildlife Refuge; Debbie Nigro, Bureau of Land Management, Fairbanks Field Office

Little current, quantitative information exists to assess postbreeding shorebird abundance and distribution across Alaska's North Slope or how site selection, movement patterns, or residency times may vary across time, space, and species. This information is critical given increased levels of human activity and industrial development near littoral areas across the Arctic Coastal Plain (ACP). This project was initiated to gain a better understanding of when and how post-breeding shorebirds use vulnerable coastal habitats across the ACP during the staging period, and to predict how future industrial and human activity may affect shorebird populations. The specific objectives for this research are (1) to assess the abundance, distribution, and species composition of shorebirds staging along the ACP coastline prior to the fall migration, (2) to quantify and compare phenological aspects of staging, such as timing of arrival after breeding for adult and hatch-year birds, overall and species-specific peaks in shorebird numbers, residency times, and movement patterns of birds among staging sites across the ACP, and (3) to examine differences in measures of physiological condition (fattening rates and stress hormone concentrations) among species and sites, which provide information on the function and quality of different staging areas.

In 2005 and 2006, we conducted a single helicopter (2005) and multiple fixed-wing (2006) aerial surveys designed to count staging shorebirds along the entire ACP from the southern end of Kasegaluk Lagoon (69.28490°N, 163.27091°W) to the eastern border of the Arctic National Wildlife Refuge (69.66046°N, 141.06690°W). Survey dates were 7-16 August 2005, and 3-7 August, 9-17 August, and 23-27 August 2006. We also conducted comparative, site-specific fieldwork examining staging shorebird abundance, phenology, and physiology at six locations across the ACP (Kasegaluk Lagoon/Icy Cape, Peard Bay, Barrow, the Colville River Delta, Sagavanirktok River Delta, and Okpilak River Delta), and examined residency times and movement patterns within and between these sites. Personnel at each location conducted regular surveys to examine shorebird abundance, distribution, species composition, and habitat use from mid July to early September. Field crews also captured birds to collect blood samples for analysis of fattening rates and stress hormone levels, and banded and equipped individuals with radio transmitters to determine residency time at each site. Over the two years of fieldwork, we banded and blood-sampled 1038 shorebirds of five species (Dunlin, Western Sandpipers, Semipalmated Sandpipers, Red Phalaropes, and Red-necked Phalaropes), and radio-equipped 137 adults and 182 hatch-year birds of the same species. Each camp maintained an automated telemetry station and conducted manual telemetry on a regular basis to estimate residency time and examine the probability of birds dispersing between breeding and staging areas, and among staging areas. Two additional remote telemetry stations were located at the mouth and 40 km up stream of the Canning River Delta to detect shorebirds (particularly Semipalmated Sandpipers) potentially using the river as a migration corridor. We also conducted telemetry surveys from the aircraft while collecting aerial abundance and distribution data as described above.

Fieldwork for this project officially ended in 2006, although the Arctic National Wildlife Refuge has continued to use some of the methodology developed during our field studies to further investigate staging shorebird use of the refuge's coastal areas (see summary in this collection by Steve Kendall *et al*: Postbreeding Shorebird Studies on the Arctic National Wildlife Refuge, Alaska). Within the last year, we have focused on the following: (1) completing fat metabolite and corticosterone assays for assessment and comparison of fattening rates and stress hormone levels across staging sites, (2) entering, proofing, and analyzing the banding data from both years and all camps to determine staging phenology across the ACP, (3) analyzing the radio telemetry data to obtain estimates of residency time and examine movement patterns, and (4) using Program Distance to estimate density of all shorebirds and component species from the ACP-wide aerial survey data collected in 2006 (ongoing). Some highlights from recent data analysis efforts are described below.

As a first step in examining phenology of our five main study species, we used banding records obtained during the 2005 and 2006 field seasons. (Future analyses will also utilize data from regular transect surveys conducted at each field camp.) We captured few adult birds in mist nets or walk-in traps, but those we did trap were captured early in each species' staging period, indicating that adult birds leave the ACP staging areas prior to juvenile birds. An exception to this generality is Dunlin: this species was still present at coastal staging areas well into mid-September, and many adults were observed (although juveniles were more numerous). We used species-specific capture dates as a proxy for peak staging abundance, since our success at capturing individuals of a species typically increases with higher densities of that species. As predicted, dates of peak abundance differed significantly across our five main study species

(ANOVA, F = 122.14, $p < 0.0001$, df = 4). Semipalmated Sandpipers showed the earliest peak staging date (2 August), while Dunlin showed the latest (21 August); Western Sandpipers and both phalarope species were intermediate in peak abundance date (13 August).

Residency times of radio-equipped shorebirds at each camp were highly variable across locations and years. After adjusting for overdispersion in the telemetry data likely caused by such variability, our best model for residency time was one of constant survival and detection probability across all five study species. Using this model, we estimated tenure time for all species to be 6.5 days (95% confidence interval: 3.4-9.6 days). Detection probability for all species (conditional upon survival) was 68% (95% CI: 58-78%). Our second best model indicated a species-specific effect on residency time. Although the power of this model was low due to high spatial and temporal variability, we believe there is biological reality in this model. Using this model, Semipalmated Sandpiper and both phalarope species exhibited distinctly shorter residency times (approximately 4.4 days) than Western Sandpipers (7.9 days), which in turn have distinctly shorter residency times than Dunlin (12.9 days). We plan to use these estimates to inform our analysis of overall staging shorebird abundance by combining density estimates during each aerial survey period with residency times to calculate the total number of birds likely to be using ACP coastlines during the postbreeding period.

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***SUBSPECIFIC IDENTITY OF RED KNOT: THE EASTERN PACIFIC PUZZLE NEARING COMPLETION** – Tomkovich et al.*

Investigators: Pavel Tomkovich, Moscow State University, Robert Gill, USGS, and David Melville and Adrian Riegen, New Zealand Wader Study Group.

Over 100 years of speculation about the identity and distribution of Red Knots (*Calidris canutus*) occurring throughout the eastern Pacific may soon be resolved. Since 2005 there has been a concerted effort by biologists throughout the North American Pacific Flyway to 1) mark and look for marked birds at breeding and stopover/staging sites, and 2) obtain biometric data and samples of tissue and feathers to compare and contrast with other defined populations of Red Knots. This effort stems from concern about documented marked population declines among most populations of Red Knot worldwide. This summary covers work conducted in 2007 on the Yukon-Kuskokwim Delta (YKD) of western Alaska, a spring staging area, and on Wrangel Island, Russia, a suspected breeding area for knots staging on the YKD.

Between 14 and 31 May, a team of three biologists occupied a camp at the mouth of the Tutakoke River on the central YKD (see 2006 summary). Birds were noted each day during this period, peaking at about 5,000 individuals daily from 21–25 May. Capture of knots was hampered in 2007 by the early melt-off that dispersed birds widely over the area. Only four adults were captured, all during 18-19 May and all individually marked with black flags having a unique set of three white alpha characters (AEC, AEP, ACH, ACV). Most rewarding were observations on the YKD of at least two birds flagged in Guerrero Negro, Baja California, in October 2006. [In the spirit of reciprocity, two birds (AAC and AAX) flagged on the YKD in spring 2006 were seen at Guerrero Negro in October 2007; N. Clark and H. Sitters et al., unpubl. data.] Until additional information becomes available, we assume Guerrero Negro is part of the core nonbreeding range of this population; how much farther south the range may extend has not been determined.

From 3 July to 24 August one of us (PT) visited Wrangel Island, Russia, to assess the status of Red Knots nesting there (identified in 1990 as *C. c. roselaari* with a breeding range also encompassing Alaska). None of the 30 adults looked at closely were banded, but 11 other adults were captured and given flags (all light blue over white on left tibia). At least one of these flagged birds was noted at Guerrero Negro on 22 October 2007 and seen subsequently there through 30 October (N. Clark and H. Sitters, unpubl. data).

Analyses of stable isotopes, genetics, and morphometrics are ongoing, but conventional marking techniques have at a minimum established links between the breeding grounds, spring staging areas, and the nonbreeding grounds of Red Knots occurring along the Pacific coast of North America and Wrangel Island.

The studies reported here are part of a multinational cooperative project involving biologists from Mexico (R. Carmona), the United Kingdom (P. Atkinson, J. Clark, N. Clark, M. Peck, H. Sitters), Russia (P. Tomkovich), New Zealand (D. Melville, A. Riegen), Australia (C. Minton), and the United States (J. Buchanan, B. Harrington, B. McCaffery).

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