Annual Progress Report

to the

Kenai Fjords National Park

for the

Alaska SeaLife Center

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RESEARCH PROJECTS

Prey Availability/Seabird Productivity (R0077) - *PI: John Maniscalco*

Abstract:
The purpose of this study was to broaden our knowledge of the Kenai Fjords ecosystem by examining the diet of predatory fish. Examination of the stomach contents of sport caught fish is a cost effective means to assess the relative availability of various prey fishes in the Gulf of Alaska and potential changes over time. In cooperation with local citizens and visiting tourists, Alaska SeaLife Center (ASLC) biologists obtained stomachs from 784 halibut, 31 Pacific cod, and 108 silver salmon that were landed in Seward, Alaska during the summer of 2012. The fish were captured over a broad area of the northern Gulf of Alaska and the contents of their stomachs were examined for prey selection. Prey items were found in more than 65% of the halibut and salmon stomachs with forage fishes being the most common category of prey. Forage fishes consumed were predominantly herring, but also included smaller amounts of capelin and sand lance. Halibut predation on forage fish declined through mid-August then increased moderately by late August, while the number of halibut without prey in their stomach reached a maximum in August. This study continues to provide baseline data for mid-trophic level species that has heretofore been missing from long-term studies in the area in and around Kenai Fjords National Park.

Project Objectives (O) and related Accomplishments (A):

O1. Collect predatory fish stomachs from charter and recreational fishing fleet in Seward, AK and identify and quantify contents.

A1. A total of 923 stomachs were collected from halibut, Pacific cod, and salmon during 2012 from the charter and recreational fishing fleet at Seward, AK. All stomachs were examined in a lab at ASLC where contents were identified to lowest taxonomic level and quantified.

O2. Summarize results and identify trends in relative abundance of prey fish over varying time scales.

A2. Results are summarized in this report with attention given to trends in prey selection over the course of the summer and compared to past 3 years of data collection.

O3. Look for potential correlations between fish prey and seabird abundance and population dynamics.

A3. Seabird abundance and nesting success are currently being analyzed for Black-legged kittiwakes and common murres in this region. However, comparison of seabird population dynamics with prey found in stomachs of predatory fish is a long-term goal and it may take several years to determine if correlations exist.

Introduction:
This project was undertaken to fill knowledge gaps in a key component of the Kenai Fjords ecosystem where public and agency understanding is currently lacking. The University of Alaska Fairbanks (UAF) has been conducting excellent studies of the physical, chemical, and lower biological parameters of this local ecosystem (e.g., Weingartner et al. 2002), while the

Alaska SeaLife Center (ASLC) has been conducting ground-breaking studies of upper trophic-level pinnipeds and killer whales (e.g., Maniscalco et al. 2007). Both sets of studies have extensive long-term data contributions. However, information from the middle trophic levels are notoriously lacking in this region. In order to have a complete understanding of how this ecosystem works, we have begun to assess the relative presence of forage fish species based on the diet of predatory fish caught in the area.

Previous work by U.S. Fish & Wildlife Service biologists in Alaska has shown that predatory fish such as halibut (*Hippoglossus stenolepis*), salmon (*Oncorhynchus* spp.), and ling cod (*Ophiodon elongatus*) are excellent samplers of forage fishes in the environment which also can be reflected in the diet of piscivorous seabirds (Roseneau and Byrd 2000). Therefore, sampling the stomach contents of predatory fish provides a cheap and easy way to assess presence/absence, relative abundance, and distribution of prey species that are also important to seabirds, baleen whales, and pinnipeds. Predatory fish stomachs are obtained voluntarily from the charter fishing fleet in Seward which has a range of >100 nm across the northern Gulf of Alaska.

This project addresses a need for understanding how different ecosystem components interact under the threat of climate change because without knowledge of the prey base for commercially and recreationally harvested fish species, and seabirds, and marine mammals, we cannot determine how these species will be affected by any environmental perturbation, natural or human-induced. In this study, we are gathering baseline data by identifying distribution and relative abundance of key prey species in the Kenai Fjords region not previously substantially quantified. Thereby we can define and better understand trophic linkages and vital signs indicative of healthy or fragile environments. As we progress with our research on this ecosystem, it may be possible to model results from this study with environmental parameters and other ASLC data of upper trophic predators to aid in our understanding of how bottom-up and top-down forces create balance in this ecosystem and further allow us to recognize why, how, and when major parts might become out of balance.

Methods:

During the summer of 2012 between 21 May and 02 September, filleted carcasses of halibut and Pacific cod (*Gadus macrocephalus*) were obtained voluntarily from private and charter fishermen at the fish cleaning stations in the small boat harbor in Seward, Alaska. Silver salmon (*O. kisutch*) were only collected during the month of July because few were caught earlier in the summer and later in the summer stomachs were generally empty as these anadromous fish stop feeding prior to moving into fresh water to spawn. Fish were collected 2 to 5 times per week from catches ranging broadly across the northern Gulf of Alaska and catch locations categorized into 5 major zones (Figure 1) based on major points of land and varying bottom structure. Fish carcasses were measured to the nearest 0.5 cm from the tip of the nose to the fork of the tail and stomachs were excised then frozen for later examination. In an ASLC laboratory, stomachs were thawed and contents quantified, measured, and identified to the lowest taxonomic level possible from gross morphological characteristics. Some prey items that were not possible to identify to at least the family level were preserved by freezing, drying, or storing in a solution of isopropynol and archived at ASLC for future identification as funding and time allows. Furthermore, approximately one-third of the stomachs with prey remains were kept for later estimates of prey size and caloric intake. Cut herring and other obvious bait items were not included in the summary of results. Data were summarized as frequency of occurrence in predator stomachs, i.e.,

the proportion of stomachs that had any amount of a particular prey item. Results were assessed for trends in prey selection over the course of the summer and compared with similar data collected in 2010 and 2011.

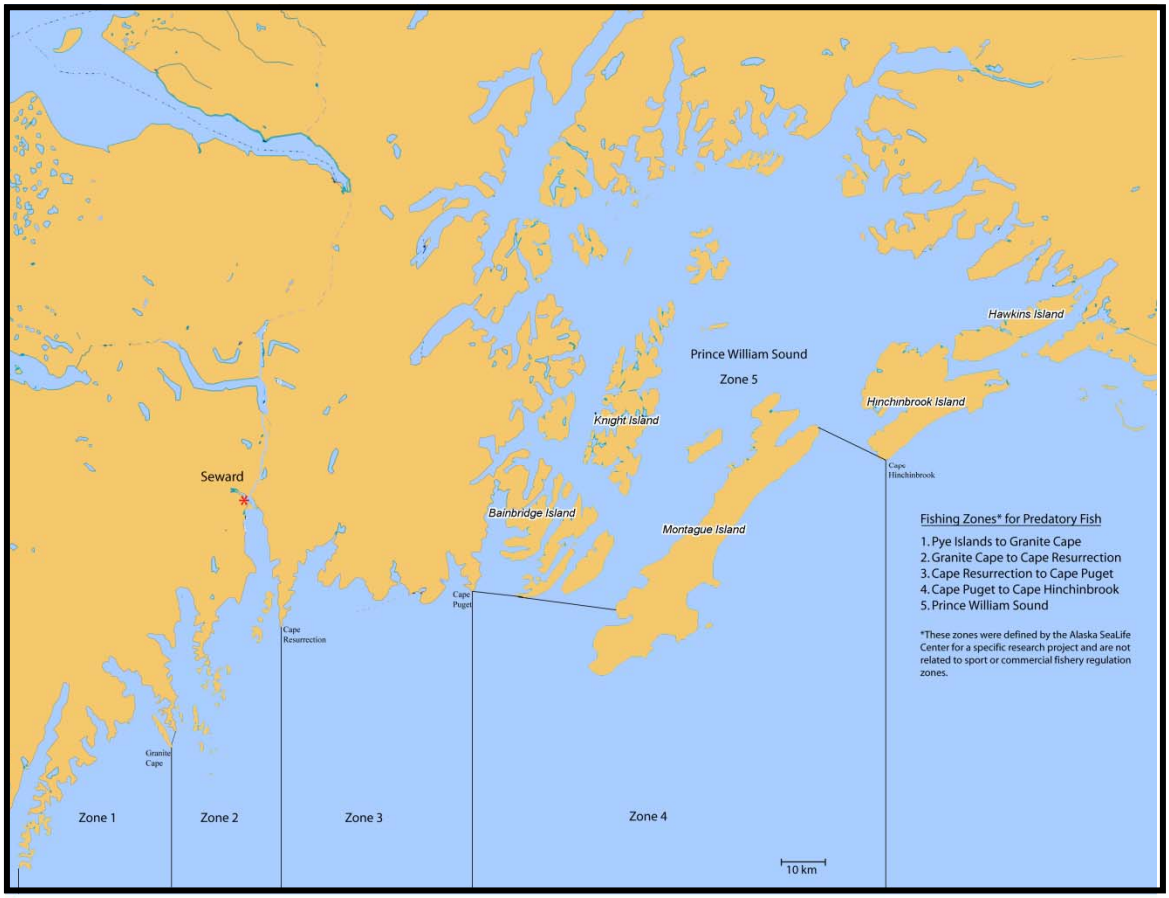

Figure 1. Map of northern Gulf of Alaska separated into five eco-zones for predatory fish diet studies.

Results and Discussion:

Stomachs from 784 halibut, 31 Pacific cod, and 108 silver salmon were obtained from charter and private fishermen at fish cleaning stations in the Seward, AK small boat harbor. The fish were captured over a broad area of the northern Gulf of Alaska (Figure 1). However, only 7 samples were obtained from Zone 1 (west of Granite Cape) and none from Zone 5 (Prince William Sound) during the 2012 season.

Major prey of halibut in order of decreasing importance consisted of forage fishes, crab and other benthic invertebrates, gadid fish (cod and pollock), octopus, and salmon with minor differences between sampling areas (Figure 2). Forage fishes should be a preferred prey over many crab species because of their high energy content (Payne et al. 1999).

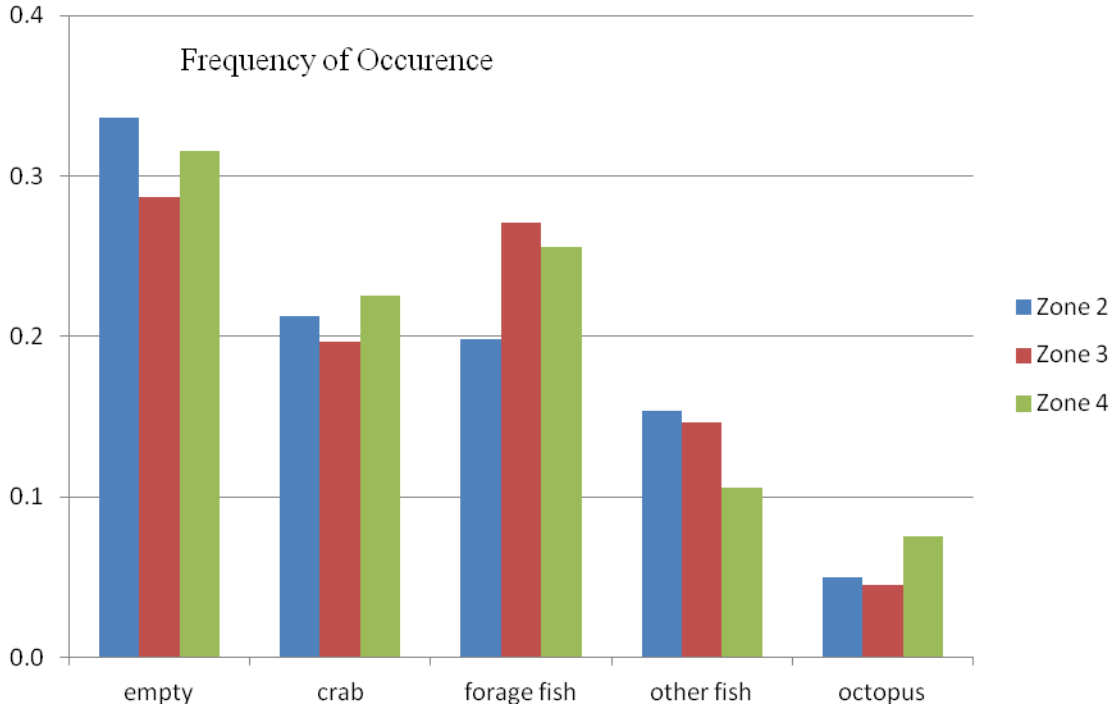

Figure 2. Frequency of prey content and lack thereof in the stomachs of halibut caught between Zones 2 – 4 in the northern Gulf of Alaska 2012.

Stomachs of 24% of salmon and 31% of halibut were empty of prey. Forage fishes made up the bulk of the diet for salmon (66%) as they did for halibut (25%). More than 50% of forage fishes were identifiable to species which were predominately Pacific herring (*Clupea pallasi*), followed by capelin (*Mallotus villosus*), then sand lance (*Ammodytes hexapterus*). Eulachon (*Thaleichthys pacificus*) was not identified among the prey items in 2012 as it was in previous years, although many prey items were not discernable to species. There was a minor increase in the proportion of halibut that preyed upon herring between 2010 and 2012, whereas sand lance decreased in their diet over the same period (Figure 3). Presence of capelin, crab, and octopus dipped somewhat in 2011 compared to 2010 and 2011 (Figure 3), but these differences may not be significant. Minor changes such as these might indicate a relatively stable environment over the short 3-year period studied here. Nevertheless, continued monitoring is essential to detect major shifts in the northern Gulf of Alaska as have been suggested in the past from a capelin dominated system in the mid-1990s to more sand lance by 1999 (Roseneau and Byrd 2000).

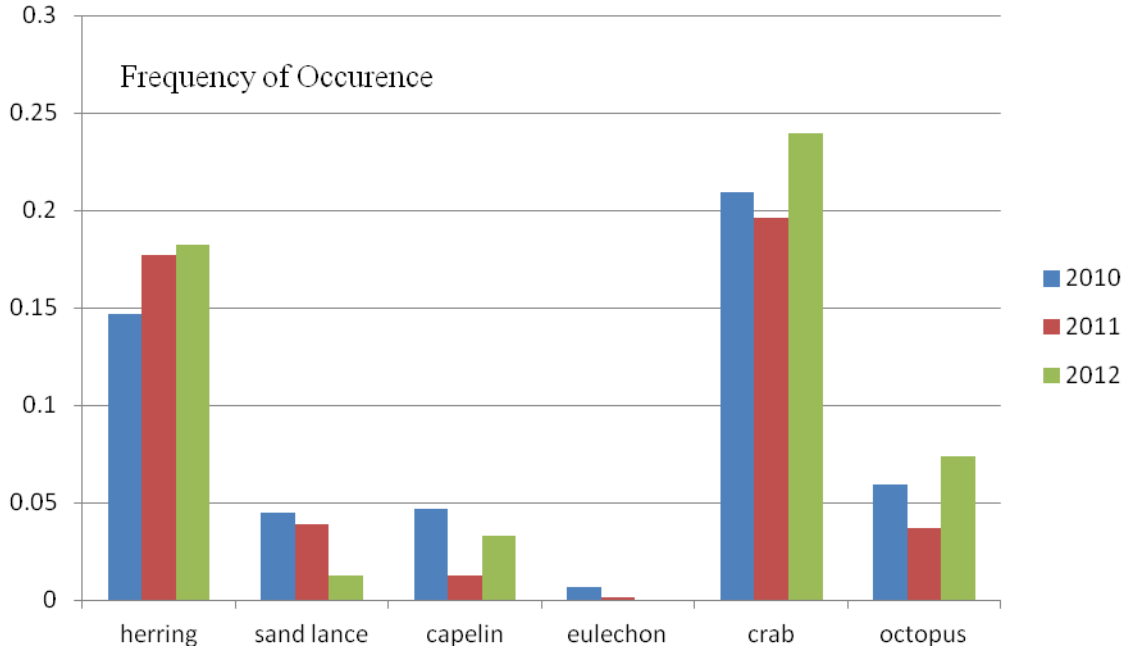

Figure 3. Frequency of occurrence of different prey items in the stomach contents of halibut collected 2010 – 2012 based only on stomachs that had prey items in them.

Crabs of various species and other benthic invertebrates such as brittle stars were observed in the diet of 20% of the sampled halibut, 16% of Pacific cod, and <1% of the salmon which forage more in the upper water column. Identified crab species from halibut stomachs included juvenile tanner, heart, decorator, lyre, pygmy cancer, among a few others. Shrimp were found in the diet of 32% of Pacific cod, and less than 2% of salmon and halibut sampled. These differences of prey selection among predatory fish suggest a fair degree of resource partitioning which may be studied in further detail with additional sampling in the future. Predation by both halibut and cod is considered as a possible reason for lack of recovery of commercially important crab species in Alaskan waters (Orensanz et al. 1998; Zheng and Kruse 2006). Cod and pollock may also have an effect on shrimp abundance as it is believed that shrimp species have declined during a period when gadids became more abundant in the Gulf of Alaska (Anderson and Piatt 1999). Therefore, continued monitoring of the diet of these fishes will provide evidence of increasing or decreasing trends in juvenile shellfish as prey and the potential threat to their recovery.

The most unusual prey items found during 2012 were two sea mice (a.k.a. bristle worms, *Aphrodita sp*.; Figure 4a) found in different stomachs of Pacific cod during August, and a common murre (*Uria aalge*; Figure 4b) found in a halibut stomach in June. Sea mice are common in the waters of the Gulf of Alaska but rarely seen in the diet of sport caught fish. Seabirds of various types have been found as prey in the stomachs of Pacific cod and other commercially important fish around the Aleutian Islands (ASLC unpublished data), but the extent to which such predation occurs is still under investigation. This is our first observation of a seabird as prey in >2500 halibut stomachs examined over the past 3 years along the Kenai coast, therefore predation by fish likely does not affect seabird populations in this region to any extent

Figure 4 – a) Sea mouse found in the stomach of a Pacific cod caught 15 August, 2012 and b) Remains of a common murre found in the stomach of a halibut caught 09 June, 2012.

The proportion of halibut with empty stomachs increased over the course of the 2012 summer with fewer containing prey items such as forage fishes and octopus between late July and early August (Figure 5). This trend was somewhat different than that seen during the previous two years when forage fish increased to a peak between late July and early August in the diet of halibut.

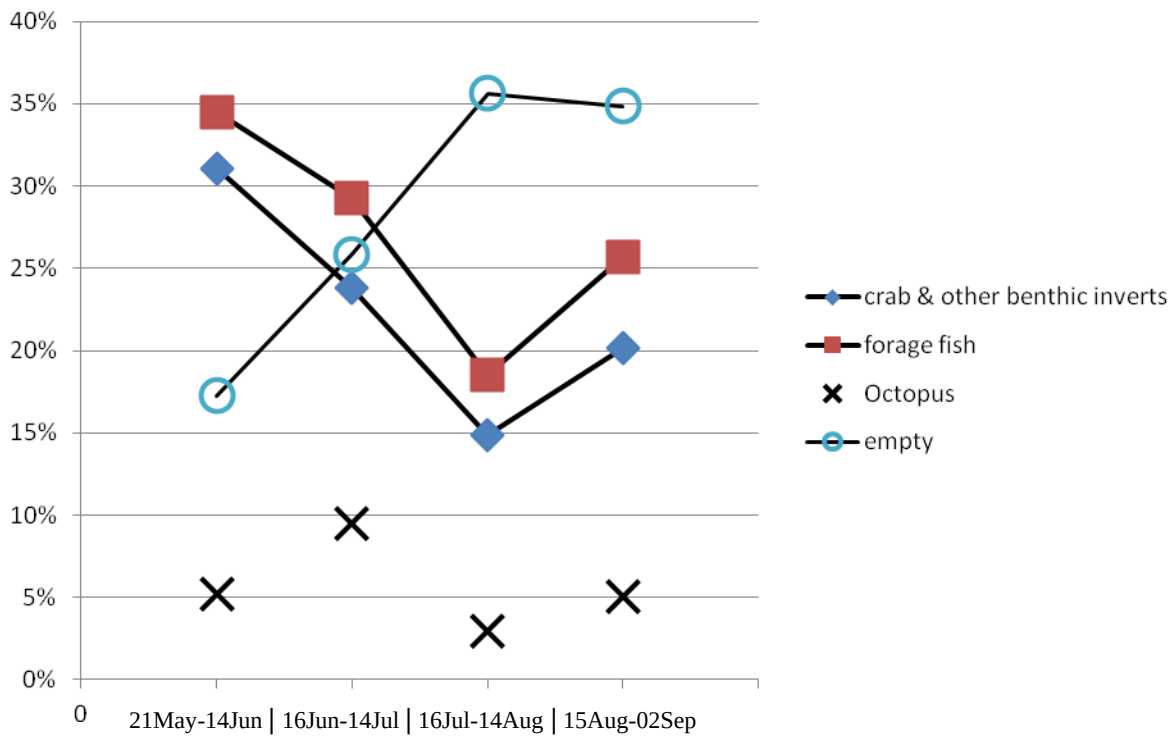

Figure 5. Relative presence of selected halibut prey items over the course of the 2012 summer.

The general categories of prey and presence/absence of fish and invertebrates in halibut stomachs were comparable to that found in a similar study of halibut prey in lower Cook Inlet halibut during the 1990s (Roseneau and Byrd 2000). However, when comparing forage fish species, capelin were less commonly observed and herring more common in the diet of halibut in this region compared to lower Cook Inlet (Roseneau and Byrd 2000). Continuation of this study into future years will provide valuable information on how short and long-term changes in northern Gulf of Alaska fishes affect many species throughout the trophic spectrum. Long-term studies of pinnipeds and nascent studies of seabirds in this region will definitely benefit from this added component.

Acknowledgments:
The Alaska SeaLife Center would like to thank the National Park Service and the National Park Foundation for providing funding for this research. Also, many thanks to Patrick Hager for collection, analysis, and summarization of fish stomachs and their contents. We are also very appreciative of the cordial and cooperative help from private and charter fishing fleet of Seward, Alaska.

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Eider and Seabird Research (R0049-01) - *PI: Tuula Hollmén, Co-PI: John Maniscalco*

Objectives and related accomplishments:

1. Seabird productivity. Monitor productivity of selected study species (including black-legged kittiwake and common murre) using camera/video imaging techniques.

   Productivity of black-legged kittiwakes was studied near Cape Resurrection and productivity of common murres was studied at Barwell Island using remote camera/video sensing techniques. Cape Resurrection and Barwell Island are home to one of the largest aggregations of kittiwakes and murres along the Kenai Coast.

2. Habitat use of coastal marine habitats in the Resurrection Bay area.

   Vessel based coastal surveys observing and counting marine bird species were conducted throughout 2012 along an off shore transect in Resurrection Bay.

3. Key species of conservation concern.

   As a continuation of a long term project on Steller's eider ecology, data is being analyzed to evaluate seasonal changes in body condition and diets.

Progress Update:

<u>Seabird productivity</u>

Black-legged kittiwakes (*Rissa tridactyla*) and common murres (*Uria aalge*) were monitored during the 2012 nesting season near Cape Resurrection. Kittiwakes were viewed using a remote-

control video system installed about 1km north of Cape Resurrection in El Dorado Narrows primarily for Steller sea lion studies. Murres were monitored via two time-lapse still cameras on top of Barwell Island adjacent to Cape Resurrection. Additionally, photographs were taken of kittiwake numbers and nests on the Cape Resurrection peninsula to a minimum of 1 km north on the east and west sides of the peninsula on June 21 and August 13.

Black-legged kittiwake

Seventeen nest plots were randomly selected from the mainland and adjacent island, and 30-second digital video clips recorded twice weekly for up to 143 nests within these plots. Video recordings were taken on 30 occasions in 2012 between May 22 and August 31 with 30-second video clips. These were the same nest plots where nesting success was recorded during 2010 and 2011, and included data from 143 and 141 individual nests, respectively. Between-year comparisons were made to investigate annual variation in nesting success.

Figure 6. Still image from a video clip of black-legged kittiwake nest monitoring plot.

Active nests were completed by the first week of June in all three years. There was a gradual nest loss to about 70% of peak by late August in both 2010 and 2011. Loss of nests in 2012 was more rapid, with 70% of peak occurring by the first week of August.

In 2010, chicks were observed in 107 of 143 nests (74.8%) with 2 chicks in 15 of those. In 2011, chicks were observed in 66 of 141 nests (46.8%) with 2 chicks in 3 of those nests. There were 36 chicks observed in 143 nests (25.2%) in 2012, with a single 2-chick nest. No nest in any year was observed to have produced more than 2 chicks. Estimated hatching success in 2010 was high (85.3 ± 4.9% SE), lower in 2011 (48.9 ± 4.6% SE), and even lower in 2012 (26.4 ± 3.9% SE). There was a significant difference (Kruskal-Wallis test; $H=80.84$, 2 d.f., $P<0.0001$) in the number of hatchlings in all years.

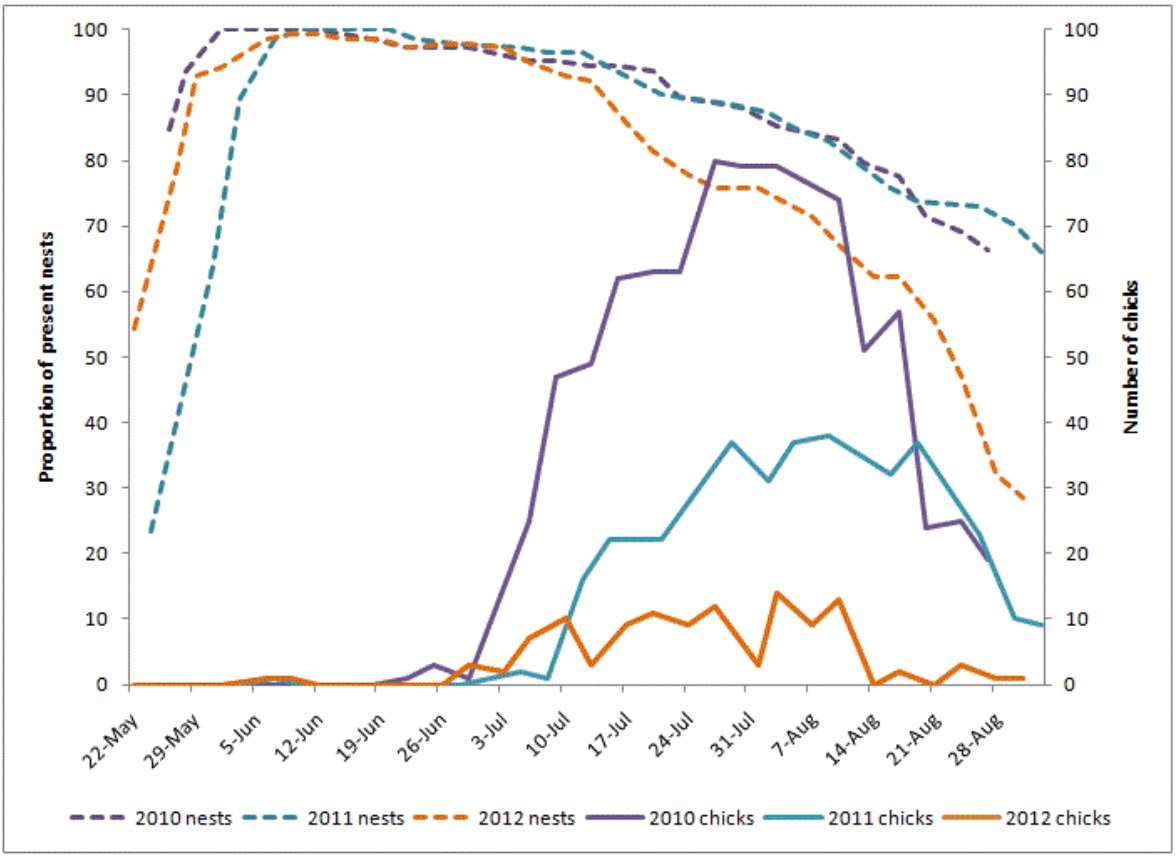

Figure 7. Nests and chicks present in 2010-2012.

In 2010, fledging success (chicks per nest) was high (62.2 ± 4.8% SE) with the average fledging date estimated at 17 Aug ± 6.8 days. Estimated average fledging date for the first chick was 17 Aug ± 6.7 days and 23 Aug ± 3.9 days for the second chick. In 2011, fledging success was low (34.0 ± 4.0% SE) with the average fledging date estimated at 21 Aug ± 9.6 days. No second chicks were observed to fledge during 2011 season. Fledging success was low (15.7 ± 3.1% SE) in 2012, with the average fledging date estimated at 27 July ± 17.0 days. No second chicks were observed to fledge during 2012 season. There was a significant difference (Kruskal-Wallis test; $H=61.37$, 2 d.f., $P<0.0001$) in the number of fledglings in all years.

We are currently working on further data analysis to investigate which variables influence fledging success and nest presence. The variables include: Year, Adult presence during laying/incubation time period, Adult presence during brooding time period, Reproductive behavior during laying/incubation time period, Reproductive behavior during brooding time period, Height of nest in rookery (in regards to possible wave exposure), Maximum wave height, and Cumulative precipitation.

Common murre

There were a total of five cameras deployed in 2012; two were Canon (12.2 megapixels) digital cameras with a DigiSnap programmable chip and three were Bushnell Trophy Cam HD (8 megapixels). In 2011, both Canon cameras stopped working on 25 July. Due to this issue, we decided on using three additional cameras of a different model for 2012.

Cameras were set-up on 16 May and retrieved on 1 October. The Canon cameras were placed in same locations as 2011. One of the Bushnell cameras was placed next to a Canon camera in order to compare image resolution (8 vs. 12.2 megapixels) quality. The remaining two Bushnell cameras were placed in new locations to capture additional nesting common murres.

During light hours, images of common murres were captured once every 4 hours with Canon cameras and every hour with the Bushnell. There were 203 images captured using both Canon cameras and 7,840 images using the Bushnell cameras. There were slight issues with each camera model. One Canon camera stopped capturing images as of 24 May, while the other captured sporadic images throughout the entire time period. Condensation was a small problem in each of the Bushnell cameras, while one camera was situated such that every daylight image was overexposed and unusable. Nevertheless, many pictures captured the presence/absence of adults with eggs or chicks and the date to which pictures were recorded should allow us to estimate proportion of egg laying murres and possibly hatching success. Review of 2012 images is underway.

Results from images of two monitoring plots from late May to end July in 2011 provided presence/absence of adults with eggs, limited chick data, and no fledgling information. Common murres were first photographed in Camera 1 location on the evening of 31 May, with variable nightly presence (prospecting) of rookery continuing until 17 June. There were 45 nests initially described by incubation and/or brooding postures in this location. The first incubation postures were observed on 17 June. In addition to these behaviors, those nests were further confirmed by presence of an egg (N=39) or chick (N=6). The first egg observation occurred on 18 June, eggs were laid by 22 June, and chicks were observed from 21 – 25 July. Images from Camera 2 were first captured on the evening of 29 May, with prospecting until 17 June. There were 32 nests determined by incubation and/or brooding postures. The first incubation postures and first egg observations occurred on 18 June. Of those nests, 28 were substantiated by observations of an egg. The first egg was observed on 18 June, eggs were all laid by 24 June, and there were no observations of chicks.

Figure 8. Of the 636 images in 2011, there were 22 images from 13 – 25 July showing various prey items to be fed to chicks. The image resolution was not quite sufficient for species identification of the prey.

Predation

This season, we captured several occasions of an avian predator taking eggs from both monitoring locations. Using the live video monitoring, we recorded a raven taking an egg from a kittiwake nest on May 29 near Cape Resurrection. Additionally, there are several still-images from Barwell Island of glaucous-winged gulls taking common murre eggs, one image of a gull eating an egg, and another one of a probable predation of murre chick. Additionally, the presence of avian predators (gulls and ravens) appears to create disturbances on the rookery.

Figure 9. Three glaucous-winged gulls, each with a common murre egg in their bill.

Figure 10. A glaucous-winged gull stands near a dead common murre chick. In the previous picture, the gull was absent and the chick was alive.

Figure 11. A series of three sequential images shows a glaucous-winged gull causing a disturbance amongst the nesting common murres on Barwell Island on June 24, 2012.

Resurrection Bay coastal surveys

Coastal vessel based surveys of Resurrection Bay were re-initiated in September 2011. The surveys cover the coastline from the head of the Bay to Caines Head on the west side, and through Thumb Cove on the east side. The survey route is separated into 20 transects, with start and end point based on shoreline characteristics. The surveys are conducted at a monthly interval throughout the year to record the species, numbers and distribution of marine birds. Due to weather and logistics, surveys were not conducted in some months.

Many sea ducks, loons, and grebes rely on this region as an overwintering area, and our surveys to date suggest seasonal and interannual changes in the presence of these and other birds (Figure 12).

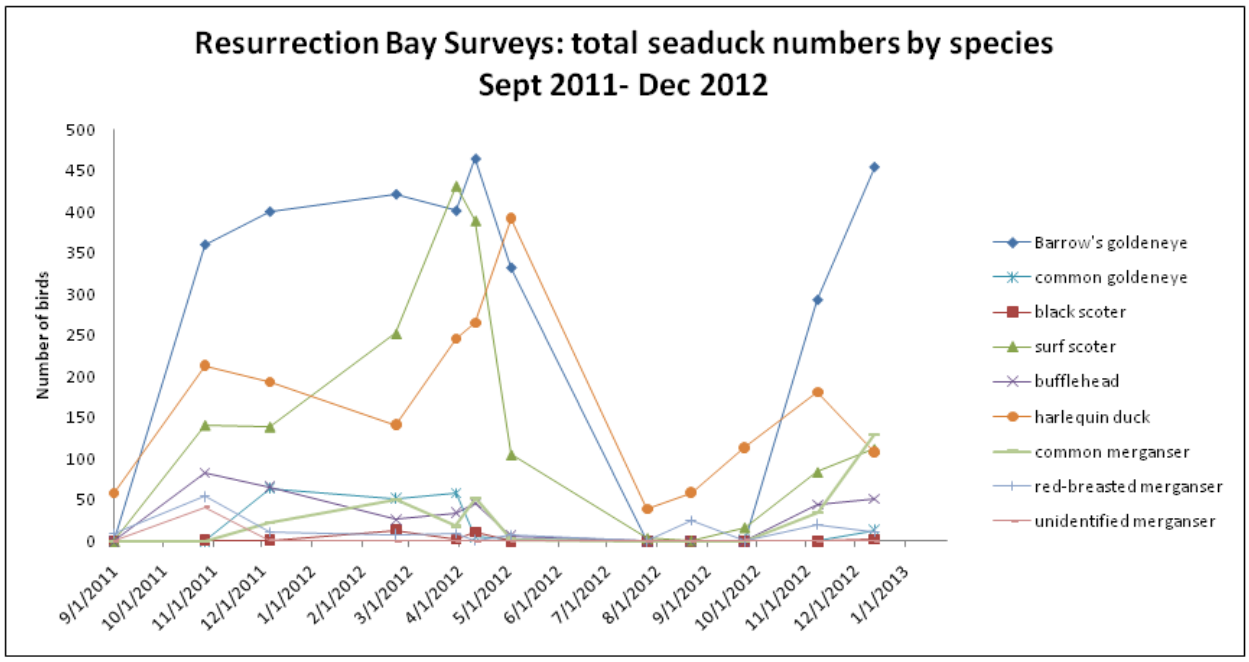

Figure 12. Number of marine birds counted during surveys over a 16 month period.

In addition to temporal variation, we plan to assess spatial variation to determine which habitat types are most important for the monitored species. Preliminary results combining all bird observations and seasons are presented (Figure 13). More detailed data analysis by season and transect is in progress. Preliminary results suggest season variation within each transect (data not shown).

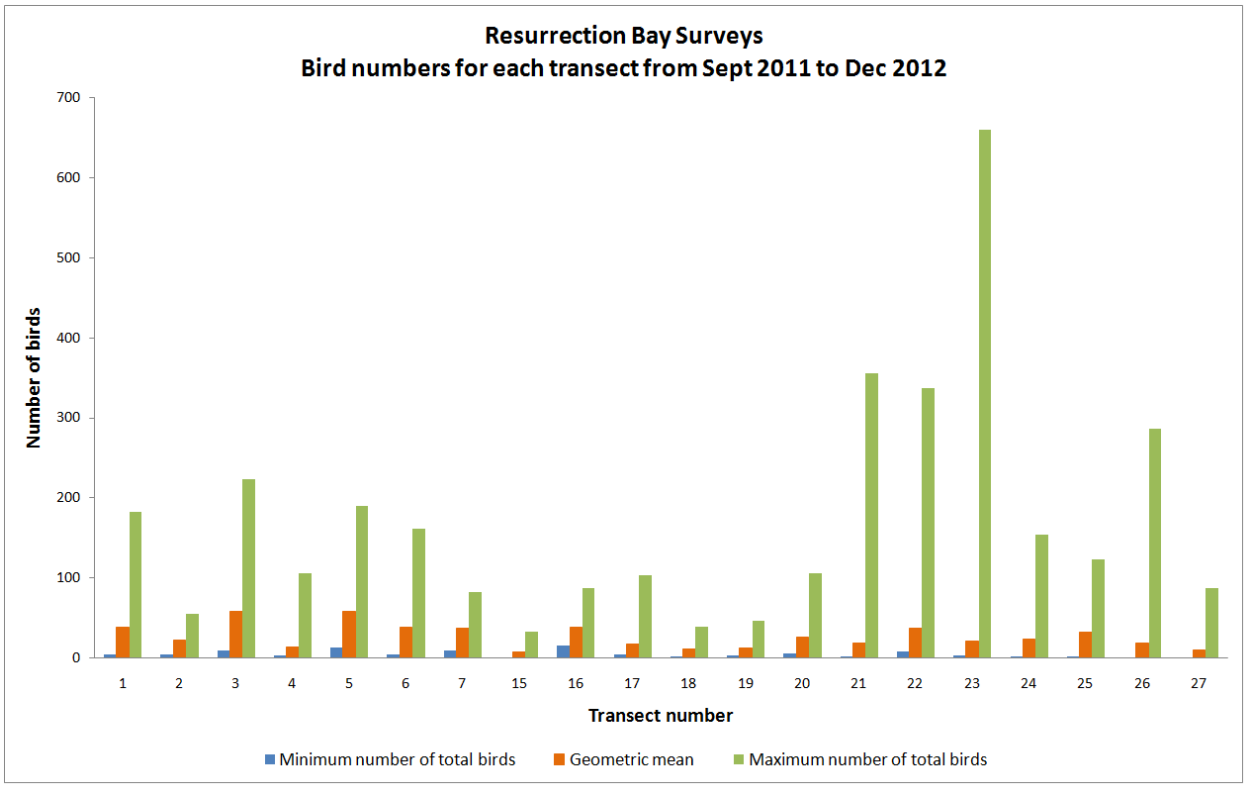

Figure 13. Number of marine birds observed across the 20 survey transects. The data represents 11 surveys. Minimum number of birds observed represents global minimum across all 11 surveys and maximum represents global maximum across all 11 surveys.

Presentations and publications:

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Ulman SEG, Maniscalco J, and Hollmén T. 2012. Black-legged kittiwake productivity on the Kenai coast: a first look at a long-term remote video monitoring study. In Proceedings of the Alaska SeaLife Center 10th Annual Research Colloquium, Seward, AK. October 24-25, 2012.

Ulman SEG, Maniscalco J, and Hollmén T. 2013. Black-legged kittiwake productivity on the Kenai coast: a first look at a long-term remote video monitoring study. *In* Proceedings of the Alaska Marine Science Symposium, Anchorage, AK January 21-25, 2013.

Harbor Seal Data Management (R0049-02) - *PI: Anne Hoover-Miller*

This study is a continuation of a long-term research and monitoring project pertaining to harbor seals using glacial ice habitats in Aialik Bay. Monitoring has been primarily conducted using remotely controlled video cameras that were installed in 2002 near Aialik and Pedersen Glaciers. Supplemental data are obtained through aerial and oceanographic surveys. Methods are described in (Hoover-Miller et al. 2010, 2011a, b, *in press* and Hoover-Miller and Pinchuk 2008).

Numbers of harbor seals in Aialik Bay and Northwestern Fjord precipitously declined during the 1980s. Using a combination of methods including field counts, aerial surveys, and observations obtained through remotely operated video cameras, numbers of seals have been tracked at both locations since 2004. In Northwestern Fjord, numbers of pups have steadily increased since from 2004-2011, while in Aialik Bay, an area heavily visited by tourists, number of pups have varied with unexpectantly low numbers from 2008-2010. It remains unknown what factors have influenced reproductive variability in Aialik Bay and why they differ between Aialik Bay and Northwestern Fjord. It also is unknown whether trends in Aialik Bay and Northwestern Fjord reflect trends at ice and land habitats elsewhere along the Kenai Peninsula. The research focus in 2012 is to complete image analysis of aerial surveys and assessments of counts from vessel and aerial surveys to evaluate regional population trends and habitat use along the southern Kenai Peninsula as well as maintain minimal population monitoring in Aialik Bay and Northwestern Fjord.

2012 Objectives

Objectives:

- Complete analysis of aerial survey images and counts obtained since 2004 along the southern Kenai Peninsula
- Assess differences in spatial and temporal trends in number of seals and pups at distinct coastal land and ice haulouts.
- Evaluate regional trends in numbers of seals with respect to variability in environmental parameters, including habitat type, oceanographic conditions, and climate parameters

2012 Summary and Accomplishments

Due to funding limitations, remotely controlled video cameras operating on Squab Island, the bluffs north of Aialik Glacier and the hillside southeast of Pedersen Glacier and the repeater site above Pedersen Lagoon were removed during the summer of 2012. Observations were not made using the video monitoring system during 2012.

<u>Objective 1: 2012 Aerial surveys and analysis</u>

- Aerial surveys were conducted on 7 and 11 June, during peak pupping, and on 8/8/12, during the molt for continuation of harbor seal trend monitoring and habitat use comparisons along the southern Kenai Peninsula. Analysis of images from 2012 surveys has been completed.
- A new database has been developed that distinguishes numbers of seals counted relative to coastline partitions used by the National Marine Fisheries Service for statewide

surveys. Of the 49 aerial surveys that have been conducted, 28 surveys still need to be reviewed. Preliminary results of regional trends suggest strong overall population growth rates for the survey region (Figure 14).

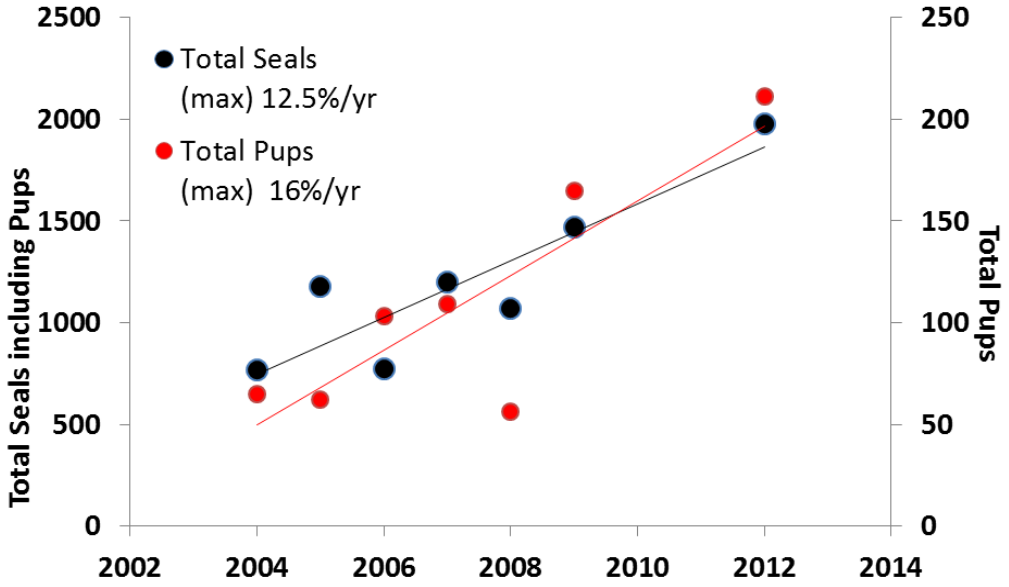

Figure 14. Preliminary summary of changes in total numbers of seals and numbers of pups counted along the southern Kenai Peninsula from Johnstone Bay through Northwestern Fjord from 2004-2012

- A collaborative project with Kenai Fjords Tours was enhanced enable (1) collection of harbor seal data from Northwestern Fjord, (2) photographs of cetaceans in route and (3) documentation of branded Steller sea lions in Resurrection Bay, Chiswell Islands, and Northwestern Fjord. Kenai Fjords Tours generously provided staff to collect information for this project following previously established protocols. This collaboration provided valuable information on the seasonal presence of seals in Northwestern Fjord (Figure 15) and a library of images to support observations.

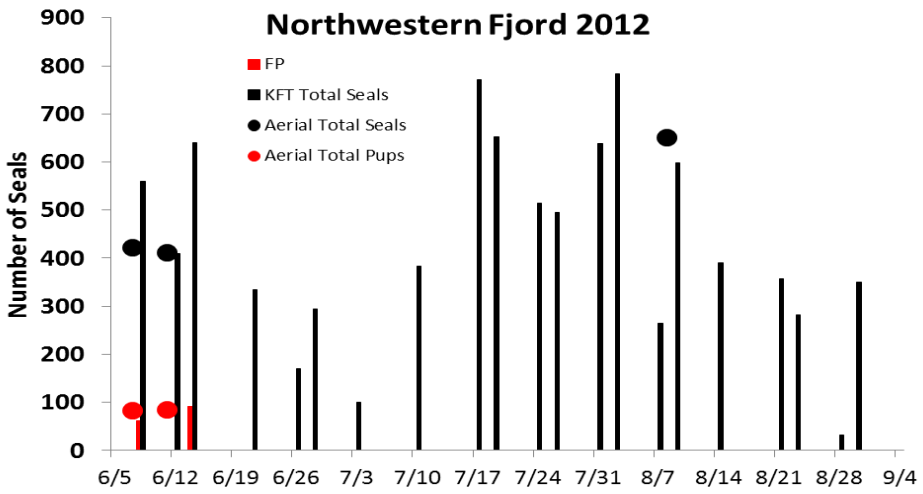

Figure 15. Numbers of seals counted in Northwestern Fjord during Aerial Surveys and Kenai Fjords Tours in 2012.

Objective 2: Assess differences in spatial and temporal trends in number of seals and pups at distinct coastal land and ice haulouts.

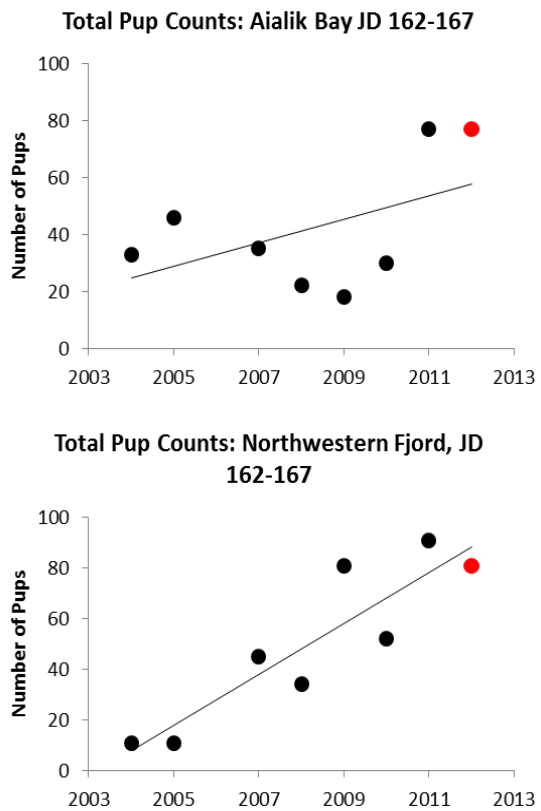

Figure 16. Comparison of changes in numbers of pups present in Aialik Bay and Northwestern Fjord during peak pupping from 2003-2012

Initial focus on Objective 2 has been focused on comparing trends in pups between Aialik Bay and Northwestern Fjord (Figure 16). Results indicate that productivity in Aialik Bay is lower and less consistent than Northwestern Fjord, suggesting that Aialik Bay is a less preferred habitat relative to Northwestern Fjord, Similar analysis will be made at other habitats along the aerial survey route, to further examine temporal, regional and habitat related differences in trends.

Objective 3: Evaluate regional trends in numbers of seals with respect to variability in environmental parameters, including habitat type, oceanographic conditions, and climate parameters.

Data are being compiled for this evaluation but further analysis is dependent on the completion of Objective 1.

2011 Objective 2: Vessel and Kayak Disturbance

During 2012, our manuscript pertaining to long-term changes in disturbance of harbor seals by vessels and kayaks was accepted for publication in Journal of Wildlife Management.

Hoover-Miller, A., A. Bishop, J. Prewitt, S. Conlon, C. Jezierski, and P. Armato. (*In Press*) Efficacy of Voluntary Mitigation in Reducing Harbor Seal Disturbance. Journal of Wildlife Management.

ABSTRACT Marine and coastal tourism has rapidly expanded worldwide in the past 2 decades, often occurring in once secluded habitats. In Alaska, tourism near tidewater glaciers has attracted millions of visitors and increased the presence of ships, tour vessels, and coastal development. Although sustainable tourism, resulting from balanced effects on wildlife and client satisfaction, is a goal of most tourism operators, it is not always achieved. Voluntary compliance with viewing guidelines and codes of conduct have been encouraged, but few assessments have the longitudinal scope to evaluate long-term changes in impacts on wildlife and the ability of vessel operators and kayak guides to sustain lower impact operating practices over time. This study assessed vessel and kayak visitation and resulting impacts on harbor seals in the Kenai Fjords National Park, southcentral Alaska. We obtained observations from 2002–2011, using remotely controlled video cameras located near Aialik and Pedersen Glaciers in the Kenai Fjords National Park, Alaska. Overall, disturbance was associated with 5.1% of vessel sightings, 28% of vessel interactions (vessel observed within approximately 300 m of seals), 11.5% of kayak sightings, and 61% of kayak interactions. Results demonstrated that voluntary changes in operations significantly reduced vessel and kayak disturbance of seals by 60-80%. Even with prior establishment of operating guidelines, tour vessel captains were able to further reduce their effect on wildlife with more careful operations. Rapid growth of guided kayak excursions that occurred during this study caused greater disturbance to seals than motorized vessels but guide trainings helped reduce disturbances. Diminished impacts of motor vessels and kayakers persisted across years although effects of kayaks were less consistent than motor vessels, which reflected greater variability in inter-annual spatial use patterns by kayakers. Long-term monitoring, including assessments of wildlife responses to vessel and kayak operations, combined with 2-way communication with vessel operators and guides, enhanced the effectiveness of mitigation and facilitated adaptive adjustments to mitigation protocols over time.

2012 Presentations

- Harbor seals in the Kenai Fjords. Alaska SeaLife Center Colloquium (October 2012)
- Kenai Fjords Tours Observer Training (June 2012)
- Kayak Guide Training: Alaska SeaLife Center (May 2012)

Progress relative to Objectives

Objective 1: Complete analysis of aerial survey images and counts obtained since 2004 along the southern Kenai Peninsula

This objective is still in progress and is taking longer than expected due to redevelopment of an enhanced database and reanalysis of many of the surveys.

Objective 2: Assess differences in spatial and temporal trends in number of seals and pups at distinct coastal land and ice haulouts.

Preliminary analysis has begun, however final analysis cannot be completed until all surveys have been included in the new database.

Objective 3: Evaluate regional trends in numbers of seals with respect to variability in environmental parameters, including habitat type, oceanographic conditions, and climate parameters.

Preliminary analysis has begun, however final analysis cannot be completed until all surveys have been included in the new database.

The redesigned database will be used enhance geospatial comparisons. Initial analysis, provided in this report indicates substantial temporal differences in pupping productivity between Aialik and Northwestern Glaciers. Similar comparisons are planned between terrestrial and other ice habitats on the Kenai Peninsula to rank importance of specific pupping and molting habitats and identify locations of high and low importance for comparison with ecological parameters.

Progress relative to Timeline

June 2012 – **Completed on time**

- Review aerial survey database and determine surveys needing further analysis
- Conduct Pupping Surveys in Aialik Bay and Northwestern Fjord if funding is available for surveys
- Analyze pupping aerial survey images (2012 images)

August 2012 – **Completed on time**

- Conduct Molting Surveys Marine Surveys in Aialik Bay and Northwestern Fjord if survey funding is available
- Analyze molt aerial survey images (2012 images)
- Begin analysis of regional population trends

December 31, 2012

- Progress Report – **Completed on time**
- Manuscript preparation – **In progress**

Deviations from established goals.

Analysis of surveys for inclusion in database has been more time-consuming than initially anticipated but is important to complete to insure consistency between surveys. Previously, surveys had been analyzed by more than one person, with varying levels of experience. Many errors were found that are now being corrected. The new database has been designed to partition the distribution of the seals in the same geographic segments used by the National Marine Fisheries Service for their statewide surveys, so the results of this study will be able to integrate with their data.

The analysis of the survey images was further slowed in fall 2012, by time needed for revisions of the manuscript *Efficacy of voluntary mitigation in reducing harbor seal disturbance. Journal of Wildlife Management* (2011, Objective 2) that is being published in Journal of Wildlife Management.

Due to funding limitations, A. Hoover-Miller, is on leave from Nov 17, 2012-Feb 2013.

Manuscripts and Publications

Hoover-Miller, A., A. Bishop, J. Prewitt, S. Conlon, C. Jezierski, and P. Armato. (In Press) Efficacy of voluntary mitigation in reducing harbor seal disturbance. Journal of Wildlife Management.

Hoover-Miller, A., S. Atkinson, S. Conlon, J. Prewitt, and P. Armato. 2011. Persistent decline in abundance of harbor seals, *Phoca vitulina richardsi*, over three decades in Aialik Bay, an Alaskan tidewater glacial fjord. Marine Ecology Progress Series. Vol. 424: 259–271.

Hoover-Miller, A., A. Bishop, J. Prewitt1, S. Conlon, and P. Armato. (In review). Balancing Ecotourism and Wildlife Conservation: Long-term benefits of stakeholder collaboration. Submitted to Conservation Biology

Bishop, A., A. Hoover-Miller, A. Read, J. Prewitt. (manuscript) Response of harbor seals (*Phoca vitulina*) to changes in glacial ice attributes and distribution in Kenai Fjords National Park, Alaska.

Bishop, A. 2011. Selection of haul-out substrate by harbor seals (*Phoca vitulina*) associated with tidewater glaciers in Kenai Fjords National Park, Alaska. M.Sc. Thesis. Duke University, Nicholas School of the Environment. http://hdl.handle.net/10161/3628

Jezierski, C. 2009.The impact of sea kayak tourism and recreation on harbor seal behavior in Kenai Fjords National Park: integrating research with outreach, education, and tourism. M.Sc. Thesis. University of Alaska Fairbanks. 69p.

Hoover-Miller A., and A. Pinchuk. 2008. An exploratory study of marine ecology and oceanography in Aialik Bay. In: M. Shaw (ed.). Scientific studies in Marine Environments. Alaska Park Science. National Park Service. Anchorage Alaska. 7(2):6-11

Jezierski C., A. Hoover-Miller and B. Norcross. 2008. Integration of tourism into the marine ecosystem. Alaska Park Science. National Park Service. Anchorage Alaska. 7(2):18-21

Maniscalco J.M., A. Hoover-Miller, and D. Zatz. 2008. Remote monitoring of pinnipeds in Kenai Fjords National Park. Alaska Park Science. National Park Service. Anchorage Alaska. 7(2):12-17

Hoover-Miller, A., S. Atkinson, P. Armato. 2004 Live feed video monitoring of harbor seals. Alaska Park Science. National Park Service. Anchorage Alaska. Vol. 3, Issue 1. pp 25-29.

Marine Ecosystems Response Synthesis (R0049-03) - *PI: Tuula Hollmén*

Progress update:
The overall priority of this synthesis task is to develop a synopsis study plan and conceptual framework linking upper trophic species for a vertically integrated study in the coastal Kenai Fjords. Initial input for a conceptual ecological model framework is being gathered from PIs conducting research in the area. The end product will be a vertically integrated framework and suite of submodels describing the current state of understanding of structural and dynamic processes of our study system. A key aspect of the effort involves development of ecological models to describe the near shore system in our study area, and involving the marine – terrestrial interface. The models of our near shore marine study system in the Kenai Fjords region will have linkages to larger modeling and monitoring efforts in the Northern Gulf of Alaska region, currently underway with larger ecosystem research programs. Our conceptual models will also provide a template and tools for expanding modeling efforts to other coastal parks and near shore marine habitats. The model will also provide materials for visual outreach and communication tools about our research projects in the Kenai Fjords region.

Objectives and related accomplishments:

1. Develop a conceptual design for a vertically integrated research study plan, linking upper trophic species to other trophic levels and environmental drivers in the Kenai Fjords area.

   Conceptual design is under development and will be incorporated into the vertically integrated conceptual model representing the scope and focus of the integrated research effort. A reference library of resource on marine ecosystem modeling is being compiled.

2. Develop an ecological model to describe structure and processes of the study system Initial input for model structure and scope is being gathered.

   We plan to complete the first version of the model by September 2013.

3. Evaluate linkages and contribution of each of the upper trophic species projects to the overarching model of system structure and process, to use as guidance for future direction of the research projects.

   This objective will be addressed in 2013.

Presentations:

Hollmén T, Maniscalco J, Hoover-Miller A. 2011. Integrating upper trophic species into ecosystem studies along the Kenai coast. Park Science Symposium. Anchorage, AK.

Monthly Research Symposia (R0049-04) - *PI: Tuula Hollmén*

This ongoing project provides the opportunity for the NPS and its partners to share current research with the general public. A monthly science seminar series was initiated in 2011 and we are in the process of planning our 2013 seminar series. Ideas for future speakers and seminar topics will continue to be coordinated with our NPS partners. A list of speakers during 2012 is below.

Jim Lovvorn: March 13, 2012 (Visiting Scientist)
Defining critical habitat for Spectacled Eiders in a climatically changing Bering Sea.

John Kennish, April 20, 2012 (Visiting Scientist)
Plastic Debris as a Source of Contaminants in the Alaska Marine Environment

Sadie E.G. Ulman, May 12, 2012
Migratory Shorebirds of Northern Kenai National Wildlife Refuge

Dan Mulcahy, June 1, 2012 (Visiting Scientist)
Two decades of implanting transmitters in birds (with musings about veterinarians, biologists, and wildlife research)

John Maniscalco, June 27, 2012
Survival estimates of juvenile Steller sea lions in the Gulf of Alaska 2005-2011

John Skinner, August 29, 2012
Pup development in a growing harbor seal population along coastal Maine

Courtney Warren, September 5, 2012 (Visiting Scientist)
Archaeal Lipids in Aquaria: Influences and Implications for Paleoclimate Reconstructions

Sadie E.G. Ulman, September 28, 2012
Passerine banding during autumn migration in Interior Alaska

Peter Gavlund, December 13, 2012 (Visiting Scientist)
National Aquarium of Denmark – 2013 – The new facility and its research

Beluga Whale / Walrus Projects (R0049-05) - *PI: Lori Polasek*

Project Overview
Two remote monitoring projects began in 2011. The first project goal was to deploy a remotely operated video observation system as a pilot assessment of the utility of this technology to record Cook Inlet Beluga (CIB) distribution, abundance, and site fidelity (Primary funding: NOAA). This project was quite successful and we able to count animals, detail use by the belugas of the Little Susitna River in the Upper Cook Inlet, and capture behaviors of belugas, human activity and presence of other animals in the river. This project was completed prior to this reporting period and therefore the rest of the report will focus on the second project.

The second project goals were to assess attendance, duration, and level of disturbance at five terrestrial walrus haulout locations using fixed still cameras (Primary funding: National Fish and Wildlife Foundation).

OASLC Project Objectives

This project will provide support for students engaged in studying Beluga Whales and Walrus. This project supports the Pacific Ocean Parks Strategy goals in furthering an understanding of the marine environment and species contained therein.

Walrus Monitoring Progress

The walrus monitoring project was implemented in 2011. The first year of any field project comes with many educational experiences and costs that are not anticipated. Multiple opportunities were made possible by the OASLC funds and the funds and findings are contributing greatly to the success of the project. Funds were used during this period to attend two meetings described in the following paragraphs, to purchase memory cards for the cameras and for the upkeep of Land Use Permits necessary for camera deployment.

A Walrus Haulout Monitoring Workshop was attended in March 2012. The meeting was hosted by the USFWS. The meeting topics included both US and Russian participants and covered topics such as estimating abundance, location and timing of haulouts and mitigating disturbance.

A Community Meeting in Point Lay was attended in August to discuss the walrus disturbance project and to facilitate placing cameras outside of Point Lay. The meeting was very fruitful. Lease and permitting documents for land use at Point Lay were completed with the North Slope Borough and Cully Corporation for the camera installation. Cameras we deployed in September.

This project has been successful at collecting animal counts, general distribution and during the preliminary image assessment from one site disturbances have been captured from boats, planes, foot traffic and bears. This project will continue in 2013 and the remaining OASLC funds will ensure another successful season of data collection.

Additionally during this reporting period two interns and five volunteers have been trained on research collections and data analysis through this project. This training has lead to one intern gaining a graduate position and a volunteer finding a position in the marine biology field.

Outreach

Through separate funding we have worked with our education department to develop an outreach project called "Watching Walrus." This is a virtual fieldtrip that describes our work. The field trip is free on the Alaska SeaLife Center website. It is aimed at 5th grade classes and has curriculum material, but will be user friendly and open to all ages to explore. The Virtual Field Trip can be accessed at the following address:
http://www.alaskasealife.org/New/education/VFT/WATCHING%20WALRUS/WalrusVFT_Introduction.php

Collaborations and Other Support
The walrus project is supported by several grants and agencies. A majority of the project is funded by the National Fish and Wildlife Foundation. A small grant has been awarded by Sea World Busch Gardens Conservation Fund. Both ADF&G and US Fish and Wildlife Service provided significant contributions by providing transportation and staffing to get to the remote site and help monitor the units. A small army of volunteers is helping us make headway through all of the images we have received.

Monitoring for Marine Invasive Species (R0049-06) - *PI: Howard Ferren*

The Alaska SeaLife Center has been conducting marine invasive species investigations for four years. Investigations have ranged from local monitoring for invasive crabs and tunicates in Resurrection Bay, to a complex economic impact study. Ocean Alaska Science and Learning Center (OASLC) has been an important funding contributor to various invasive species projects we have conducted including local monitoring and an invasive rats exhibit. This report addresses OASLC funding supporting the 2010 Marine Invasive Species Workshop held in Seward and our 2010 local monitoring program (Appendix 1), as well as the more recent Invasive Species Economic Impact Assessment conducted as collaboration between the Alaska SeaLife Center (ASLC) and University of Alaska Anchorage, Institute of Social and Economic Research (ISER).

The final report addressing the 2010 Marine Invasive Species Workshop and Monitoring Program was initially submitted to OASLC in December 2010. Therefore, the focus of this report is the Invasive Species Economic Impact Assessment. As background, the Alaska SeaLife Center entered into an agreement with the Prince William Sound Regional Citizens' Advisory Council (PWSRCAC) to undertake an assessment of invasive species economic impact in Alaska in collaboration with staff at the University of Alaska Anchorage (UAA), Institute for Social and Economic Research (ISER). The project was additionally funded by the US Fish and Wildlife Service, Alaska Legislative Council, Bureau of Land Management and the National Parks Service (NPS) through OASLC. OASLC funding for the project provided incremental support to cover staff time for data gathering necessary to perform the economic analysis. ASLC staff launched the project in November, 2011. The study was completed in fall 2012 and the final report delivered to PWSRCAC. OASLC's funding, which represented 7% of the total project funding, was vital and assured completion of the project.

The Final Economic Impact Assessment Report is presented as three documents (attachments).

1) Four-page research summary (Appendix 2)
2) Journal article to be submitted to a peer-reviewed academic journal (Appendix 3)
3) PowerPoint presentation developed for the Alaska State Legislature (Appendix 4)

Key insights about economic impacts can be found in the Research Summary. This is a more concise document than the draft manuscript. We are searching for a publisher for the manuscript. ISER economist Tobias Schwörer continues to invest effort toward completing a predictive model based on invasion scenarios for various species. That model will be available in the future.

All goals and objectives provided in the ASLC monitoring, workshop and economic impact assessment studies have been met. Funding has supported development of a diverse invasive

species program with long term benefits to Alaska, Resurrection Bay and national parks adjacent to the marine environment. The economic impact study and ensuing model will have reverberating impacts at policy level debates. The 2010 invasive species workshop report continues to be a guiding force to prioritize projects including the economic impact study and a recently submitted proposal to the North Pacific Research Board tacking development of an invasive species prioritization tool, both priorities recommended in the 2010 report. Without OASLC financial support these important works could not have been accomplished. We hope to continue to work with OASLC in the future.

POPS Award #11POPSTAC001 (R0049-07): Mapping Social Values of Marine Wildlife - *PI: Lori Polasek*

There has been no activity on this project during this reporting period.

Bioindicators for Coastal Monitoring (R0049-08) - *PI: Tuula Hollmén*

Objectives and related accomplishments:

1. Develop a panel of tests to assess physiological health of the blue mussel, a key monitoring species for coastal habitats.

   A pilot project was conducted in Kenai Fjords in collaboration with Heather Coletti, NPS. We received blue mussels (*Mytilus* sp) from five sites to test two different transport techniques from remote locations, and a panel of physiological assays.

2. Develop cell culture based techniques to complement current techniques to assess health and contaminants exposure in sea otters.

   We conducted pilot experiments during summer 2012 to test laboratory techniques to establish tissue culture methods for sea otters.

Progress update:

Mussels may be able to serve as indicators of environmental change, including microbial pollution or change in water chemistry or temperature. In order to validate a panel of assays designed to assess the physiological health of blue mussels, a total of 160 *Mytilus* spp. were received from five sites in the Kenai Fjords National Park during the summer of 2012. Mussels were transported on ice or in seawater from the collection site to establish guidelines to maintain a viable stock of mussels from distant sites to the laboratory. Preliminary findings indicate that mussels held in seawater had higher levels of survival and provided larger quantities of hemolymph material for the assays. Transport conditions and times from five study sites are presented in Table 1.

Table 1. Number of mussels, transport conditions, and transport times from five sites in the Kenai Fjords.

Site	Site Name	No. Mussels Collected	Transport Condition	Transport Time
MI4	Nuka Passage	20	Ice	6 Days
MI3	Nuka Bay	20	Ice	5 Days
MI2	McCarty Fjord	20	Water	4 Days
MI2	McCarty Fjord	20	Ice	4 Days
MI5	Harris Bay	20	Water	2 Days
MI5	Harris Bay	20	Ice	2 Days
MI1	Aialik Bay	20	Water	1 Day
MI1	Aialik Bay	20	Ice	1 Day

We also performed a series of assays to establish baseline physiological and behavioral parameters. Experiments were set up at the ASLC laboratories (Figure 17 and 18). The experiments performed were: hemocyte viability, hydrogen production, feeding rate, byssal thread production, RNA:DNA ratio and morphometrics (length, width, height, weight, shell thickness, shell weight, soft tissue weight ratio and condition factor). These particular assessments were chosen to provide a suite of assays that can be used to observe potential responses to a variety of environmental stressors, including exposure to organic or inorganic pollution, general environmental stress, water acidification, or thermal stress. The experimental results are undergoing statistical analysis.

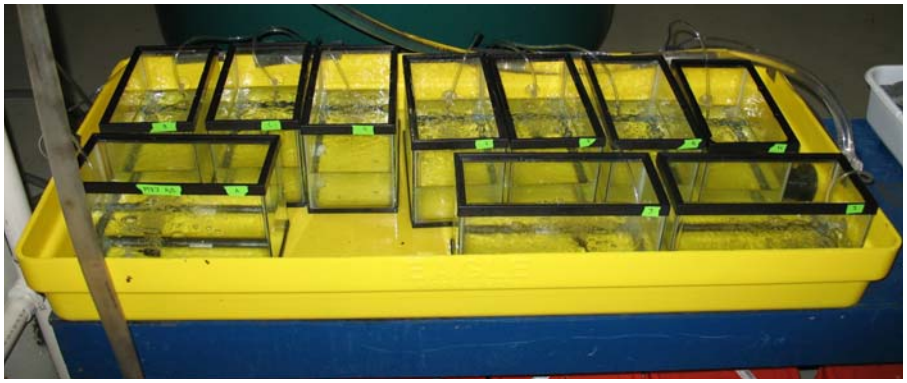

Figure 17. Mussel feeding rate assay

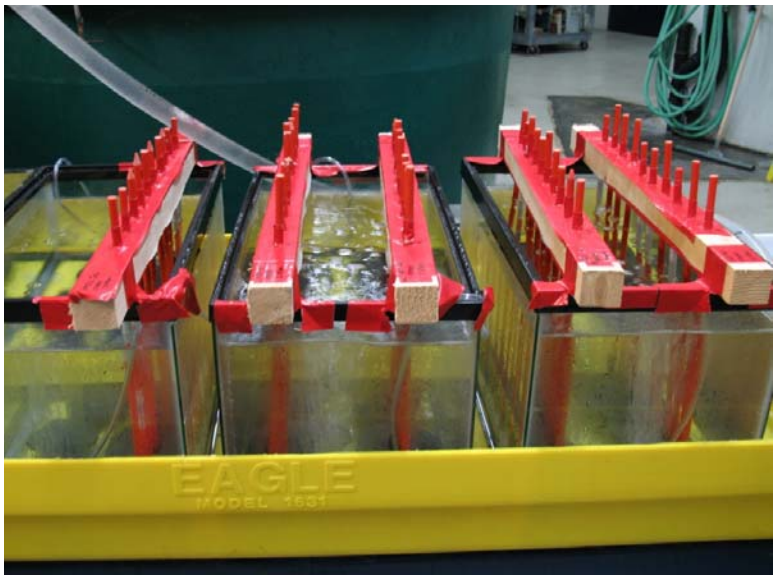

Figure 18. Byssal thread production experiment

Primary cell lines are powerful laboratory tools that can be a surrogate for live animal studies. During the summer of 2012, tissues from three northern sea otters (*Enhydra lutris kenyoni*) were processed in order to develop primary cell lines. The liver was digested using type IV collagenase and trypsin in order to develop hepatocytes. Aorta was digested with collagenase H to extract endothelial cells. Intestine was processed with one of two methods; it was either digested with type XI collagenase or treated with chelating solution to extract crypts and villi (Figure 19). We successfully cultured cells from tissues that were up to 72 hours post-mortem, which provides a longer window for obtaining these samples than originally thought.

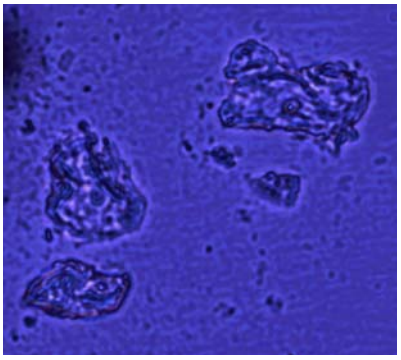

Figure 19. Sea otter intestinal cells, 400X magnification

Presentations:

Counihan-Edgar, KL, H Coletti and TE Hollmén (2012) *Mytilus* spp. as indicators of environmental health. *In* proceedings of the Alaska SeaLife Center 10th Annual Research Colloquium, Seward, AK. October 24-25, 2012.

Counihan-Edgar, KL, A Riddle-Berntsen, V Gill, C Goertz, and TE Hollmén (2012) Primary cell line development in the Eider Laboratory. *In* proceedings of the Alaska SeaLife Center 10th Annual Research Colloquium, Seward, AK. October 24-25, 2012.

Counihan-Edgar, KL, H Coletti and TE Hollmén (2013) *Poster:* Physiological assessment of *Mytilus* spp. in Kenai Fjords National Park. *In* proceeding of the Alaska Marine Science Symposium Anchorage, AK. January 21-25, 2013.

Seabirds and Rats: Interpretive Exhibit (L0004) - *PI: Howard Ferren*

This project has been completed. A final report was submitted in December 2010.

Marine Observational Surveys KEFJ (R0078) - *PI: Anne Hoover-Miller*

This project has been completed. A final report was submitted in December 2011.

EDUCATION PROJECTS

Village Outreach (E0447-01) - *PI: Laurie Morrow*

Progress Report: In 2012, outreach trips were conducted in Cordova, Chignik Lagoon, Chignik Bay, and Chignik Lake schools.

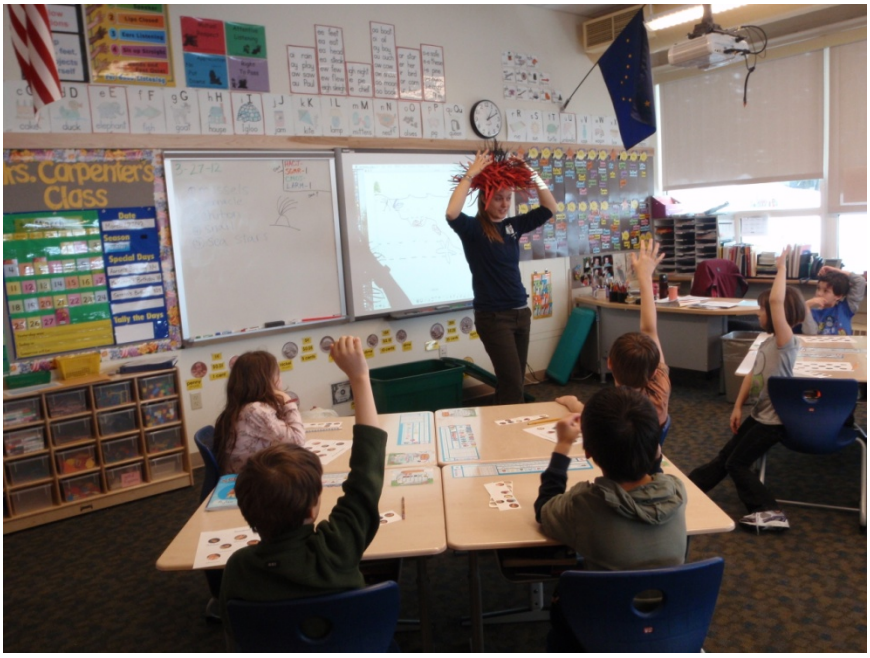

Figure 20. ASLC AmeriCorps member Krista Doersch talks to Cordova second graders about the adaptations of tide pool dwellers

In March, ASLC educator Callie Stark and AmeriCorps volunteer Krista Doersch traveled to Cordova. Over the course of two days, they delivered marine education classes to 141 elementary students and 25 high school students. They also conducted an evening “Science Night” session at the Prince William Sound Science Center, open to local community members, which covered the topic of veterinary care for stranded marine animals.

Figure 21. Chignik Lagoon students tide pool with ASLC educators in May 2012

Figure 22. Chignik Lake students dissect squid in May 2012

In May, ASLC educator Darin Trobaugh and AmeriCorps volunteer Kasi Gilbert traveled to the Lake & Peninsula school district to deliver education sessions in three different communities. In Chignik Lagoon, 11 students grades K-12 went tidepooling and learned about marine animal adaptations. In Chignik Bay, 17 students grades K-12 participated in classes about marine mammal adaptations and monitoring, bioluminescence, and the role of macro-invertebrates in determining the health of salmon streams. In Chignik Lake, 14 students grades K-12 studied marine mammal adaptations and monitoring, bioluminescence, squid anatomy, and marine invasive species.

ASLC Educator Callie Stark was scheduled to visit Valdez schools and conduct a Science Night presentation for their Ocean Science Festival in September 2012. Her travels, and the Valdez portion of the fair, were canceled at the last minute due to severe storms and flooding.

In 2012, videoconferenced education sessions were delivered to 23 Alaskan classrooms, most in the southwest region of the state. Connections are still being made available to all participants of our Mentoring Ocean Connections workshop and the teachers that they are mentoring during the current school year (see project report included for the POPS Award).

One objective of the current project plan is to integrate NPS staff in some of the ASLC distance learning connections and messaging. Jim Pfeiffenberger has described initial ideas for this integration, but we have heard little interest from the Education section of the KFNP office. Coincidentally, two NPS education staff from Gates of the Arctic and APLIC participated in the OASLC teacher workshop in October 2012 and expressed interest in receiving distance learning training from the ASLC. We are continuing to pursue this possibility and plan to discuss options with OASLC staff in January 2013.

Milestones for the 2012-2013 school year are on target. The ASLC is currently talking to schools in the Southwest Region, Northwest Arctic, and the Lower Kuskokwim school districts about possible outreach trips in spring 2013. We will discuss these possibilities with OASLC staff in January 2013 for possible inclusion of NPS staff on these education trips.

In addition, the ASLC is in the process of assuming management of the COSEE Ocean Science Fair segment of the Alaska Science & Engineering Fair (www.alaskasciencefair.org). ASLC Education staff will be adding a science fair education component to all of their outreach communications, whether through visits, videoconference connections, or printed materials.

Teacher Professional Development (E0447-02) - *PI: Laurie Morrow*

Final Report: The 2012 annual teacher professional development workshop has been completed in accordance with the milestones and deliverables outlined.

This year's annual OASLC teacher workshop was held October 19-21. The workshop, entitled "Scientists on the Beat: Keeping an Eye on the Natural Neighborhood", provided curriculum content training for teachers in grades 6-12. To deliver content, a number of NPS and ASLC researchers shared their monitoring research procedures and data sets.

In addition to the curriculum demonstrations and content introductions provided by OASLC and ASLC educators, speakers at the workshop included:

1. Deb Kurtz, Natural Resource Program Manager, KFNP: Monitoring research on the Kenai Fjords National Park's glaciers
2. Heather Coletti, Marine Ecologist, SW Alaska Network Inventory & Monitoring Program: Nearshore and sea otter monitoring
3. Laura Phillips, Ecologist, KFNP: Seabird monitoring in the KFNP
4. Chip Arnold, Dive Safety Officer, ASLC: Keynote address about juvenile Steller sea lion capture
5. Jane Belovarac, Senior Clinical Vet Tech, ASLC: Sea otter natural history & stranding

6. Tasha DiMarzio, Assistant Avian Curator, ASLC: Seabird natural history
7. Dr. Markus Horning, Marine Mammal Scientist, OSU/UAF, and Dr. Jo-Ann Mellish, Marine Mammal Scientist, ASLC: (By Skype from Antarctica) Monitoring seals in Antarctica and what this means for understanding and monitoring Alaska's seals
8. Pam Parker, Research Assistant, ASLC: Hands-on practice with the Chiswell monitoring project
9. Dr. Lori Polasek, Marine Mammal Scientist, ASLC: Monitoring Pacific walrus

Twenty teachers from the Anchorage, Kenai Peninsula, and Mat-Su Borough School Districts registered. Four teachers signed up for the UAA one-credit follow-up course (UAA ED A581 Science) with Laurie Stuart Morrow as the lead instructor. Refer to Appendix 5 to view the course syllabus. The course assignments included online collaboration and two written assignments, all of which proved invaluable in assessing the impact of the October workshop presentations. The course concluded on December 14, 2012. Rather than using the University of Alaska online site, all participants were invited to an open forum through basecamp.com for the rest of the semester. This allowed all participants to comment on the ongoing homework projects and share resources. The coordinators also shared data sets and contact information for researchers through basecamp.com.

Funds on this project covered the lodging and meals of all participants and guest speakers. Staff time included the planning, organizing, and conducting of the weekend workshop, as well as time for teaching the one-credit course and analyzing the assessments.

To review the evaluations, reflections, and final assignments of the workshop participants, please refer to Appendix 6.

Photos of the event were taken and stored by Jim Pfeiffenberger (NPS).

All deliverables for this project have been achieved for the 2012 season. Planning for the 2013 teacher workshop with OASLC is already underway, with initial recruitment of participants scheduled for next spring. As this year's focus was on secondary education, the 2013 workshop is expected to focus on curriculum ideas and content for elementary teachers.

OASLC Research-Based Public Education Programs and Products (E0447-03) - *PI: Laurie Morrow*

Progress Report: In 2012, we were able to maintain the Alaska SeaLife Center's plotter with supplies purchased in 2011. However, the inks will need to be resupplied and the plotter serviced early in 2013. We are currently evaluating the most efficient solution for having the plotter serviced outside of Seward.

Examples of the signage produced by the plotter can be seen in the updates for the project "Public Gallery Interpretative Display (E0447-07)". A working plotter in Seward is essential for updating signage related to live animals, their research, and their ongoing care.

Milestones and deliverables for this project are on track. The Exhibits planned for the 2012 summer season were completed and officially opened during a World Oceans Day ceremony.

The Exhibits task list for winter 2012-2013 construction has been finalized and is currently in progress. Included on this winter's list are two new exhibits and a variety of small upgrades throughout the existing exhibits.

Visitor Operations Interns ASLC/KEFJ (E0447-04) - *PI: Laurie Morrow*

Final Report: Intern candidates were recruited and interviewed in February of 2012. Three candidates were selected: Cassie Strodtman, Perri Moeller, and Rebecca Niemiec. In mid-May, these three interns received training from both ASLC and NPS staff before beginning their interpretation shifts on the boats and at the Alaska SeaLife Center.

On September 28, 2012, Don Stanko and Laura Sturtz from the National Park Service met with Laurie Morrow, ASLC Senior Education Manager, and Leah Wold, ASLC Interpretation Supervisor, to evaluate the success of the 2012 intern season. Both the NPS and ASLC teams were again pleased with the interns and the processes of the 2012 season. The interns demonstrated professionalism, worked collaboratively with their teams, increased their interpretation skills, and cross-pollinated marine science messages across both platforms. Plans were made for minor changes to the cross-team communications and intern assignments. The ASLC Interpretation work plan for 2013 includes a revision of the intern booklet and pre-season information.

All deliverables for this project have been achieved. This is the final report for the 2012 season.

The ASLC is currently accepting intern applications for the summer 2013 season, anticipating the same format as in previous successful seasons. Interns will be interviewed and selected in February 2013. The three successful candidates will arrive for training in mid-May 2013.

POPS Support ASLC (E0447-05) - *PI: Laurie Morrow*

The ASLC co-hosted the 2010 Pacific Ocean Parks Workshop for the Alaska Region. A final report was submitted in 2010. There was no additional activity on this project in 2011 or 2012.

Website (E0447-06) - *PI: Chip Arnold*

Ongoing project to maintain the OASLC website. The deliverable is the updated website.

Public Gallery Interpretive Display (E0447-07) - *PI: Laurie Morrow*

Progress Report: Two new exhibit projects were completed in May 2012 for the summer season.

Figure 23. An exhibit about Cook Inlet Beluga research and monitoring is the first exhibit in the ASLC's newly designed "Changing Exhibit Room"

Figure 24. An interactive exhibit about ocean stewardship. This exhibit is continued in an exit exhibit experience, inviting visitors to leave comments related to their own stewardship efforts.

Signage for a third exhibit, the I.Sea.U critical care facility, was installed to interpret this stranding exhibit as it developed over the course of 2012.

Figure 25. 2012 Temporary signage for the developing I.Sea.U

Through August and September of 2012, two walrus calves from the Arctic were visible from the I.Sea.U windows as they received care from the stranding staff. In October, a sea otter pup rescued from Homer could be observed receiving care. Funding has been secured to install permanent front-end interpretation panels on this large exhibit for summer 2013. However, OASLC support was essential for initial installation signage through 2012.

Two more exhibits have been redesigned and are currently waiting for final panel installation. These installations should be completed by the next report.

Figure 26. The Near Shore Transition tanks received a complete redesign, cleaning up the exhibit substrate and re-theming the 'look and feel' to match other newer exhibits. Update-able I.D. panels have been installed.

Basic graphic work and an introduction panel will be printed and installed by April 2013.

Figure 27. The Eider exhibit was re-themed in keeping with the current ASLC exhibit design and ADA standards. The redesigned text and graphics better interpret Dr. Tuula Holmen's ongoing research about eider dietary habits and requirements.

The panels are currently in the process of being printed and installed. Installation should be complete no later than April 2013.

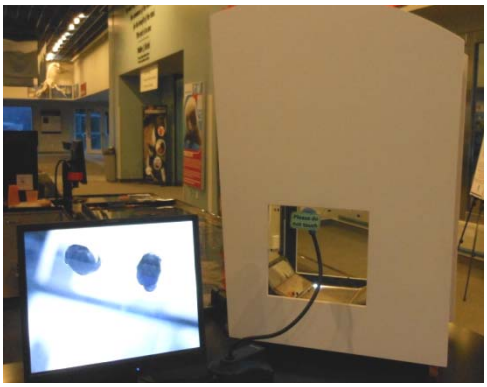

Figure 28. A plankton exhibit tank was installed at the Discovery Touch Pool experience in 2012. The tank exhibits a changing and growing collection of planktonic creatures, and has been a very popular exhibit with both school groups and the public.

Interpretative panels have been designed and are currently in the process of being printed and installed. Installation should be complete no later than April 2013.

Support for PA System (E0447-08) - *PI: Laurie Morrow*

Upgrade audio capabilities for exhibits. No deliverable is due for this work.

Oceans Kiosk Program (E0447-09) - *PI: Laurie Morrow*

All reporting for this project was completed in December 2010.

Improve Ranger in Residence Program (E0447-10) - *PI: Chip Arnold*

The upgraded computer equipment was received by the ASLC and then subsequently removed by the Park Service as the system could not be configured to Alaska SeaLife Center network standards. There are no expenses or reporting requirements associated with this project.

Kachemak Bay Research Reserve (E0447-11) - *PI: Laurie Morrow*

This project has been completed. A final report was submitted in December 2011.

POPS Award #12POPSTAC009 (E0447-12): Mentoring Ocean Connections - *PI: Laurie Morrow*

Final Report: A three-day workshop was held September 25-27, 2012, at the Alaska SeaLife Center.

The budget for this project originally included travel support for five rural teachers. However, a representative from the Alaska Department of Education & Early Development became aware of this opportunity and sponsored additional teachers and an educator with the Alaska Learning Network. In all, there were 10 participants:

1. Curriculum Coordinator – North Slope Borough School District
2. Instructional Technology Coordinator – North Slope Borough School District
3. Elementary Educator – Lower Yukon School District
4. Elementary Educator – Lower Yukon School District
5. Elementary Educator – Lower Yukon School District
6. Education Tech Coordinator – Bering Strait School District

7. Secondary Educator - Bering Strait School District
8. Coordinator – Alaska Learning Network
9. Paralibrarian and OWL program trainee – Seward City Library & Museum
10. New Educator without prior distance learning experience – Alaska SeaLife Center

The participants were assessed upon their arrival. Refer to Appendix 7 for a summary of the pre-assessment data. Presenters included educators from the Alaska SeaLife Center and distance learning coordinators from GCI School Access and the Center for Interactive Learning and Collaboration (CILC). Refer to Appendix 8 for the workshop agenda.

Figure 29. Participants in the Mentoring Ocean Connections workshop participate in a content call to Reef HQ in Australia with the ASLC Ocean Sciences Club students. The workshop participants evaluated the Reef HQ presentation and observed student interactions with the videoconferenced content.

The workshop participants worked in groups to create videoconference lessons related to marine science topics. On the final day of the workshop, these lessons were presented to the whole group for peer feedback.

Collaborative connections were maintained with the participants in two ways once the workshop was over. Teachers had the option to sign up for a professional credit opportunity through UAA. ASLC Senior Education Manager, Laurie Morrow, was the teacher of record. Refer to Appendix 9 for the UAA ED566 course syllabus. In addition, all participants were invited to a basecamp.com project site. The Basecamp site will be maintained for the remainder of the 2012-2013 school year so that all participants and the coordinators can continue to share resources and ideas.

A post-workshop survey was conducted. Reference Appendix 10 for the survey results. The post-workshop survey documented marked improvement in the understanding and use of basic videoconference tools. Also recorded are satisfaction with the workshop format and ideas for practical applications of the acquired and practiced skills.

A follow-up connection with all of the participants was conducted in November. The group shared their plans to mentor others in their school districts, and plans were made to create a videoconference presentation contest modeled after CILC's VC3 national contest.

Currently, four schools have signed up to participate in the Alaskan contest. They will make their presentations in February 2013; judging and decisions will occur in March. The winners for both the elementary and secondary level use of the VC technology will connect to the ASLC for a special behind-the-scene visit with our mammal care staff. Reference Appendix 11 for a description of the contest rules and format.

All deliverables and outcomes for this project have been achieved. The follow-up connections and communications with the workshop participants will continue throughout the school year under our Village Outreach program. A final evaluation will be conducted in June 2013, the results of which will inform the next iteration of the Mentoring Ocean Connections workshop.

In the final budget break-down, some travel costs were reduced when participants were able to ride-share and double-bunk in the hotel rooms. Personnel hours exceeded the proposed level, as this was the first workshop of its kind developed and drew on the coordination of multiple partners. Any funding saved in mileage and food was applied to personnel costs.