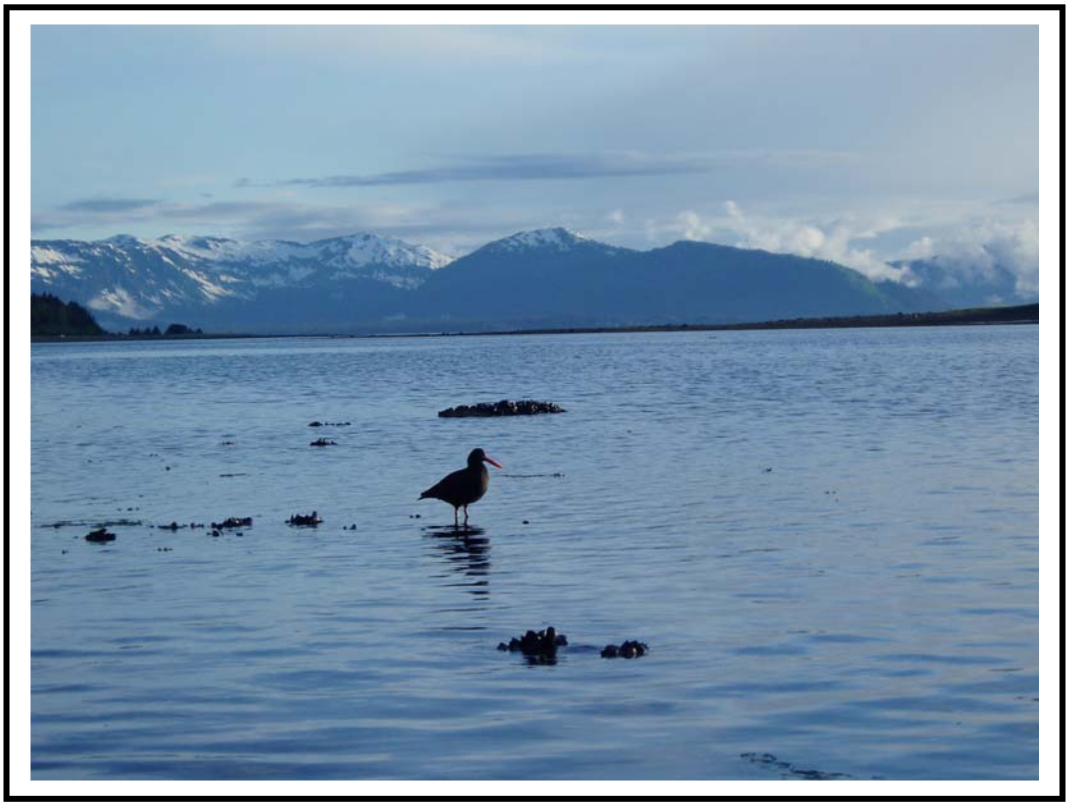
Black Oystercatcher Distribution and Productivity in the Beardslee Islands, Glacier Bay National Park and Preserve, Alaska



David F. Tessler, Louis S. Garding

Alaska Department of Fish and Game
Nongame Program
333 Raspberry Road
Anchorage, Alaska 99518

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ABSTRACT

Currently, direct conservation efforts for the Black Oystercatcher are somewhat limited by a general lack of basic baseline ecological information. Addressing these serious gaps in our understanding is a prerequisite for developing statewide or regional conservation strategies for this species. This project aligns and expands the research objectives and methodologies of several previously unrelated studies of the black oystercatcher in multiple locations across the heart of this species' range: The Aleutian Islands, Kodiak Island, Kenai Fjords National Park, Middleton Island, Prince William Sound, Glacier Bay National Park, Tongass National Forest, and the Queen Charlotte Islands in British Columbia. By promoting the adoption of a core set of shared methods among new and current projects, we address several key aspects of oystercatcher ecology critical to the conservation of this poorly understood species. This cooperatively funded and administered project draws together the efforts of the U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, U.S.G.S., The Alaska Department of Fish and Game, the University of Alaska Fairbanks, and ultimately the Canadian Wildlife Service, Parks Canada, and the Laskeek Bay Conservation Society in British Columbia. The principal aims of the project are to: 1) Assess the size of several important breeding populations throughout the range, and determine nesting density in each; 2) Determine adult survival, breeding site fidelity, and natal philopatry; 3) Assess regional differences in nesting effort, breeding success and productivity; 4) Identify local threats or limitations to productivity; 5) Elucidate levels of population structuring and the degree of connectivity between regional breeding populations; 6) Identify the locations of important wintering areas and the number of birds in those areas; and 7) Identify movements between breeding and wintering sites.

KEYWORDS: *Black oystercatcher, important breeding areas, productivity, banding, survival, ecology, conservation, inter-seasonal movements*

OVERVIEW

The Black oystercatcher (*Haematopus bachmani*) is listed as a "species of high concern" within the U.S., Canadian, and Alaskan shorebird conservation plans because of their very small population size, potential threats to their shoreline/intertidal habitat, and their susceptibility to human disturbance (Alaska Shorebird Working Group 2000, Brown et al. 2001, Donaldson et al. 2000). The black oystercatcher is also on the Audubon Society's Watch List, the Western Hemisphere Shorebird Reserve Network's (WHSRN) list of the most vulnerable shorebirds, it is one of nine "focal" species designated nationally by the U.S. Fish and Wildlife Service, and it is a featured species in the Comprehensive Wildlife Conservation Strategies in Alaska, Washington, and Oregon (ADF&G 2004, Muehter 1998). They range from the Aleutian Islands to Baja California, but the vast majority (about 65%) of the global population (estimated at between 8,900 and 11,000 birds) resides in Alaska, conferring on this state a significant amount of the global stewardship responsibility for this species (Andres and Falxa 1995, Brown et al.

2001). The black oystercatcher is an intertidal obligate, spending it's entire life history in this narrow ecological zone, and feeding exclusively on intertidal invertebrates. They are thought to be a particularly sensitive indicator of the overall health of this ecological community (USDA Forest Service 2002). Current understanding of the Black oystercatcher is severely limited by a general lack of basic baseline information on factors such as the size of local breeding populations, the overall population status, adult survival, fledging success, breeding site fidelity, population structure, local and regional threats to survival and productivity, the locations of important wintering areas, the number of birds in those wintering areas, and movements between breeding and wintering sites (Andres 1994, Andres and Falxa 1995, Andres 1998). Addressing these serious gaps in our understanding is a prerequisite for developing statewide or regional conservation strategies for this species (Brown et al. 2001).

In 2003, researchers from multiple agencies initiated a coordinated, regional effort to address several key aspects of Black oystercatcher ecology critical to the conservation of this poorly understood species: *An integrated regional ecological assessment of the black oystercatcher (Haematopus bachmani.* ADF&G took the lead in this cooperatively funded and administered project drawing together the efforts of the U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, U.S. Geologic Survey, the University of Alaska Fairbanks, and ultimately the Canadian Wildlife Service, Parks Canada, and the Lakseek Bay Conservation Society in British Columbia.

OBJECTIVES

The principal aims of the project are to:

1) Determine the size and nesting density of several important local breeding populations throughout the range;
2) Assess adult survival, breeding site fidelity, and natal philopatry, and other demographic parameters important in regulating population size;
3) Assess regional differences in nesting effort, breeding success, and productivity;
4) Identify local threats or limitations to productivity;
5) Elucidate levels of population structuring and the degree of connectivity between regional breeding populations;
6) Identify locations of important wintering areas and the numbers of birds in those areas; Identify movement patterns between various breeding and wintering areas.

METHODS

Summer Work

In 2004, 2005 we had four field camps located in Prince William Sound, Kenai Fjords National Park, Middleton Island, and Glacier Bay National Park. In Glacier Bay, the study area consisted of approximately 60 Black oystercatcher territories in the non-motorized wilderness of the Beardslee Island Region. The crew used kayaks for all travel within the study area, and completed official NPS kayak safety training in Bartlett Cove.

The crew utilized a lightweight, low-impact camp that could be moved easily and frequently by kayak. As wisdom and pepper spray are the only means of protection against bears in the Park, a portable electric bear fence was employed around the roving field camp, and the field crew was issued bear spray and personal, pen-style "bear bangers" and was trained in their safe use. The work schedule while in the field was variable, ranging from 5 to 10 days in the field before coming in for 2-3 days to re-supply and dry out. Housing while out of the field was in a rented National Park Service apartment in Gustavus, AK. Fieldwork commenced in early May and lasted until August 10. The field crew of two was accompanied by the project P.I. for several weeks at the onset of fieldwork for training and orientation.

Beginning 12 May, we thoroughly searched the Beardslee Island Study Area and noted the locations of all observed oystercatchers, and identified territorial pairs via behavioral observation. Survey and search protocols followed Poe 2003. Locations of all observed oystercatchers were recorded daily. Each actively defended territory was searched to locate nests, and a commercial GPS was used to record the locations of both territories and nests. A visitation schedule was implemented to insure that each identified territory was revisited at least every seven days (within the average relaying period of nine days). When a nest was located, the size and number of eggs were recorded, the eggs were floated to estimate laying and hatching dates (V. Gill, unpubl. data), and each was marked inconspicuously with a letter for identification. We determined breeding chronology and daily nest and chick survival rates using the Mayfield estimator. We plan to re-analyze the final data using program MARK. Every effort was made to determine the fate of all nests, and record the cause of any losses. When a nest failed prior to hatch, territorial pairs were observed to determine if and when they initiated a second nest. Because black oystercatchers remain on their territory after successfully hatching young, we documented the survival of chicks by observing them on territories from a distance using spotting scopes (Andres 1999). We continued to monitor territories according to the visitation schedule until any chicks present fledged or until the end of field operations on August 10th.

A coordinated, strategic banding program is crucial to meeting many of the stated objectives. We captured breeding birds using a number of situation-specific capture techniques previously used for American and black oystercatchers (McGowan and Simons 2002, J. Morse, R. Lanctot, V. Gill, pers. comm.). We also developed several novel safe and effective capture methods. Noose mats or were employed in conjunction with decoys and recorded territorial calls to capture birds away from the nest. Nest nooses were used to capture birds sitting on a nest (after temporarily replacing the real eggs with dummies). Adult capture efforts took place either during the pre-lay period or during incubation approximately one week after laying, to minimize the potential for nest abandonment. Chicks were opportunistically hand captured at nest sites and on territories. The use of these various capture methods ensures a large number of adults and chicks are marked each year. All captured oystercatchers were banded with metal leg bands and unique combinations of colored plastic Darvic leg bands to enable identification of both the individual and its original breeding area. Glacier Bay oystercatchers have a light green band above the USFWS stainless steel band on the left leg below the knee. The right leg of birds banded as adults will have two colored bands. Birds banded as chicks will have three bands on the right leg: two color bands below the knee, and one above to differentiate between cohorts from different years. 2005 was our first year banding chicks in Glacier Bay, and the cohort color was red. Resighting banded birds in subsequent summers will be used to estimate site and mate fidelity of adults, natal philopatry, and the survival of individual birds over the winter. Captured adults and chicks were weighed, and the length of the tarsus, flattened wing, head and bill were measured. Blood samples (~ 100 microliters) were taken from the medial metatarsal vein of adults for use in the genetic analyses of population structuring. We collected any dud eggs or eggshells with attached membrane found at nest sites for inclusion in the population genetics dataset. Samples will be processed and the extracted DNA will be analyzed using microsatellites as molecular markers to identify the degree of connectivity between regional breeding populations. The genetic analyses are being conducted by an ADF&G technician working under the supervision of Dr. Sandra Talbot at the Molecular Biology Laboratory at the U.S.G.S. Alaska Science Center.

Study Area

The Beardslee Islands Study Area is located within a designated non-motorized wilderness area of Glacier Bay National Park and Preserve. The Study Area is northwest of Bartlett Cove, southwest of the Beartrack Valley, east of Strawberry Island, southeast of Flapjack Island, and northeast of Young Island. Strawberry Island, Young Island, and Secret Bay were not surveyed due to time and accessibility constraints. A few islands in the group are designated as marine mammal haulouts where access is restricted. Hence, they were not included in our monitoring effort. These islands are: Spider Island, Eider Island, island #28, and Flapjack Island. (See Figure 1).

Winter Work

February 2007 we will begin work on identifying important wintering concentrations and possible movement patterns. We intend to aerially survey parts of the Aleutian Islands and the Alaska Peninsula, all of Kenai Fjords National Park, Prince William Sound, Yakutat Bay, Glacier Bay National Park, and a sizable portion of the Southeast Alaska coast to locate concentrations of oystercatchers and estimate their numbers. Survey flights will be conducted from an altitude of 150 feet at an airspeed of 85 miles per hour. In Prince William Sound and Glacier Bay these aerial surveys will be used to target boat-based efforts for resighting banded birds and enumerating flocks. Flock location, enumeration and band resighting efforts will be conducted by boat on Kodiak Island, and via ground based surveys on Middleton Island.

RESULTS

Territories and Clutches

We surveyed the entire Beardslee Island Study Area, between 12 May and 10 August, 2005. Although we discovered a large proportion of territories during our initial surveying effort, additional territories were encountered and new territories were established throughout the season. We mapped a total of 58 actively defended black oystercatcher territories (see Figure 1 and Appendices A and B). Fifty of the 58 territorial pairs (86%) produced at least one clutch of eggs. Three of the remaining eight territories exhibited signs of active nesting, though no eggs were ever documented. These 50 first clutch nests produced 112 eggs for an average first clutch size of 2.24 eggs. Thirty-seven of the 50 (74%) first clutch nests were completely lost prior to hatching. Seven first clutch nests (14%) successfully fledged 14 young. Twenty-five of the 37 pairs (67.6%) that failed on their first attempt laid a second clutch. Second clutches produced 53 eggs for a slightly smaller average clutch size of 2.12 eggs. Nineteen second clutch nests were completely lost prior to hatching (76%), and only three second attempts (12%) successfully fledged a total of seven young. Five pairs laid a third clutch, totaling nine eggs for an average third clutch size of 1.80 eggs. Only a single third clutch egg successfully hatched and subsequently fledged a chick (11%). In summary, in the 58 territories we monitored, 174 eggs were laid in 80 nest attempts on 50 territories, 37 eggs (21%) hatched in 18 territories, and twenty two chicks (13%) successfully fledged from 12 territories. Documented lay dates ranged from 11 May to 10 July (see Figure 2). Most first clutches were laid before 1 June, but some egg laying continued throughout the season as second and third replacement clutches were laid. When all clutches are considered together, the median lay date in 2005 was 7 June; for first clutches only the median lay date was 20 May. In 2004 the median lay date for all clutches combined (there were no third clutches) was 24 May.

A USGS Biological Sciences team, lead by Mayumi Arimitsu, surveyed ground nesting birds throughout Glacier Bay this summer, and was given limited access to two of the islands in the Beardslee group that we were not permitted to survey: Spider and Eider Islands. The USGS team surveyed Spider Island on 25 June and found two breeding pairs, one with three chicks, the other a nest with one egg. On 26 June they surveyed the south islet of Spider Island and Eider Island and found four breeding pairs with nests and a total of eleven eggs. They found one additional apparently territorial pair, but never located a nest, eggs, or chicks. In all, they found eight pairs of territorial black oystercatchers, seven actively breeding pairs, and five nests with thirteen eggs and three chicks. (Appendix A). Because the territories found on Spider and Eider Islands were not continuously monitored, we have excluded them from our estimates of productivity. It must be noted that the USGS visits came one day after the highest tides of the month, tides that resulted in the loss of at least 10 nests from monitored territories. Therefore the numbers of territorial and breeding pairs on Spider and Eider Islands should be considered minimum estimates. If we include the figures from Spider and Eider Islands, the Beardslee Island Study Area was home to at least 66 territorial pairs and 57 actively breeding pairs in 2005. This means the Beardslees are home to at least 1.2 to 1.6% of the global population of black oystercatchers.

Egg Losses and Hatching Success

We attempted to classify all egg losses by cause: flooding, depredation, duds, or unknown. A total of 137 (79%) eggs out of 174 were confirmed lost prior to hatching compared to 47 eggs (69%) last year. We attributed 43% of egg losses (59 eggs) to seawater inundation and flooding of nests, compared to 47% (22 eggs) the previous year (see Figure 3). We classified lost eggs as depredated if broken eggshells or other evidence consistent with predation were found. We documented 39 eggs (28%) as depredated, though we never directly observed a depredation event. Five eggs (3% of eggs lost) were categorized as duds: These eggs were not obviously damaged in any way, and were incubated just like any other egg in an active nest: They simply failed to hatch after the incubation period (28 days). These eggs eventually disappeared from their nests, and no chicks were ever observed. Behavioral observations of the territorial pairs in question were consistent with nest loss. For the remaining 34 eggs (25%), there was no evidence available to ascertain the cause of loss. Punctuated episodes of heavy nest losses are associated with tidal flooding (see Figure 4).

Productivity
Out of 174 eggs laid in 2005, at least 37 (21.3%) chicks were hatched in 18 individual territories. Twenty-two chicks from 12 territories ultimately fledged. We defined a fledgling as a chick that was either observed flying or was alive and healthy on the final day of field observations (10 August). The clutch size, averaged over all nesting attempts (174 eggs * 80 documented clutches^{-1}), was 2.18 eggs. Overall apparent hatching success (chicks hatched * eggs laid^{-1} * breeding pair^{-1}) was 18% (Figure 5). In 2005, 22 chicks fledged, resulting in an apparent fledging success (fledglings * eggs laid $^{-1}$) of 13%. Most losses or limitations to productivity occurred during the egg stage, and while some chicks were lost before fledging, 60% of chicks hatched survived to fledge. Overall productivity for 2005 (fledglings * breeding pairs^{-1}) was 0.44.

Capture and Banding
A total of 19 adults were captured, measured, and banded (see Appendix C). No nests were abandoned after successful or attempted captures. Eleven adults (58%) were caught with nest snares; seven adults (37%) were caught in noose mats; one adult (5%) was caught with a pole noose. No adults were injured during any of the capture attempts. Twenty-three chicks were captured by hand, measured, and banded. Each of these chick captures went smoothly and the chicks were released without incident or injury. However, three banded chicks did not survive to fledge. This proportion (13%) is actually lower than the pre-fledge mortality rate of unbanded chicks (85%) at Glacier Bay. A combined 32 samples were collected for genetic analyses (19 blood samples from adults, and 13 eggshell membrane samples from broken eggs). Genetic analyses will be conducted at the Molecular Biology Laboratory of the U.S.G.S. Alaska Science Center over the next two years.

A banded oystercatcher matching the description of a chick banded in 2005 at Glacier Bay was sighted 5 January 2006. The bird was observed with a flock of 12 unbanded BLOY, near Lady Ellen Point, approximately 6 km North-West of Port McNeil, Vancouver Island, British Columbia, Canada. The banded oystercatcher appeared healthy. The bird had a metal band on the lower left leg, and on the left leg, a red band above the knee, and two blue bands below the knee. This bird does not match any other known banded oystercatcher anywhere. However, if it is one of "our" birds, the light-green color band on the left leg that designates Glacier Bay as the breeding location appears to have come off.

DISCUSSION

Territories and Clutches 2004 & 2005

In 2004, only 31 territorial pairs were documented, 23 of which (74%) were considered actively breeding. In 2005 we documented 58 territorial and 50 (86%) breeding pairs. Despite the fact that the crew sizes, visitation schedules, field season length, survey methods, and presumed effort were nearly identical between years, it is unlikely that this apparent increase in oystercatcher numbers and breeding effort is entirely the result of immigration into the study area. This disparity is more likely an artifact of greater experience on the part of the principal investigator and the field crew, and heightened diligence in survey and census efforts. However, a 2003 survey of the Beardslees conducted by USGS personnel (Arimitsu et al. 2004) found only 28 territorial pairs, nine of which were actively breeding at the time of their survey. Although the USGS effort consisted of a one-time survey of the study area, an increase in nesting oystercatchers in the Beardslees over this time period cannot be ruled out. However, in 1987 Lentfer et. al. reported 63 territorial pairs while monitoring the size and distribution of 59 nesting pairs in the Beardslees, indicating some stability in the Glacier Bay population over the intervening years.

Because our 6 to 8 day visitation schedule was shorter than the average 9 or 10 day relaying interval for black oystercatchers, it is unlikely that we missed any second or third clutches that were laid and subsequently lost between visits. However, it is possible that some first clutches were lost prior to discovery, and were therefore never detected. We found highly developed nests and scrapes in three territories where no eggs or chicks were ever found. Undetected clutches would decrease the apparent hatching success and fledging percentage, but would have no effect on overall productivity.

Average Clutch Sizes 2004 & 2005

In 2005 the average size of the first clutch was 2.24 eggs (112 eggs * 50 1st clutches^{-1}). This is close to the 2004 average first clutch size of 2.39 eggs per clutch (55 eggs * 23 1st clutches^{-1}). Thirty-seven (67%) first clutch nests were completely lost in 2005, compared to 12 (52%) in 2004. Average size of the second clutch in 2005 was 2.12 (53 eggs * 25 2nd clutches^{-1}) compared to a relatively high second clutch size average of 2.60 (13 eggs * 5 2nd clutches^{-1}) in 2004. Seventy six percent (19) of second clutches were completely lost in 2005, compared to one hundred percent (5) in 2004. Third clutches were substantially smaller in 2005; 1.80 (9 eggs * 5 3rd clutches^{-1}) with no third clutches documented in 2004.

The overall average clutch size in 2005 was 2.18 (174 eggs/80 clutches) compared to 2.43 (68 eggs/28 clutches) in 2004. In 1987 Lentfer (1990) documented the average clutch size in the Beardslees at 2.67 eggs (144 eggs/54 clutches). Although the sample size for 2004 was relatively small, and the survey design and effort were considerably different in 1987, these figures suggest the average clutch size may have decreased over time in this region. No key elements have been defined as primary influences on black oystercatcher clutch size, and numerous variables (including relative forage quality and availability, body condition, conspecific stress, and severity of the preceding winter) are likely to have an impact. If oystercatcher numbers are indeed increasing it is at least conceivable that greater competition for food and/or conspecific interactions might produce the observed decrease in clutch size, although without focused experimentation this is purely conjecture.

Hatching 2004 & 2005

Hatching success (viable chicks hatched * total eggs laid $^{-1}$) in 2005 was 21%, down from 31% in 2004. Both of these number fall within the range of values we see across the state. There is no significant difference between hatching success in Glacier Bay, Prince William Sound, or Kenai Fjords. However, hatching success is significantly higher at Middleton Island where there are no terrestrial predators and the birds nest away from the shoreline. There were four categories of egg loss: tidal events, depredation, duds, and unknown. Any loss for which we could not clearly establish the cause, fell into the unknown category, meaning that tidal and predator losses were likely underestimated in both years. Because our productivity observations were based on six to eight-day rotating surveys, it is conceivable that a few chicks may have hatched and subsequently fallen victim to predation without being documented. 60% of chicks hatched survived to fledging whereas only 21% of eggs survived to hatch, indicating that egg loss exerts significantly more restraint on productivity than does chick loss.

Losses due to depredation apparently increased in 2005, however this is likely an artifact of better and more complete nest surveillance reducing the proportion of unknown losses. In 2004, 45% eggs were lost to unknown causes, while in 2005 only 25% of losses were classified as unknown. In both years the greatest documented cause of nest loss in Glacier Bay was seawater inundation or tidal flooding: 47% in 2004 and 43% in 2005. This represents a significant drain on the potential productivity for this species. Their demonstrated susceptibility to natural flooding during extreme tidal events underscores the need to explore and understand the potential combined effects of high tide events and waves. It is conceivable that a when a large wave coincides with the highest tides, nearly every oystercatcher nest in the area would be lost. Storms, tsunamis, and other stochastic natural events would be one infrequent source for such waves, but vessel traffic, whether slow moving large displacement ships, or smaller faster recreational boats, may create such waves with regularity. Because this species has such chronically low productivity, any additional and recurring drain on productivity locally could imperil a population. The frequency and timing of these anthropogenically created waves may have serious implications for the conservation and survival of this species.

Only 2 eggs (4% of losses) were duds in 2004, and only five eggs (4% of losses) in 2005. This proportion is relatively small, consistent between seasons, and does not indicate a major depression of egg viability consistent with chemical contamination. These eggs may simply have not been fertilized, but a number of potential causes may have rendered these eggs inert. No genetic samples were taken from these eggs.

Fledging and Productivity 2004 & 2005

Although considerably more chicks fledged in the Beardslee Islands Study Area in 2005 than in 2004 (22 versus 17), productivity (fledglings * breeding pair^{-1}) was lower in 2005 (0.44) than it was in 2004 (0.74). The fledging percentage (fledglings * total eggs^{-1}) in the Beardslee Islands was also down in 2005, to 13% (22 chicks/ 174 eggs) from 25% in 2004 (17 chicks/ 68 eggs). However, when the years are averaged together, the fledging percentage of 16% is similar to the 12% reported from earlier work in western Prince William Sound (Andres et al. 1995). Although these productivity numbers appear low, they are consistent with other dispersed breeding, long-lived shorebirds, and do not differ statistically from the three other Alaskan sites considered in this investigation (see Figure 6). The authors feel that the apparent decrease in productivity between years is probably in part an artifact of a more adequate sample size; the consequence of simply having discovered most of the existing territories in 2005. As our ongoing work suggests, black oystercatcher productivity appears to remain low throughout Alaska, but is highly variable between years.

Capture and Banding 2004 & 2005

We successfully trapped 19 adult black oystercatchers in the Beardslee Islands in 2005. Thirty-six adult oystercatchers have now been banded in Glacier Bay without injury, mortality or nest abandonment. For the 2005 banding season nest nooses and noose mats were the main methods of trapping. The nest noose was most effective, capturing 11 (58%) adults. We caught 7 adults (37%) with the noose mat. One (5%) adult was caught w/a pole noose. We did not employ mist nets this year due to limited prior success. When both years are combined, 17 adults (53%) were captured with noose mats, 11 adults (31%) with a nest noose, five (14%) were caught in mist nets, and one (2%) with the pole noose. However, the amount of effort expended on each trapping method was uneven, and it is impossible to derive statistical meaning from these capture percentages. We contend that the nest noose is the preferable technique for capturing breeding adults because it is easy to employ, requires the least set up time, and ultimately results in more birds caught with less disturbance at the nest. Twenty-three chicks were captured by hand without injury or mortality (19 ultimately fledged). This is ultimately the easiest, fastest, and most benign method to capture oystercatchers, and if one can limit banding to juveniles, this would be the preferred approach.

Band Resighting and Demographics

Thirteen of the 17 adults banded in 2004 returned in 2005. We will classify the four missing birds as winter kill, although it is impossible to rule out emigration. Thus overwintering mortality for the Glacier Bay study site between 2004 and 2005 was 23.5%. This is roughly twice the estimated overwintering mortality of 12.2% when all Alaskan sites are considered together. One adult marked in 2004 was observed once in May and not seen again. The twelve remaining marked birds from 2004 all actively defended a territory in 2005. Two banded adults switched territories in 2005, and four banded adults switched mates, making apparent site fidelity about 85% and mate fidelity about 70%. However, in two cases of mate-switching, the 2004 mate didn't return in 2005 (presumably died). In a third case of mate switching, the 2004 mate was unmarked so it is impossible to say if it had returned or was lost over winter, but the 2005 mate was one of the two marked birds above that had lost it's own previous mate. In the last case of mate switching, the 2004 mate was in the area, but the pair did not reunite. It is therefore probable that mate fidelity outside of pair member loss is about 93%, and this is consistent with our findings in other parts of Alaska. Of the two birds that switched territories, one was the mate-switcher from the third case above, and the other was the spurned mate from case number four. So site fidelity is also approximately 95%. To adequately investigate mate and site fidelity, we would like to have more territories in which both pair members are marked in the future.

The banded oystercatcher sighted 5 January 2006 on Vancouver Island, British Columbia is by all accounts a juvenile banded in the Beardslees in 2005. If this is indeed the case, it would be a first in many respects: The very first black oystercatcher banded in Alaska seen in the winter; and the first black oystercatcher chick banded anywhere seen in the winter. It is the first documentation of black oystercatchers,either juveniles or adults, undertaking significant seasonal migrations. We know very little of their interseasonal movements, and this sort of lengthy migration has not been anticipated: This is exciting news indeed. We look forward to more winter band resightings in the future, the results of upcoming winter surveys efforts in 2007, and to a future rangewide satellite telemetry study currently in the planning stages.

FUNDING

No funding was provided for this work by the National Park Service. However, Glacier Bay National Park and Preserve did provide in kind support by allowing the investigators to use NPS sea kayaks in this study.

The total budget for the broader project is difficult to calculate because it involves contributions from so many collaborating partners. Indeed, it is difficult to separate out the specific fraction of funding involved in the Glacier Bay piece because technicians and equipment were also involved in aspects of the study beyond the Park. The State Wildlife Grant Program, administered through the Alaska Department of Fish and Game and the Office of Federal Aid at the US Fish and Wildlife Service, provided the approximately $25,000 dollars spent on black oystercatcher work in Glacier Bay in 2005.

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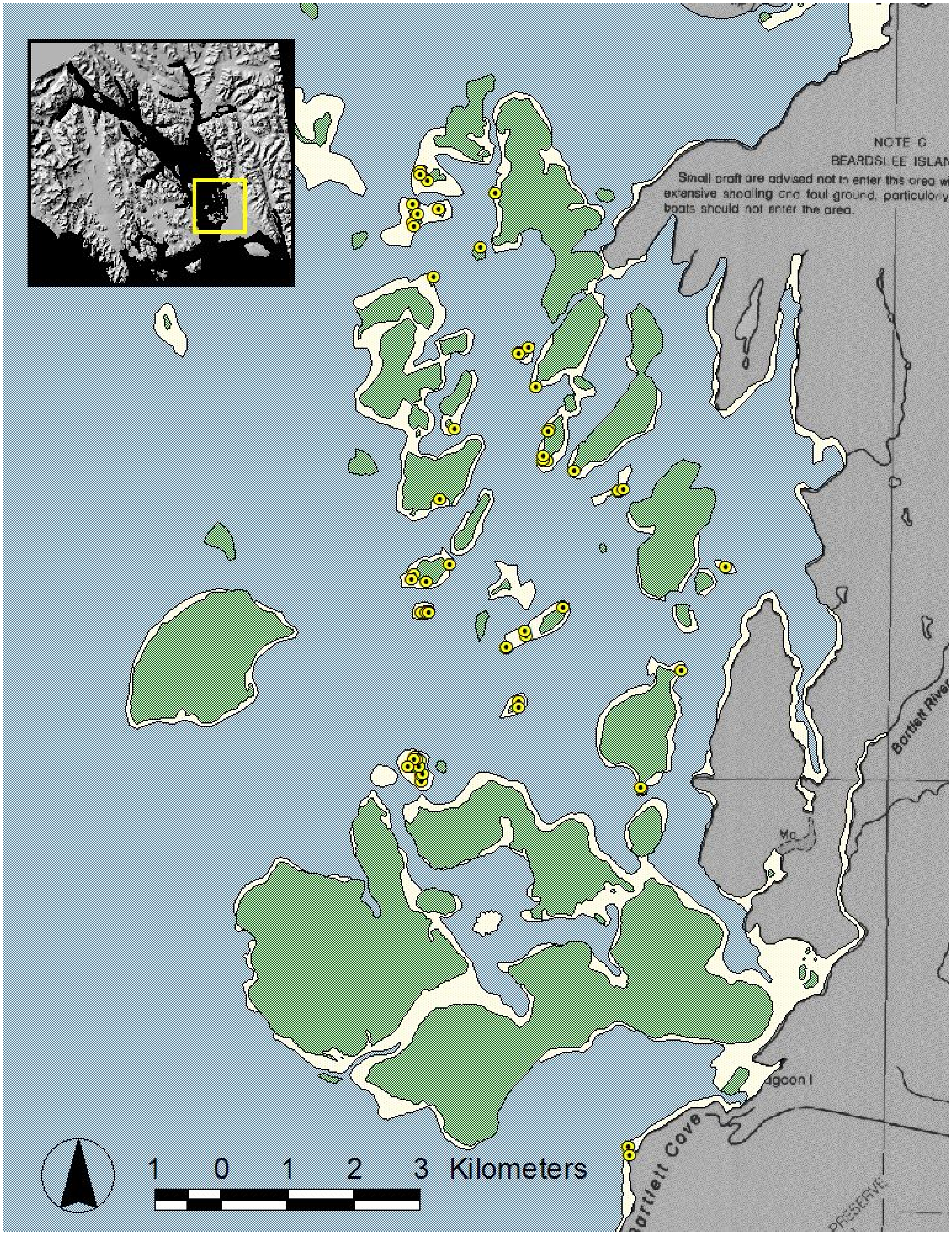
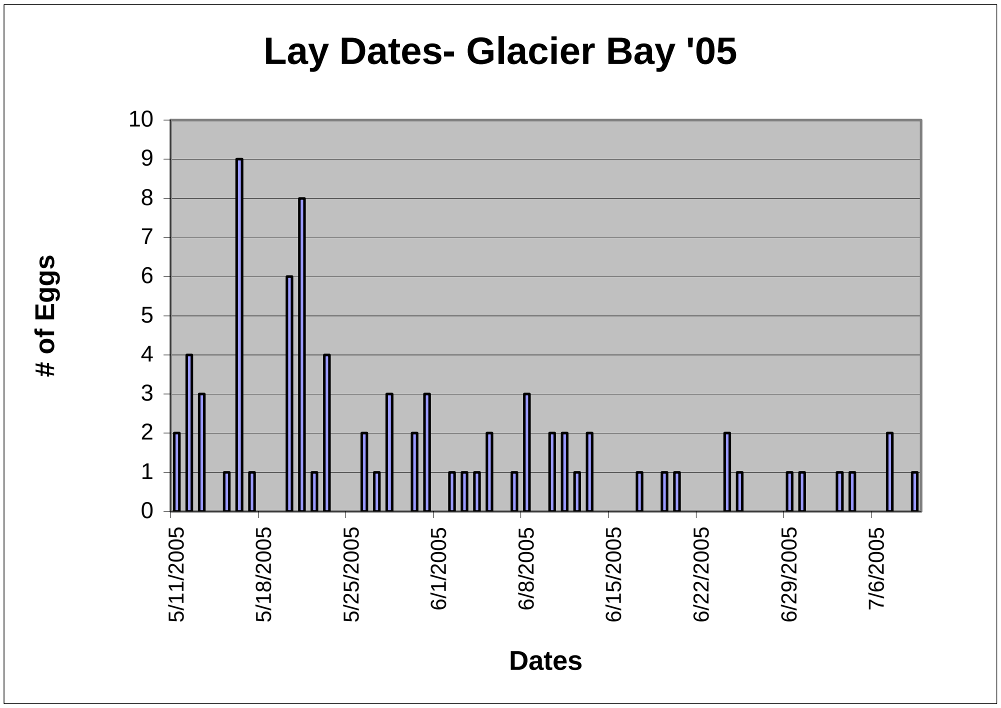


Figure 1: Beardslee Island Study Area in Glacier Bay National Park and Preserve, Gustavus, Alaska. Dots indicate actively defended black oystercatcher territories found between May and August, 2004 and 2005.



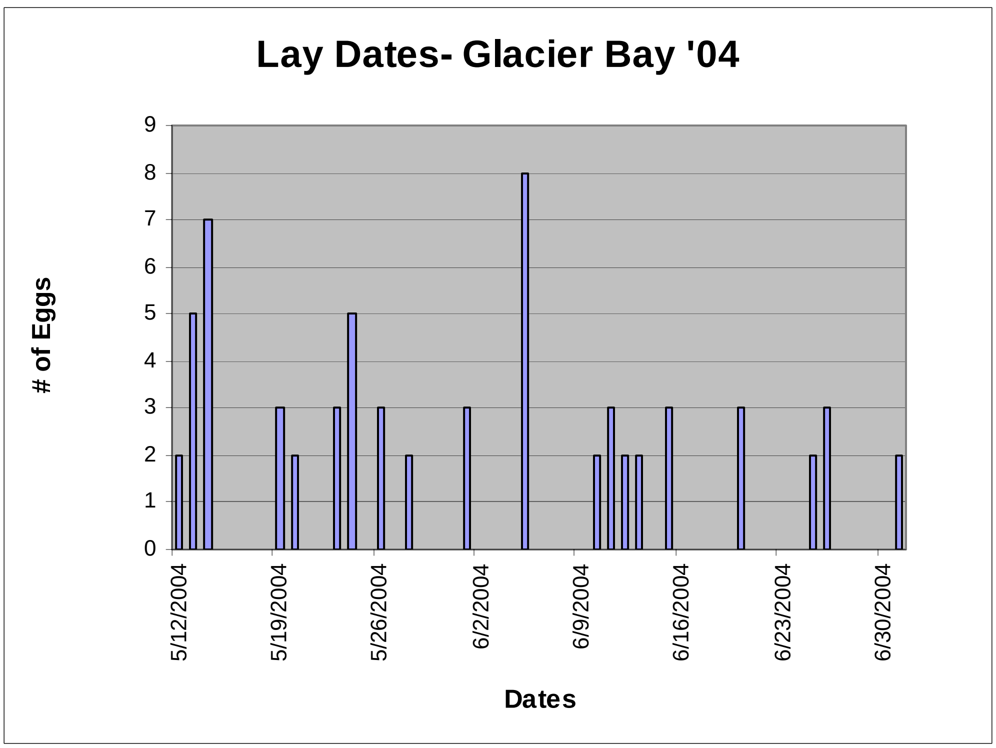
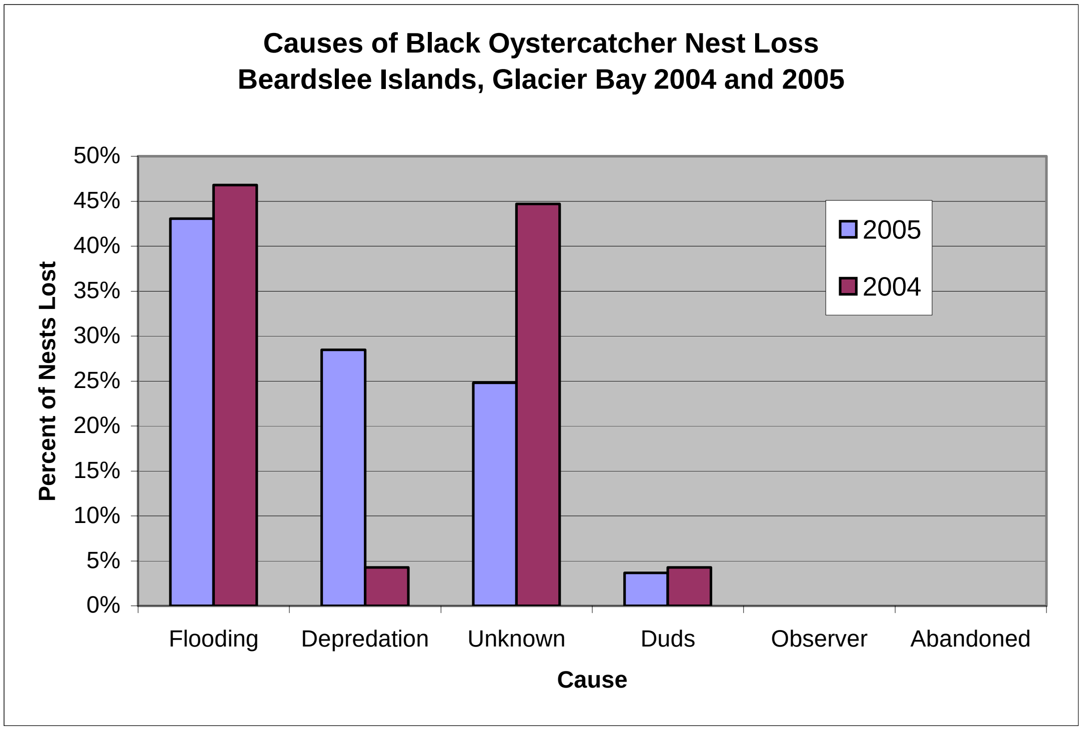


Figure 2. Black oystercatcher egg laying dates for the Beardslee Island Study Area for 2004 and 2005. Most first clutches were initiated by June 1 in both years. Some egg laying continues throughout the season as second and third replacement clutches are laid.



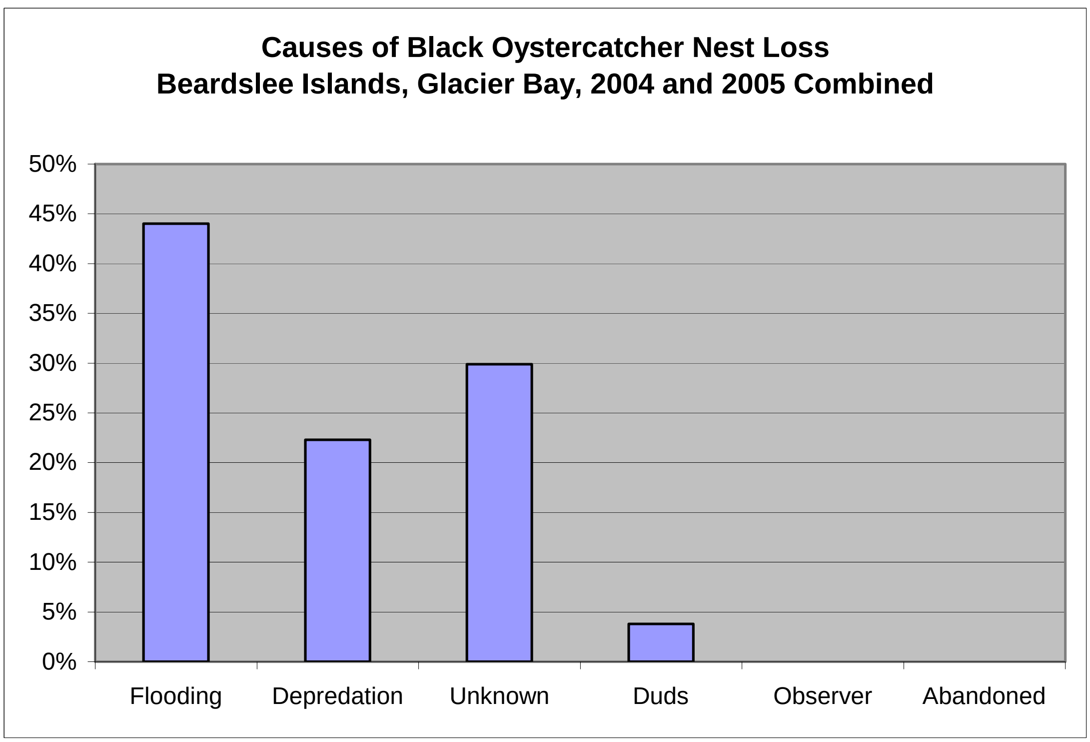
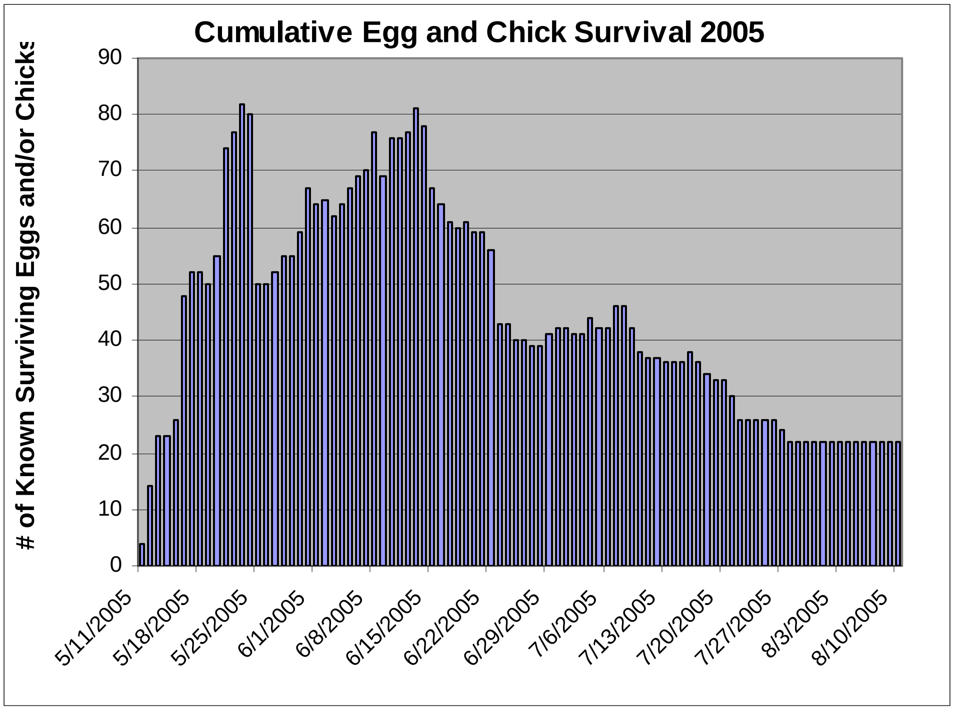


Figure 3. Causes of black oystercatcher egg and nest loss in the Beardslee islands Study Area, Glacier Bay National Park and Preserve. The upper graph depicts the number of nests lost to various causes between 2004 and 2005 breeding seasons. The lower graph illustrates the cumulative causes of nest loss as a percentage for 2004 and 2005 combined.



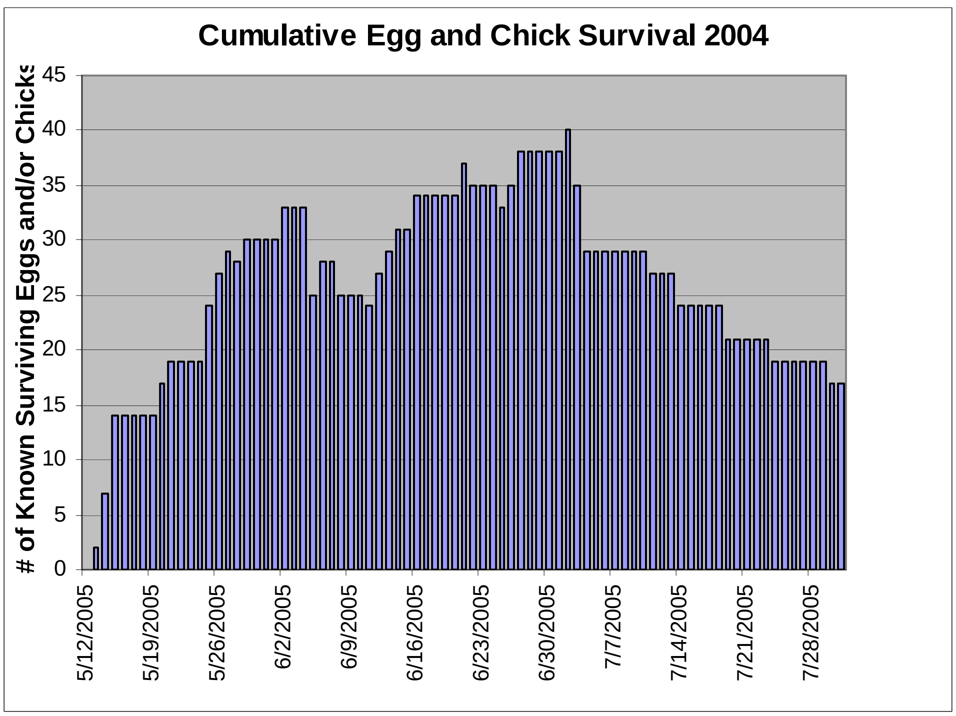
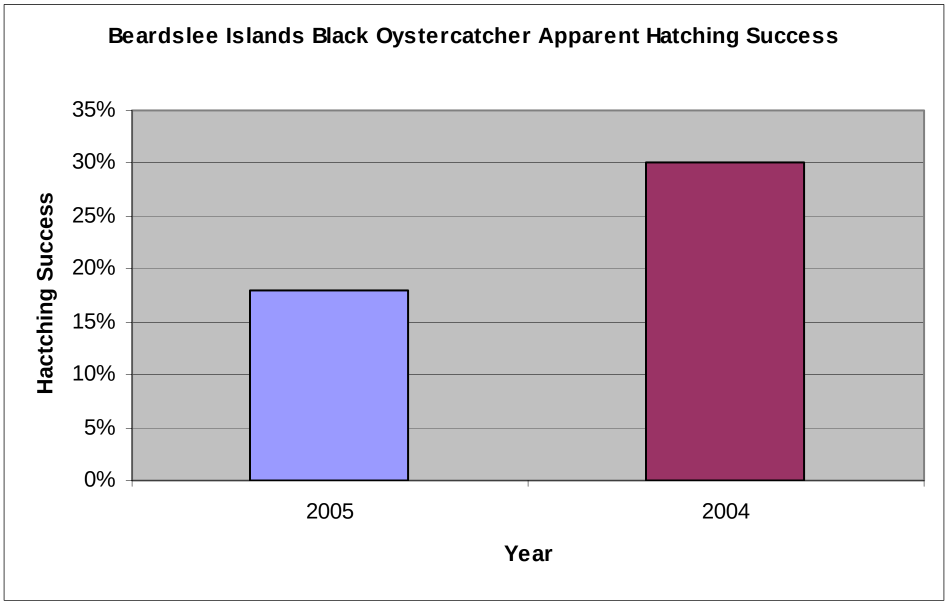


Figure 4. Survival of eggs and chicks during the breeding season as a function of date. The upper frame shows the number of known viable eggs and/or chicks by date for 2005. The lower frame shows the number of known viable eggs and/or chicks by date for 2004. Notice in both seasons the very steep declines associated with specific dates: These steep losses coincide with tidal flooding events and subsequent nest loss.



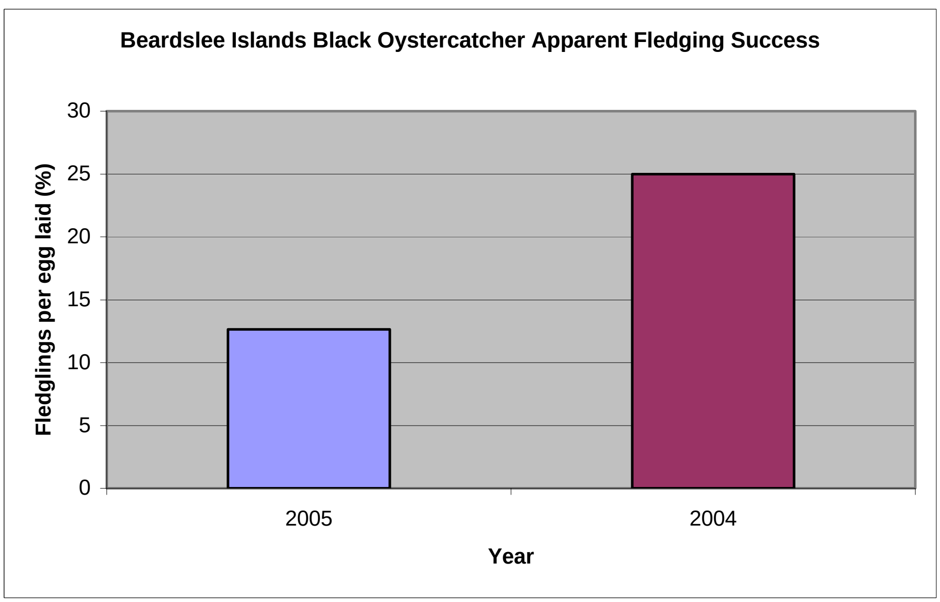
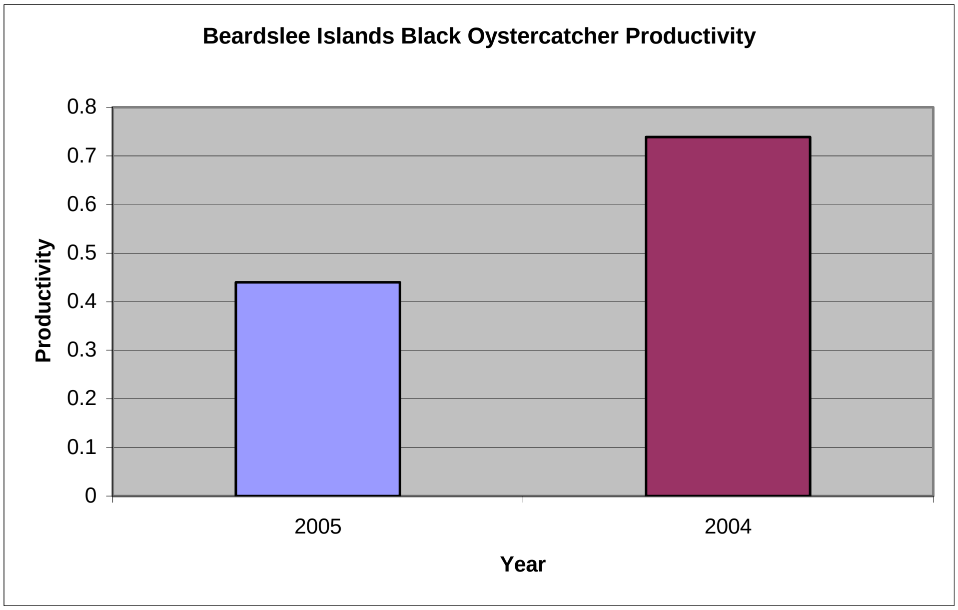


Figure 5. Hatching and fledging success for black oystercatchers in the Beardslee Island Study Area for the 2004 and 2005 breeding seasons. Top: Apparent Hatching Success (average chicks hatched * eggs laid^{-1}). Bottom: Apparent Fledging Success (chicks fledged * eggs laid^{-1}). These graphs demonstrate that most losses or limitations to productivity occur during the egg stage, and that while some chicks are lost before fledging, those that hatch have enjoy a 60% chance of survival.



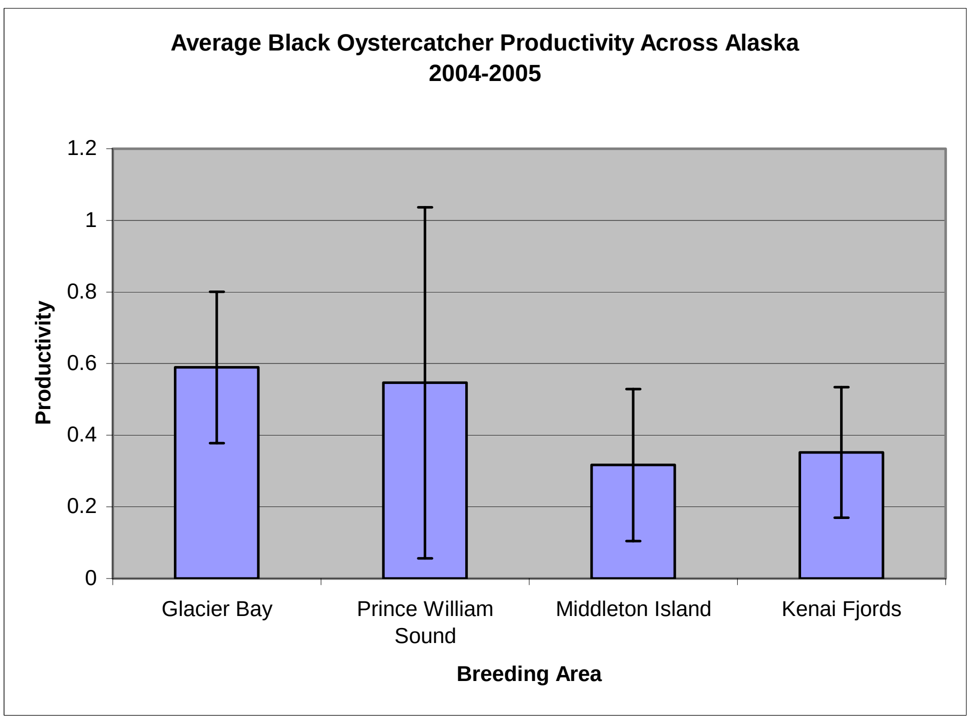


Figure 6. Productivity of black oystercatchers in the Beardslee Island Study Area for the 2004 and 2005 breeding seasons. Top: Productivity in the Beardslee Islands in 2004 and 2005 (chicks fledged * breeding pairs^{-1}). Bottom: Average productivity over 2004 and 2005 from four study areas in Alaska (error bars indicate standard errors). Although black oystercatcher productivity is low in the Beardslee Islands, it is not significantly different from three other Alaskan sites over the same period.

Appendix A: Black oystercatcher nest locations and outcomes for 2005 in the Beardslee Islands Study Area, Glacier Bay National Park and Preserve. Location units are decimal degrees recorded in the datum WGS-1984 using a handheld GPS.

Territory Number	Nesting Attempt	Outcome	# of eggs	# hatched	fledglings	Latitude	Longitude
05GBI04001	1	failed	3	0	0	58.57953	-135.95407
05GBI04002	1	failed	2	0	0	58.58085	-135.95599
05GBI04003	1	failed	3	0	0	58.58035	-135.95584
05GBI06001	1	failed	1	0	0	58.57635	-135.95731
05GBI06002	1	failed	3	0	0	58.57639	-135.95756
05GBI06004	1	failed	1	0	0	58.57394	-135.95760
05GBI06005	1	failed	3	0	0	58.57336	-135.95738
05GBI06006	1	failed	1	0	0	58.57499	-135.95634
05GBI07001	1	failed	3	0	0	58.57583	-135.95084
05GBI08001	1	failed	1	0	0	58.57069	-135.93991
05GBI09001	1	failed	3	0	0	58.57808	-135.93645
05GBI15001	1	failed	3	0	0	58.55210	-135.92511
05GBI18001	1	failed	2	0	0	58.54621	-135.94620
05GBI21001	1	failed	3	0	0	58.54219	-135.92302
05GBI21002	1	failed	1	0	0	58.54272	-135.92316
05GBI21003	1	failed	3	0	0	58.54613	-135.92191
05GBI25001	1	failed	3	0	0	58.52560	-135.95265
05GBI25002	1	failed	1	0	0	58.52652	-135.95604
05GBI25003	1	failed	3	0	0	58.52592	-135.95647
05GBI27001	1	failed	2	0	0	58.52155	-135.95227
05GBI27002	1	failed	3	0	0	58.52145	-135.95282
05GBI27003	1	failed	4	0	0	58.52145	-135.95384
05GBI27004	1	fledged	3	2	2	58.52155	-135.95268
05GBI27005	1	failed	2	2	0	58.52134	-135.95303
05GBI27006	1	failed	2	0	0	58.52794	-135.94688
05GBI27007	1	failed	1	0	0	58.52145	-135.95396
05GBI27009	1	failed	2	0	0	58.52143	-135.95262
05GBI27010	1	fledged	2	1	1	58.52145	-135.95216
05GBI35001	1	failed	2	0	0	58.52807	-135.87578
05GBI38001	1	fledged	3	3	2	58.53817	-135.90370
05GBI38002	1	failed	2	0	0	58.53846	-135.90244
05GBI39002	1	failed	2	0	0	58.49829	-135.89679
05GBI42001	1	failed	2	0	0	58.49876	-135.95320
05GBI42002	1	fledged	3	3	3	58.49961	-135.95323
05GBI42003	1	failed	2	2	0	58.50067	-135.95419
05GBI42004	1	failed	2	1	0	58.50153	-135.95529
05GBI42005	1	failed	3	0	0	58.50163	-135.95457
05GBI42006	1	fledged	3	2	1	58.50155	-135.95387
05GBI42007	1	fledged	3	3	3	58.49963	-135.95319

05GBI42008	1	fledged	3	2	1	58.50070	-135.95396
05GBI42009	1	failed	1	0	0	58.50176	-135.95541
05GBI42010	1	failed	1	0	0	58.50174	-135.95470
05GBI42011	1	failed	3	3	0	58.50174	-135.95526
05GBI42012	1	failed	1	0	0	58.50063	-135.95695
05GBI54001	1	failed	3	0	0	58.56665	-135.95198
05GBIEI001	1	unknown	3	unknown	unknown	58.50963	-135.92873
05GBIEI002	1	unknown	3	unknown	unknown	58.50887	-135.92858
05GBILK001	1	failed	2	0	0	58.54082	-135.91512
05GBISP001	1	unknown	2	2	unknown	58.51842	-135.92675
05GBISP002	1	unknown	1	unknown	unknown	58.51912	-135.92717
05GBISP003	1	unknown	1	1	unknown	58.52245	-135.91752
05GBISP004	1	unknown	3	unknown	unknown	58.51688	-135.93195
05GBISP005	1	unknown	3	unknown	unknown	58.51692	-135.9319
05GBIXX001	1	failed	2	0	0	58.55651	-135.92996
05GBIXX002	1	fledged	2	1	1	58.55741	-135.92719
05GBLES001	1	failed	2	0	0	58.29022	-135.52983
05GBMBC001	1	failed	1	0	0	58.44876	-135.89847
05GBI04001	2	failed	2	2	0	58.58033	-135.95461
05GBI04003	2	failed	3	0	0	58.58003	-135.95589
05GBI06001	2	failed	2	0	0	58.34571	-135.57422
05GBI06002	2	failed	1	0	0	58.57637	-135.95757
05GBI06004	2	failed	2	0	0	58.57449	-135.95775
05GBI06005	2	failed	1	0	0	58.57334	-135.95755
05GBI06006	2	failed	1	0	0	58.57468	-135.95589
05GBI08001	2	failed	1	0	0	58.57070	-135.93992
05GBI18001	2	failed	2	0	0	58.54613	-135.94580
05GBI21001	2	failed	2	0	0	58.54171	-135.92316
05GBI21003	2	failed	2	0	0	58.54537	-135.92226
05GBI25002	2	failed	3	0	0	58.52793	-135.95430
05GBI25003	2	failed	2	0	0	58.52591	-135.95638
05GBI27001	2	fledged	3	3	3	58.52157	-135.95247
05GBI27002	2	fledged	3	3	2	58.52145	-135.95280
05GBI27003	2	failed	1	0	0	58.52148	-135.95387
05GBI27006	2	failed	2	0	0	58.52145	-135.95216
05GBI27007	2	failed	3	0	0	58.52148	-135.95407
05GBI35001	2	failed	2	0	0	58.51816	-135.87613
05GBI39002	2	failed	2	0	0	58.49765	-135.89682
05GBI42001	2	failed	3	1	0	58.49899	-135.95341
05GBI42010	2	failed	3	0	0	58.50176	-135.95468
05GBI54001	2	failed	1	0	0	58.56667	-135.95172
05GBILK001	2	failed	3	0	0	58.54061	-135.91499
05GBIXX001	2	fledged	3	2	2	58.55727	-135.92754
05GBI06001	3	failed	2	0	0	58.57641	-135.95714
05GBI06002	3	failed	2	0	0	58.57625	-135.95786

05GBI27007	3	failed	1	0	0	58.52147	-135.95399
05GBI39002	3	fledged	1	1	1	58.49794	-135.89677
05GBILK001	3	failed	3	0	0	58.54049	-135.91458

Appendix B: Black oystercatcher nest locations and outcomes for 2004 in the Beardslee Islands Study Area, Glacier Bay National Park and Preserve. Location units are decimal degrees recorded in the datum WGS-1984 using a handheld GPS.

Territory Number	Attempt Code	Nesting Attempt	Outcome	# of eggs	# hatched	fledglings	Latitude (N)	Longitude (W)
04GBI21001	101	1	failed	1	0	0	58.54203	-135.92315
04GBI21002	102	1	failed	2	0	0	58.54204	-135.92225
04GBI21002	202	2	failed	3	0	0	58.54204	-135.92225
04GBI21003	103	1	failed	2	2	0	58.54638	-135.92174
04GBI24001	101	1	failed	3	0	0	58.53676	-135.94950
04GBI24001	201	2	failed	3	0	0	58.53676	-135.94950
04GBI27001	101	1	fledged	3	3	3	58.52155	-135.95209
04GBI27003	103	1	failed	3	0	0	58.52148	-135.95384
04GBI27003	203	2	failed	2	0	0	58.52148	-135.95384
04GBI27004	104	1	fledged	3	3	3	58.52160	-135.95261
04GBI27007	108	1	failed	2	0	0	58.52147	-135.95397
04GBI27007	208	2	failed	2	0	0	58.52147	-135.95397
04GBI38002	102	1	failed	1	0	0	58.53807	-135.90351
04GBI39001	101	1	failed	3	0	0	58.51418	-135.8869
04GBI39002	102	1	failed	2	0	0	58.49816	-135.8964
04GBI42001	101	1	fledged	1	1	1	58.49882	-135.95327
04GBI42002	102	1	fledged	3	1	1	58.49961	-135.95324
04GBI42003	103	1	failed	3	0	0	58.50057	-135.95408
04GBI42005	105	1	fledged	3	3	3	58.50163	-135.95450
04GBI42006	106	1	failed	3	0	0	58.50063	-135.95396
04GBI42007	107	1	failed	2	0	0	58.49963	-135.95313
04GBI42008	108	1	failed	2	0	0	58.50153	-135.95392
04GBI42009	109	1	fledged	2	1	1	58.502	-135.955
04GBI42011	111	1	failed	2	2	2	58.50158	-135.95527
04GBI42013	113	1	fledged	3	3	3	58.50175	-135.95523
04GBIXX001	101	1	failed	3	0	0	58.5567	-135.92983
04GBMBC001	101	1	failed	3	0	0	58.44994	-135.89881
04GBMBC001	201	2	failed	3	0	0	58.44994	-135.89881

Appendix C: Black oystercatchers banded in the Beardslee Islands, Glacier Bay National Park and Preserve, 2004 and 2005. This appendix includes the Territory I.D., Latitude, Longitude, and mate status as of 2005. The second table includes notes on the current disposition of banded birds.

Territory I.D.	Latitude	Longitude	Left Leg Band Colors	Right Leg Band Colors	Left Leg Below Knee		Right Leg Above Knee	Right Leg Below Knee	Right Leg Above Ankle	2005 Mate	2004 Mate
05GBI04003	58.58035	-135.95584	: LG_m	:O_B						unmarked	unmarked
05GBI06001	58.34571	-135.57422	: LG_m	:Y_Y						unmarked	unmarked
05GBI07001	58.57583	-135.95084	: LG_m	:LG_R						unmarked	unmarked
05GBI21001	58.54219	-135.92302	: BR_m	:K_O						unmarked	unmarked
05GBI21002	58.54272	-135.92316	: LG_m	:LG_B						unmarked	unmarked
05GBI21003	58.54613	-135.92191	: LG_m	:K_R						unmarked	unmarked
05GBI25001	58.52560	-135.95265	: LG_m	:B_LG						unmarked	unmarked
05GBI25002	58.52793	-135.95430	: LG_m	:R_R						unmarked	unmarked
05GBI25003	58.52592	-135.95647	: LG_m	:LG_K						unmarked	unmarked
05GBI27001	58.52157	-135.95247	: LG_m	:B_K						unmarked	unmarked
05GBI27001	58.52157	-135.95247	: LG_m	R:B_Y						unmarked	unmarked
05GBI27001	58.52157	-135.95247	: LG_m	R:LG_B						unmarked	unmarked
05GBI27001	58.52157	-135.95247	: LG_m	R:Y_R						unmarked	unmarked
05GBI27002	58.52145	-135.95282	: LG_m	:LG_LG						unmarked	unmarked
05GBI27002	58.52145	-135.95282	: LG_m	R:LG_W						unmarked	unmarked
05GBI27002	58.52145	-135.95282	: LG_m	R:R_R						unmarked	unmarked
05GBI27003	58.52148	-135.95387	: LG_m	:Y_B						:K_W	:K_Y
05GBI27003	58.52148	-135.95387	: LG_m	:K_W						:Y_B	unmarked
05GBI27004	58.52155	-135.95268	: LG_m	R:R_W						unmarked	unmarked
05GBI27004	58.52155	-135.95268	: LG_m	R:R_O						unmarked	unmarked
05GBI27005	58.52134	-135.95303	: LG_m	:O_W						unmarked	unmarked
05GBI27007	58.52145	-135.95396	: LG_m	:Y_R						unmarked	unmarked
05GBI27009	58.52143	-135.95262	: LG_m	:Y_LG						unmarked	unmarked
05GBI27010	58.52145	-135.95216	: LG_m	:O_K						unmarked	unmarked
05GBI38001	58.53817	-135.90370	: LG_m	R:K_B						unmarked	unmarked
05GBI38001	58.53817	-135.90370	: LG_m	R:K_LG						unmarked	unmarked
05GBI38001	58.53817	-135.90370	: LG_m	R:K_O						unmarked	unmarked
05GBI38002	58.53846	-135.90244	: LG_m	:K_O						unmarked	unmarked
05GBI39001	58.51418	-135.88690	: BR_m	:K_K						unmarked	unmarked
05GBI39002	58.49765	-135.89682	: LG_m	:B_W						:B_R	:B_R
05GBI39002	58.49765	-135.89682	: LG_m	:B_R						:B_W	:B_W
05GBI42001	58.49876	-135.95320	: LG_m	:LG_W						unmarked	unmarked
05GBI42002	58.49961	-135.95323	: LG_m	R:B_LG						unmarked	unmarked
05GBI42002	58.49961	-135.95323	: LG_m	R:B_O						unmarked	unmarked
05GBI42002	58.49961	-135.95323	: LG_m	R:LG_R						unmarked	unmarked
05GBI42003	58.50067	-135.95419	: LG_m	:LG_O						unmarked	unmarked
05GBI42003	58.50067	-135.95419	: LG_m	R:B_R						unmarked	unmarked
05GBI42004	58.50153	-135.95529	: LG_m	R:K_W						unmarked	unmarked
05GBI42006	58.50155	-135.95387	: LG_m	:R_O						unmarked	:R_W
05GBI42006	58.50155	-135.95387	: LG_m	R:K_R						unmarked	unmarked
05GBI42007	58.49963	-135.95319	: LG_m	R:K_Y						unmarked	unmarked
05GBI42007	58.49963	-135.95319	: LG_m	R:B_W						unmarked	unmarked

05GBI42007	58.49963	-135.95319	: LG_m	R:LG_O						unmarked	unmarked
05GBI42008	58.50070	-135.95396	: LG_m	:W_K						unmarked	:W_B
05GBI42008	58.50070	-135.95396	: LG_m	R:B_B						unmarked	unmarked
05GBI42009	58.50176	-135.95541	: LG_m	:B_O						unmarked	unmarked
05GBI42010	58.50174	-135.95470	: LG_m	:Y_B						unmarked	unmarked
05GBI42011	58.50174	-135.95526	: LG_m	:R_B						unmarked	unmarked
05GBILK001	58.54082	-135.91512	: LG_m	:O_Y						unmarked	unmarked
05GBIXX001	58.55727	-135.92754	: LG_m	:B_B						unmarked	unmarked
05GBIXX001	58.55727	-135.92754	: LG_m	R:W_R						unmarked	unmarked
05GBIXX001	58.55727	-135.92754	: LG_m	R:O_R						unmarked	unmarked
05GBIXX002	58.55741	-135.92719	: LG_m	:LG_Y						unmarked	unmarked
05GBIXX002	58.55741	-135.92719	: LG_m	R:LG_LG						unmarked	unmarked
04GBI27003	58.52148	-135.95384	: LG_m	:K_Y						unmarked	:B_Y
04GBI42013	58.50175	-135.95523	: LG_m	:R_K						unmarked	unmarked
04GBI42008	58.50153	-135.95392	: LG_m	:W_B						unknown	:W_K
04GBI42006	58.50063	-135.95396	: LG_m	:R_W						unmarked	:R_O
04GBI42007	58.49963	-135.95313	: LG_m	:R_Y						unmarked	unmarked

2005 GLBA Banded Bird Status						
Territory I.D.	**Left Leg Band Colors**	**Right Leg Band Colors**	**2005 Mate**	**2004 Mate**	**Banded as A or C**	**Comments**
05GBI04003	: LG_m	:O_B	U	U	A	
05GBI06001	: LG_m	:Y_Y	U	U	A	
05GBI07001	: LG_m	:LG_R	U	U	A	
05GBI21001	: BR_m	:K_O	U	U	A	this bird stayed in the same territory
05GBI21002	: LG_m	:LG_B	U	U	A	
05GBI21003	: LG_m	:K_R	U	U	A	this bird stayed in the same territory
05GBI25001	: LG_m	:B_LG	U	U	A	
05GBI25002	: LG_m	:R_R	U	U	A	
05GBI25003	: LG_m	:LG_K	U	U	A	
05GBI27001	: LG_m	:B_K	U	U	A	
05GBI27001	: LG_m	R:B_Y	U	U	C	
05GBI27001	: LG_m	R:LG_B	U	U	C	
05GBI27001	: LG_m	R:Y_R	U	U	C	
05GBI27002	: LG_m	:LG_LG	U	U	A	
05GBI27002	: LG_m	R:LG_W	U	U	C	
05GBI27002	: LG_m	R:R_R	U	U	C	
05GBI27003	: LG_m	:Y_B	:K_W	:K_Y	A	Mate did not return - switched mates. now there are 2 marked birds with :Y_B band on right leg; produced whacky eggs
05GBI27003	: LG_m	:K_W	:Y_B	U	A	this bird changed mates - mate was unmarked, impossible to know if it survived. switched territories according to last year's data; produced whacky eggs
05GBI27004	: LG_m	R:R_W	U	U	C	

05GBI27004	: LG_m	R:R_O	U	U	C	
05GBI27005	: LG_m	:O_W	U	U	A	
05GBI27007	: LG_m	:Y_R	U	U	A	
05GBI27009	: LG_m	:Y_LG	U	U	A	
05GBI27010	: LG_m	:O_K	U	U	A	
05GBI38001	: LG_m	R:K_B	U	U	C	one of these chicks was lost; couldn't id the bands; 8/6/05
05GBI38001	: LG_m	R:K_LG	U	U	C	one of these chicks was lost; couldn't id the bands; 8/6/05
05GBI38001	: LG_m	R:K_O	U	U	C	this one was present on 8/6/05
05GBI38002	: LG_m	:K_O	U	U	A	
05GBI39001	: BR_m	:K_K	U	U	A	this bird stayed in the same territory
05GBI39002	: LG_m	:B_W	:B_R	:B_R	A	pair stayed in the same territory; strong site and mate fidelity
05GBI39002	: LG_m	:B_R	:B_W	:B_W	A	pair stayed in the same territory; strong site and mate fidelity
05GBI42001	: LG_m	:LG_W	U	U	A	
05GBI42002	: LG_m	R:B_LG	U	U	C	no sign of chick after 7/6
05GBI42002	: LG_m	R:B_O	U	U	C	
05GBI42002	: LG_m	R:LG_R	U	U	C	
05GBI42003	: LG_m	:LG_O	U	U	A	
05GBI42003	: LG_m	R:B_R	U	U	C	no sign of chick after 7/6
05GBI42004	: LG_m	R:K_W	U	U	C	no sign of chick after 7/6
05GBI42006	: LG_m	:R_O	U	:R_W	A	this bird stayed in the same territory - changed mate because previous mate did not return
05GBI42006	: LG_m	R:K_R	U	U	C	
05GBI42007	: LG_m	R:K_Y	U	U	C	
05GBI42007	: LG_m	R:B_W	U	U	C	
05GBI42007	: LG_m	R:LG_O	U	U	C	
05GBI42008	: LG_m	:W_K	U	:W_B	A	has new mate, old mate was in area during nest initiation, but disappeared after. stayed in same territory
05GBI42008	: LG_m	R:B_B	U	U	C	
05GBI42009	: LG_m	:B_O	U	U	A	this bird stayed in the same territory
05GBI42010	: LG_m	:Y_B	U	U	A	2nd bird w/this band combo on Is. # 27
05GBI42011	: LG_m	:R_B	U	U	A	this bird stayed in the same territory
05GBILK001	: LG_m	:O_Y	U	U	A	
05GBIXX001	: LG_m	:B_B	U	U	A	this bird stayed in the same territory
05GBIXX001	: LG_m	R:W_R	U	U	C	
05GBIXX001	: LG_m	R:O_R	U	U	C	
05GBIXX002	: LG_m	:LG_Y	U	U	A	
05GBIXX002	: LG_m	R:LG_LG	U	U	C	
04GBI27003	: LG_m	:K_Y	U	:B_Y	A	not observed in 2005
04GBI42013	: LG_m	:R_K	U	U	A	not observed in 2005
04GBI42008	: LG_m	:W_B	unknown	:W_K	A	this bird was observed on 5-31-05 but not after
04GBI42006	: LG_m	:R_W	U	:R_O	A	not observed in 2005
04GBI42007	: LG_m	:R_Y	U	U	A	not observed in 2005

Appendix D: Notes from field technicians regarding logistical and operational issues when working in the non-motorized wilderness of the Beardslee Islands.

Water

Depending heavily on fresh water sources we generally chose not to haul much water with us when departing Bartlett Cove. We eliminated water weight from our boats allowing for more personal energy conservation. This operating procedure forced us to filter water more often. We located four clean water sources that we regularly utilized.

Often our first stop was the southeast side of Kidney Island. There is a small bight with a good spout close to the forest edge. We always made a point not to go far into the forest and risk contaminating any fresh water source. The west side of Kidney Island has a few good water sources. They are rather obvious and easy to find. The furthest one to the north seems like the largest source. To the north the next good source was on Island #9 toward the southwest end of the island, just north of Otter Cut. This is a small source with a tiny pool in the rye grass. If it is a dry summer this source will most likely dry out. Another convenient location is south of Island #42 on #44. The source is identifiable by the only fine, gravel section of beach to the southeast of #42. There is a large amount of rye grass in the area and a large, tree stump/ root wad exactly over the source.

Kayak Access

Entering the Beardslee Islands is not simple. Every trip we navigated through the “cut”. It’s possible to go through the “cut” during a high tide but the higher it rises the stronger the current flows out of the Beardslee’s and into Bartlett Cove. So, it takes a substantial amount of intense paddling at these times. It is much easier to enter with a rising tide. Depending on the tide it’s optimal to enter the “cut” an hour or two before high tide.

Exiting the Beardslee’s is basically the same procedure as entering, except that high slack or falling tide is preferential. The current on a falling tide facilitates the process. We usually exited the Beardslee Islands between the end of a slack high and an hour after high tide. After about two hours of falling tide it is impossible to paddle out of the “cut.”

Nest visitation

We tried to adhere to the ideal seven-day nest visitation schedule. It was not possible to remain on this strict schedule. After the census we realized the large amount of territories would regulate our visits. We implemented six-day surveys and two to three days re-supply in Bartlett Cove. Generally, this schedule put us on an eight-day rotation, so we still visited nest sites before the average nine-day relaying period. If no trapping was involved a seven-day rotation period would probably suffice in this region.

Kayak travel is slow. The anticipation of spending the summer months in a kayak encourages maintaining a slow pace throughout the project to reduce overall fatigue, minimizing chances of personal injury, which might terminate or hinder the project.

Island #27
There is an immense congregation of nesting adult arctic terns during the month of June. One literally must use extreme caution not to step on an egg or chick on the small island. We noted a few visitors passing by that stopped on the island for a brief hiatus. There is no good camping or water source. The birds definitely react to human presence, usually by dive-bombing the person. This generally indicates that a bird is distraught. At popular camping beaches in Kenai Fjords National Park temporary beach closures were implemented during prime nesting season in sensitive areas. A similar measure may effectively and temporarily keep park visitors out of sensitive areas. We are confident park managers will use this information to execute prudent management decisions concerning the disturbance of these sensitive shorebird nesting habitats.

3 person team vs. 2 person team
This project was designed for the deployment of a two-person team of field biologists. During certain periods we utilized more than two people. Three techs were present during the census survey, which greatly enhanced efficiency and coverage. One hot day we utilized a USGS field researcher for a three-chick capture and banding episode. Two people processed birds while the third searched for more chicks, expediting the process.

We recruited a third researcher for three days in mid-July and successfully caught and marked four adults and four chicks. This is the most adults and individuals caught in that short of a time period this summer. One additional researcher greatly facilitates the operating procedures involved with shorebird marking projects. In any type of emergency or rescue situation there is little doubt that a team of three would be more capable of effectively managing the situation.

Radio Communication
This summer we chose not to use a hand-held park issued radio for communication. We carried a tremendous amount of expensive field gear with us including a marine radio and satellite phone for communication. The marine radio proved very effective. If we were unable to make contact with Bartlett Cove we used a satellite phone. It is highly recommended to refrain from the use of a park system radio. The batteries constantly die. The units are heavy, expensive and cumbersome.

Camping Locations
We found Island #25 to be a strategic location. Camping on #25 allows quick access to Island #27. We generally camped there for two nights at a time during the peak nesting periods. About half the times we stayed on Island #25 we paddled straight to #42. Other times weather or currents prevented us from traveling that route. During late June and early July we found it suitable to camp on Island #44 just southeast of the northeastern point near a large pile of beach logs. This spot provided quick access to Island #42. When camping on Island #21 we utilized the south end. The forest contains plenty of openings with abundant space for tents. In 2004 the team chose to camp at the southwest tip in a small tree cluster. We found it a burden to haul gear to that location. We often camped on Island #9 in a small open saddle on the west side of the island. Usually we stayed two nights during peak nesting periods. After the strawberries ripened we camped on the

beach on the south side of the forest to reduce bear encounters. Another good campsite was the northeast end of Kidney Island.

Bear Encounters

It is almost impossible to go into the islands without seeing a black bear. Anyone involved with this project should be comfortable in heavily populated black bear habitat. We observed many bears while paddling, occasionally, encountering them near our campsites or on the same island as us. These incidents should be anticipated.

We saw cinnamon colored bears. One cinnamon bear had three cubs, one black and two cinnamons. We witnessed this bear on Island #43 on two separate occasions.

One early encounter on Island #9 involved a medium sized sow with two small cubs at the edge of the forest. They came out of the forest and stayed next to the alders slowly browsing and grazing their way up into the strawberry meadow away from us.

Early one morning we had an episode on island #21 with a couple of adult black bears. After eating breakfast on the beach next to a meadow we looked to the north and a large, adult black bear was sprinting toward us from the forest about 200 meters away. Immediately, I began yelling, and waving. It paused, looked around then continued running. I yelled some more. It turned and went into the forest. Moments later a second, bigger, adult black bear sprinted out of the forest from the same place the first bear did. I yelled again. It stopped instantly, sitting on its haunches. It sniffed the air, looking around. Then it slowly walked to the forest where the first bear reentered. We maintained our position on the beach to the west. Eventually the bear went to the south point of the island. We walked to our campsite and prepared to disembark. Upon launching our kayaks the bear slowly walked over the burm and into the forest as we paddled away.

On Island #9 we were camped up in the strawberry meadow with our electric fence deployed. I emerged from my tent to find a small black bear between our tents. I hollered at the bear. Instantly it sprinted east into the forest. After dinner we saw a healthy, large sow with two cubs grazing a quarter of a mile north. Late that night I was awoken by noises so I hollered from inside my tent. Right away I heard the sound of mega fauna crashing through alders into the forest. Apparently a bear ran through the fence, dragging a long portion into the forest. We re-installed the fence and resumed sleeping.

Island #25 harbored a resident bear. This bear was particularly large and well rounded. We saw this bear on the west side of #25 in the strawberry meadows on several occasions. The bear never seemed interested in our operations.

One day while paddling north we observed a black bear walking toward the beach at the southwest end of Island #15. The bear stood on its hind legs at the shoreline. We observed a star-shaped white patch on its chest. It walked on its hind legs into the water until it started swimming and swam to Island #21.

These observations do not account for every black bear sighting we made throughout the season. The purpose of this bear encounter section is to document typical black bear behaviors and territories in the Beardslee Islands during the summer of 2005.