Nearshore Monitoring Trip Report 2008:
Kenai Fjords National Park and Katmai National Park and Preserve
Southwest Alaska Inventory and Monitoring Network

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Acronyms:

ASC	Alaska Science Center
CRA	Coastal Resource Associates
GIS	Geographic Information System
I&M	Inventory and Monitoring
NPS	National Park Service
SWAN	Southwest Alaska Network
KATM	Katmai National Park and Preserve
KEFJ	Kenai Fjords National Park
USGS	US Geological Survey

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Trip Report: SWAN Nearshore Monitoring Kenai Fjords NP 12-21 June and Katmai NP 27 June – 8 July 2008

The following includes reporting of field activities associated with the preliminary implementation of sampling NPS Vital Signs in nearshore marine habitats in Kenai Fjords and Katmai National Parks in 2008. The report is organized by activity and sampling protocol rather than the Park unit.

Kenai Fjords NP
Personnel
Jim Bodkin
Heather Coletti
Tom Dean
Allan Fukuyama
Meg Hahr
Michael Shephard

Vessel: USGS R/V Alaskan Gyre
Skipper: Greg Snedgen

Travel and Activity Summary

Kenai Fjords
11-21 June 2007

11 June: Depart Seward 1930 hrs. Arrive Agnes Cove: 2400, remain overnight.
12 June: Conduct MBM surveys as vessel travels southwest along the Kenai Peninsula. Data processing, entry and management.
13 June: Conduct MBM surveys as vessel travels southwest along the Kenai Peninsula. Collect sea otter foraging data in McCarty Lagoon. Conduct carcass surveys in McCarty Lagoon. Data processing, entry and management.
14 June: Conduct MBM surveys. Collect sea otter foraging data in McCarty Lagoon and on Beautiful Island. Conduct carcass surveys in Tonsina Bay. Data processing, entry and management.
15 June: Conduct MBM surveys. Collect sea otter foraging data at Harrington Point and in Tonsina Bay. Begin survey of Black oystercatcher transects RI-3 and RI-4 in Nuka Passage and Nuka Bay. Test eelgrass sampling SOP. Test mussel bed sampling. Data processing, entry and management.
16 June: Sample RI-4, Nuka Passage. Set up and sample mussel site, MI-4. Sample eelgrass bed (EI-4). Data processing, entry and management.
17 June: Sample RI-3, Nuka Bay. Set up and sample mussel site MI-3. Sample eelgrass bed (EI-3). Complete BLOY transect RI-3. Conduct carcass survey on Yalik Glacier Beach. Data processing, entry and management.
18 June: Sample RI-2, McCarty Fjord and set up and sample mussel bed MI-2. Collect sea otter forage data. Conduct MBM surveys. Conduct carcass survey in Otter Cove and James Beach. Sample eelgrass bed (EI-2). Data processing, entry and management.

19 June: Sample RI-5, Harris Bay. Set up and sample mussel bed, MI-5. Collect sea otter forage data. Sample eelgrass bed (EI-5). Conduct carcass survey. Complete BLOY transect, RI-5. Data processing, entry and management.
20 June: Sample RI-1, Aialik Bay, and set up and sample mussel bed MI-1. Conduct MBM transects. Collect sea otter forage data at Squab Island. Conduct carcass survey in Pederson Lagoon. Sample eelgrass bed (EI-1). Complete BLOY transect, RI-1. Moss collection. Data processing, entry and management.
21 June: Data processing, entry and management. Return to Seward 1200 hrs.

Katmai NP
Personnel
Jim Bodkin
Ashley Coletti
Heather Coletti
Tom Dean
Alan Fukuyama
Claudette Moore
Ralph Moore

Vessel: R/V Alaskan Gyre
Skipper: George Esslinger

27 June-8 July 2007

27 June: Depart Homer 2200 hrs.
27 June: Arrive Cape Douglas 0730 hrs. Conduct MBM surveys. Sample BLOY nests along Shakun Isl and RS-1. Conduct carcass surveys along Shakun Isl coast. Data processing, entry and management.
28 June: Conduct MBM surveys as vessel travels southwest along the Katmai coast. Collect sea otter forage data in Kukak Bay. Conduct BLOY survey along RI-5, Takli Isl. Data processing, entry and management.
29 June: Conduct MBM surveys. Collect sea otter forage data on Ilktugitak Isl (RI-5/4). Complete part of BLOY transect, RI-4. Data processing, entry and management.
30 June: Sample rocky intertidal site, RI-5, Takli Island. Set up and sample mussel site, MI-5, Takli Isl. Data processing, entry and management.
1 July: Sample RI-4, Amalik Bay. Set up and sample mussel site RI-4, Amalik. Conduct subtidal sampling of kelps and urchins near RI-4/5. Data processing, entry and management.
2 July: Sample RI-3, Kinak. Set up and sample mussel site, MI-3, Kinak. Complete BLOY transect, RI-3, Kinak. Sample eelgrass bed, EI-3, Kinak. Data processing, entry and management.
3 July: Foul weather day. Conduct subtidal sampling of kelps and urchins near RI-4/5. Travel to Kukak. Begin BLOY transect, RI-1, Kukak. Data processing, entry and management.

4 July: Foul weather day. Sample RI-1, Kukak. Set up and sample mussel bed, MI-1, Kukak. Walked inside perimeter of eelgrass bed, EI-1. Data processing, entry and management.
5 July: Foul weather day. Sample eelgrass bed, EI-1. Collect sea otter foraging data, Kukak Bay. Data processing, entry and management.
6 July: Foul weather day. Sample RI-2, Kaflia Bay. Set up and sample mussel bed, MI-2, Kaflia. Partial completion of BLOY transect, RI-2, due to poor weather conditions. Data processing, entry and management.
7 July: Sea otter forage data collection in Kukak Bay. Carcass survey and HOBO data download from RS-1, Ninagiak Island. Data processing, entry and management. 1600 hrs begin return trip to Homer.
8 July: Arrive Homer 1200 hrs.

Summary of Activities by Sampling Protocol

Black Oystercatcher breeding territory occupancy and chick diet

Kenai Fjords NP

We sampled five black oystercatcher transects corresponding to each of the five rocky intertidal intensive sampling locations RI-1-RI-5 plus several nests that were not located on the designated transects in the interest of increasing our sample size regarding nest occupancy and prey collection. Off transect nests were not used in nest density calculations. A new category of nest status classification was added. Prior to this sampling season, the categories were: Active – a nest with a brooding pair, eggs or chicks present; Inactive – a nest that was active during previous seasons but had no adults, chicks or eggs present at the time of the survey; Failed – a brooding pair present but evidence of egg shell fragments or dead chicks. While initially we felt these categories could encompass the status of the nests we would find, we found that a fourth category was necessary. This fourth category is called 'Occupied'. A nest that is considered occupied is one that has two adults, no visible nests, chicks or eggs, but the adult pair is exhibiting nesting behavior.

Twenty nest sites were visited in 2008. We mapped seven new active black oystercatcher nests off transect, while three new active nests were mapped on transect. Four nests were given the 'occupied' designation, two from 2007 and two from 2008. All occupied nests were on transect. One nest that was active in 2007 was designated 'failed' in 2008 due to the presence of egg shell fragments and yolk as well as the absence of an adult pair. Three nests that were active in 2007 were inactive in 2008. There was one nest given an 'unknown' status and will be checked next year, but will not be used in any calculations. Twenty eggs and nine chicks were located. We recovered dietary prey remains from 10 of the 20 nest sites, six from active nests, two from nests with both chicks and eggs, two from an active nest with chicks, and two from active nests with just eggs, presuming prey items were from the previous year. Prey items were also collected from two occupied nests, one failed nest and one inactive nest, but we again presumed prey items were from a previous year. More than 280 prey items were identified to

species and measured. Limpets (*Lottia* sp) and mussels (*Mytilus*) dominated the dietary remains. No nests were located on RI-2.

The sampling protocol was successfully implemented for a second year and transect widths were extended offshore some distance (~1 km) to encompass islands and offshore rocks that are not part of the original survey design. The inclusion of off transect nests increases the sample size for dietary and nest occupancy analysis, but will not factor into nest density/km calculations. The sampling of each transect required about 3-4 hours for two persons (6-8 person hours). Care was taken to minimize disturbance to eggs/chicks.

Katmai NP

We sampled five black oystercatcher transects corresponding to each of the five rocky intertidal intensive sampling locations RI-1-RI-5 plus several nests that were not located on the designated transects in the interest of increasing our sample size regarding nest occupancy and prey collection. One additional transect associated with the selected site at Ninagiak Island in Hallo Bay was only partially completed due to inclement weather. We visited 42 black oystercatcher nests, 19 of which were located on the 5 intensive transects. Twenty-six were classified as active, one as failed, 11 as inactive and 4 classified as occupied. Nine eggs and 15 chicks were located. We recovered dietary prey remains from 20 of the 42 nest sites. Almost 2,000 prey items were identified to species and measured. Limpets (*Lottia* sp) and mussels (*Mytilus*) dominated the dietary remains.

The sampling protocol was successfully implemented for a third year and transect widths were extended offshore some distance (~1 km) to encompass islands and offshore rocks that are not part of the original survey design. The inclusion of off transect nests increases the sample size for dietary and nest occupancy analysis, but will not factor into nest density/km calculations. The sampling of each transect required about 3-4 hours for two persons (6-8 person hours). Continued care was taken to minimize disturbance to eggs/chicks. Additional data related to the black oystercatcher vital sign were collected during a separate National Pacific Research Board (NPRB) sponsored cruise in August along the KATM coast. The data obtained from that trip are not reported here.

Collection of sea otter foraging data

Kenai Fjords NP

We collected foraging data on sea otters associated with 5 of the 5 rocky intertidal intensive sites (RI-1, RI-2, RI-3, RI-4, and RI-5 (Pederson Lagoon, McCarty Lagoon, Beauty Island, Nuka Passage, and Otter cove, respectively). Sea otters were generally absent or rare in the vicinity of intensive sites RI-1 and RI-2, Aialik Bay and McCarty Fjord. We obtained data from more than 55 forage bouts that included a total of over 400 dives. Diet was dominated numerically by mussels (*Mytilus trossulus*), observed on roughly 70% of the dives. Clams were identified on < 15% of the dives observed. Sea

otter diet includes a diverse array of other invertebrates including chitons, urchins, crabs, and stars.

Additional effort was allocated to sea otter forage data collection in KEFJ than in the previous sampling season due to the reduced data recovery rate, possibly because of lower sea otter densities in KEFJ than in KATM. Data collection was constrained to sites where sea otters were present in relatively high densities and to where visual access to feeding animals was possible. Two observers spent about 30 hours (60 observer hours) acquiring feeding data from approximately 55 forage bouts (0.9/hr) and about 400 dives (~7/hr).

Katmai NP

We collected foraging data on sea otters associated with 3 of the 5 rocky intertidal intensive sites; RI-1 (Kukak Bay), and RI-4 (Amalik Bay) and RI-5 (Takli Island). Sea otters were generally absent or rare in the vicinity of intensive site RI-3 (Kinak Bay), precluding sampling there. Inclement weather throughout the trip did not allow us to sample in Kaflia Bay (RI-2), nor were we able to collect our desired sample size of 50 bouts during this trip. We observed 38 foraging bouts at Kukak Bay, Amalik Bay and Takli Island, that consisted of over 500 dives. Diet was dominated numerically by clams (>50%) but included a diverse array of other invertebrates including, stars, urchins, crabs, chitons, snails and octopus. Compared to Kenai Fjords, the mussel (*Mytilus trossulus*) was rarely observed (<4%).

Data collection will continue to be constrained to sites where sea otters are present in relatively high densities and to where visual access to feeding animals is possible. Additional data related to the sea otter vital sign were collected during a separate National Pacific Research Board (NPRB) sponsored cruise in August along the KATM coast. The data obtained from that trip are not reported here.

Collection of marine bird and mammal abundance data

Kenai Fjords NP

We surveyed all marine birds and mammals along 37, roughly 2.5-5 km transects systematically selected (transect 16 was not completed because of the presence of ice). All of these transects were located 100 m offshore from the shoreline and included sampling offshore islands. Several other transects were completed including four that were centered on each rocky site. RI-1 is an exception. Transect #8 already existed and was centered on RI-1, so it was not necessary to add an additional transect near RI-1. Because we only sample a 200-m strip contiguous with the shoreline and some species that occupy shallow nearshore habitats > 200m offshore may be underrepresented, ten offshore transects were added to the survey design and completed this year as well as in 2007. All data were entered directly into dLog2 software for biological sampling as described in the standard operating protocol. Each transect required about 40 minutes to sample, at an average survey speed of about 10 knots.

Data have been reviewed in their digital format. A skiff large enough to accommodate three standing persons and incorporating a navigation /steering console was used almost exclusively as a survey platform, both for safe navigation and to provide suitable observation conditions.

Katmai NP

We surveyed all marine birds and mammals along approximately 26 roughly 2.5-5 km transects systematically selected. Several transects could not be completed due to inclement weather. All transects were located 100 m offshore from the shoreline and included sampling offshore islands. Because we only sample a 200-m strip contiguous with the shoreline and some species that occupy shallow nearshore habitats > 200m offshore may be underrepresented, ten offshore transects that were added to the survey design and completed in 2007 were also surveyed this year. Additionally, 5 km transects centered at four of the five intensive intertidal sites that were added to the survey design in 2007 were also completed during 2008. All data were entered directly into dLog2 software for biological sampling as described in the standard operating protocol. Each transect required about 40 minutes to sample, at an average survey speed of about 10 knots.

Data have been reviewed in their digital format. A skiff large enough to accommodate three standing persons and incorporating a navigation /steering console was used exclusively as a survey platform, both for safe navigation and to provide suitable observation conditions.

Coastline surveys of animal carcasses
Kenai Fjords NP

The coastline protocol has been modified to only include animal carcass surveys, specifically sea otter carcasses and the collection of sea otter scat data. Ten beach segments along the KEFJ shoreline were surveyed in 2008. One sea otter skull was found in Otter Cove. A tooth was extracted and sent to a lab for age analysis. Recommendations are to emphasize the collection of scat data in areas where otters are seen and foraging data is collected. Because sea otter densities are relatively low, collections of adequate numbers of sea otter carcasses may require additional effort and a longer period of time to obtain a meaningful sample size. Efforts to obtain sea otter carcasses should be coordinated with other ongoing biological sampling conducted by NPS biologists.

Katmai NP

In 2006, we recommended that to gain efficiency in terms of sea otter carcass recovery rates, identifying and searching for sea otter haul outs on islands would provide an efficient means to recover a large sample of skulls suitable for analyzing and modeling age at death. In 2008, we recovered 31 sea otter carcasses, 9 on Shakun Island, 19 at

Ninagiak, 1 at Hallo Beach, 1 on Douglas Reef and 1 on the south end of Swikshak Bay. In August, as part of a NPRB research cruise (Estes and Bodkin PI's), Shakun Island was revisited and an additional four carcasses were recovered, and one additional carcass was recovered from Douglas reef. Teeth were collected from 28 of the31 skulls for age analysis. Scat data was collected from three different areas (Shakun Isl, Ninagiak Isl, and Kaflia Bay). Clams were the predominate prey item in the scat.

Sampling of intertidal invertebrates and algae on sheltered rocky shores

Kenai Fjords NP

In 2008 we sampled five sheltered rocky intertidal sites that were located throughout KEFJ; RI-4 in Nuka Passage, RI-3 in the West Arm of Nuka Bay, RI-2 in McCarty Fjord, RI-5 in Harris Bay and RI-1 in Aialik Bay. Five Hobo temperature recording devices that were deployed in 2007 were recovered in 2008, but only four had data. Five new Hobos were placed next to the +0.5 m tidal elevation transect marker at each site. One salinity recording device was placed at the Aialik Bay (RI-1) site and will be continuously recording data throughout the year. Sea stars were counted along a 100 X 8 m transect at the 0 tidal elevation at each rocky intertidal site. A few changes were made to the original rocky intertidal sampling regime. We reduced the number of random point contact (RPC) data points from 49 to 25. We set up permanent photo plots that we will visit annually and we removed the mussel size distribution metric of the rocky SOP, implementing a new mussel sampling SOP that is conducted at a mussel bed in close proximity to a rocky site and is accomplished by a separate crew of people. All transect quadrat data (RPC) were entered into an Access database that is currently being developed for SWAN.

A sample of approximately 120 limpets were measured *in situ* to determine size distribution. Where possible, limpets were measured (regardless of size) from 6 locations at each site directly above odd numbered quadrats.

It was decided that setting up and sampling an intertidal rocky intensive site in the same year as intertidal soft sediment sampling was taking place was not possible. Rocky sites will be sampled intensively in alternate years to the sampling of soft sediment sites. We were generally able complete the intensive rocky intertidal sampling regime in five hours with 3 to 4 people. In years in which soft sediment sampling is occurring, a crew will visit the rocky site to retrieve Hobo data, take pictures at the permanent photo quads, measure limpets for size distribution and complete swath counts of stars. This less intensive sampling should only require two hours with a crew of 2-3 people.

Katmai NP

In 2008 we resampled five sheltered rocky intertidal sites in Kukak Bay, Kaflia Bay, Kinak Bay, Amalik Bay, and Takli Island (RI-1-RI-5) that were established and initially sampled in 2006. One additional selected intensive site that was set up at Ninagiak Island (RS-1) in 2007, was not sampled in 2008 due to time constraints caused by inclement

weather. Five Hobo temperature recording devices installed in 2007 were recovered in 2008. The Hobo that was installed at the Kukak Bay site (RI-1) was not re-located in 2008. New Hobo temperature recording devices were placed next to the +0.5 m tidal elevation transect marker at each site in 2008. One salinity recording device was placed at the Takli Island (RI-5) site and will be continuously recording data throughout the year. All quadrat data (RPC) were entered into an Access database that is currently being developed for SWAN. Sea stars were counted along a 100 X 8 m transect at the 0 tidal elevation. A few changes were made to the original rocky intertidal sampling regime. As at KEFJ, we reduced the number of random point contact (RPC) data points. We set up permanent photo plots that we will visit annually and we removed the mussel size distribution metric of the rocky SOP, implementing a new mussel sampling SOP that is conducted at a mussel bed in close proximity to a rocky site and is accomplished by a separate crew of people.

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Surveys of the extent of eelgrass beds

Kenai Fjord NP

We utilized an underwater video camera to detect the presence or absence of eelgrass beds as well as determine the boundaries of the eelgrass bed. Temporary buoys were deployed to mark four edges (2 inshore, 2 offshore) of a 200 m (?) long (parallel to the shoreline) section of an eelgrass bed. Within this designated section of eelgrass bed, several transects were created perpendicular to shore by deploying buoys to mark the beginning and end points within the designated sample area. Once the buoys were deployed, Dlog2 (GPS linked mapping software) was used to record the transect line as well as points along the transect where eelgrass bed density was recorded. The underwater video camera was used to categorically estimate the density of eelgrass along each transect line. We chose eelgrass beds in close proximity to the sheltered rocky sites. A total of five eelgrass beds corresponding to each rocky intensive site were sampled. There were no eelgrass beds within several km of our rocky intertidal sampling sites at either Harris Bay or McCarty Fjord.

Katmai NP
We utilized an underwater video camera to detect the presence or absence of eelgrass beds as well as determine the boundaries of the eelgrass bed. Temporary buoys were deployed to mark four edges (2 inshore, 2 offshore) of a 200 m (?) long (parallel to the shoreline) section of an eelgrass bed. Within this designated section of eelgrass bed, several transects were created perpendicular to shore by deploying buoys to mark the beginning and end points within the designated sample area. Once the buoys were deployed, Dlog2 (GPS linked mapping software) was used to record the transect line as well as points along the transect where eelgrass bed density was recorded. The underwater video camera was used to categorically estimate the density of eel grass along each transect. Density measurements were categorical. We chose eelgrass beds in close proximity to the sheltered rocky sites. A total of four eelgrass beds were sampled in four areas associated with RI-2 (Kaflia Bay), RI-3 (Kinak Bay), RI-4 (Amalik Bay) and RI-5 (Takli Isl.).

Surveys of the extent of kelp canopies
To be Determined

Mussel Bed Sampling

Kenai Fjords NP

A new protocol for estimating mussel bed density and mussel size distribution was tested in 2008. Five new sites in KEFJ were established. All were located within close proximity to each of the rocky sites. Once a bed was located, a permanent marker was placed at the top, left edge of the mussel bed to be sampled. The markers were metal tags affixed to the rock using stainless steel screw and anchors. A 50-m tape was then stretched along the shoreline parallel to the waters edge from the marker at the bed's top boundary. Ten vertical transect tapes were laid at equal intervals along the horizontal tape at the top of the bed to the lower extent of the mussel bed. If the lower extent of the mussel bed was below the 0 tidal elevation, the vertical tape was only stretched to the 0 tidal elevation. Distances were measured for each vertical transect and recorded. These distances were used to calculate a random placement point along the transect for placement of a quadrat to be sampled at each of the ten vertical transects. At each of these sampled quadrats, a core sample was also taken to estimate density of mussels of all sizes. A larger quadrat was sampled to estimate density and size distribution of large mussels (>20 mm). The quadrat was adjustable in size to ensure a minimum sample size of twenty, 20 mm or greater mussels per quadrat. Based on these metrics, we can estimate the changes in available mussel biomass as prey of several key vertebrate predators.

Katmai NP

A new protocol for estimating mussel bed density and size distribution was tested in 2008. Five new sites in KATM were established. All were located within close proximity to each of the rocky sites. Once a bed was located, a permanent marker was placed at the top, left edge of the mussel bed to be sampled. The markers were metal tags affixed to the rock using stainless steel screw and anchors. A 50-m tape was then stretched along the shoreline parallel to the waters edge from the marker at the bed's top boundary. Ten vertical transect tapes were laid at equal intervals along the horizontal tape at the top of the bed to the lower extent of the mussel bed. If the lower extent of the mussel bed was below the 0 tidal elevation, the vertical tape was only stretched to the 0 tidal elevation. Distances were measured for each vertical transect and recorded. These distances were used to calculate a random placement point along the transect for placement of a quadrat to be sampled at each of the ten vertical transects. At each of these sampled quadrats, a core sample was also taken to estimate density of mussels of all sizes. A larger quadrat was sampled to estimate density and size distribution of large mussels (>20 mm). The quadrant was adjustable in size to ensure a minimum sample size of twenty, 20 mm or greater mussels per quadrat. Based on these metrics, we can estimate the changes in available mussel biomass as prey of several key vertebrate predators.

Suggested revisions

1. Sheltered Rocky intertidal sampling: Permanent limpet transects should be established. Permanent markers for sea star transects should also be placed and recorded with a GPS.
2. Black Oystercatcher: Consider exploring existing data toward creation of a habitat selection model that may increase nest detection and sample size. This may be particularly relevant for Kenai Fjords NP as nest sites were comparatively rare. Continue to monitor nests that were located off transect for nest occupancy and prey provisioning.
3. Coastline surveys: Consider methods to focus sea otter carcass collections near locations of relatively high sea otter abundance. Increase scat data collection effort.
5. Eelgrass: Consider using a sub-meter accuracy GPS unit to accurately map the section of the bed that will be resampled annually.
6. Mussel: Consider using a sub-meter accuracy GPS unit to accurately map the section of bed that is to be monitored over time.
7. Data Management: Implement a system to delegate responsibilities of data management for each metric that is measured as well as equipment care and maintenance (i.e. cameras, GPSs, etc.). Consider a systematic approach to "end of the day" tasks that include but are not limited to: data sheet check in (i.e. all fields filled in properly), data entry on laptops and data backup.

Table illustrating estimated hours spent per SOP during the 2008 field season.

	KATMAI	KENAI FJORDS
SOP	**PERSON HRS**	**PERSON HRS**
Sea otter forage	40	60
*Bloy txs	(3 people) 20/person	(3 people) 20/person
*Rocky sampling	(3-4 people) 25/person	(3-4 people) 25/person
*Mussel sampling	(2-3 people) 15/person	(2-3 people) 15/person
Eelgrass mapping	(3 people) 10/person	(3 people) 10/person
MBM txs	(3 people)>30/person	(3 people) >50/person
*Coastline survey (carcass)	(2-3 people)	(2-3 people) 11.5/person
Sea otter aerial survey	(2 persons) 35/person	.

This does not include travel time to survey locations,

* SOPs that require additional extensive field time, not recorded in this table, for processing and data entry (i.e. measuring clams and mussels from intertidal SOP, measuring prey items collected from BLOY nests and processing sea otter skulls)