Nearshore Monitoring Trip Report 2007:
Kenai Fjords National Park and Katmai National Park and Preserve
Southwest Alaska Inventory and Monitoring Network

James L. Bodkin
US Geological Survey
Alaska Science Center
1011 E. Tudor Rd.
Anchorage, Alaska 99503

Thomas A. Dean
Coastal Resources Associates Inc.
1948 Kellog Ave.
Carlsbad, CA 92008

Heather A. Coletti
US Geological Survey
Alaska Science Center
1011 E. Tudor Rd.
Anchorage, Alaska 99503

October 2007

National Park Service
Southwest Alaska Network
Inventory and Monitoring

Contract Number: F2101050008

Funding Source(s):
Inventory & Monitoring Program, National Park Service

File Name: BodkinJ_2007_KATM-KEFJ_NearshoreTripReport_20071012.doc

Recommended Citation:
Bodkin, J. L., T. A. Dean, and H. A. Coletti. 2007. Nearshore Monitoring Trip Report 2007: Kenai Fjords National Park and Katmai National Park and Preserve Southwest Alaska Inventory and Monitoring Network. National Park Service. Anchorage, AK. 12pg.

Topics:
Nearshore Marine Monitoring

Subtopics:
Biological
Water
Interdisciplinary
Sample Design

Theme Keywords:
Vital Signs, Intertidal, Marine Algae, Marine Invertebrates, Seabirds, Marine Mammals, Black oystercatchers, Sea otters, Abundance, Distribution, Diet, Reproduction, Mortality, Eelgrass, Kelp

Place name Keywords:
Alaska, Southwest Alaska Network, SWAN, Katmai National Park and Preserve, KATM, Kenai Fjords National Park, KEFJ, Kukak, Kaflia, Kinak, Ninagiak, Amalik, Hallo Bay, Shakun, Takli Island, Mink Island, Nuka Passage, West Arm of Nuka Bay, McCarty Fjord, Harris Bay, Aialik Bay, Otter Cove, Pye Islands, Tonsina Bay.

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

Initial Distribution:
SWAN: 1 electronic
ASC: 1 electronic

Trip Report: SWAN Nearshore Monitoring Kenai Fjords NP 10-20 June and Katmai NP 26 June – 5 July 2007

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 2007. The report is organized by activity and sampling protocol rather than the Park unit.

Kenai Fjords NP
Personnel
Tom Dean
Jim Bodkin
Heather Coletti
Alan Fukuyama
Meg Hahr
Kim Kloecker

Vessel: USGS R/V Alaskan Gyre
Skipper: John Wetzel

Travel and Activity Summary

Kenai Fjords
10-20 June 2007

10 June: Depart Seward 1800 hrs, arrive and RON Pye Island.
11 June: Conduct MBM surveys AM, travel to Nuka Passage, reconnaissance RI-4 and initiate BLOY survey at RI-4 in PM.
12 June: Set up and sample soft sediment intertidal site SI-4, Nuka Island, in AM. Set up and initiate sampling of RI-4 Nuka Passage, in AM. MBM surveys in PM. Continue BLOY transect RI-4. Initiate field testing of kelp and eel grass SOP.
13 June: Complete intertidal sampling at RI-4 in AM. Complete sampling of RI-4 BLOY transect. Collect sea otter forage data Tonsina Bay, Nuka Passage (RI-4).
14 June: Set up RI-3, rocky and soft and sample SI-3, Nuka Bay. Sea otter forage data collection Beautiful Island, RI-3/4. Sample BLOY transect RI-3.
15 June: Conduct MBM transects. Collect sea otter forage data at Beautiful Island and McCarty Lagoon, RI-2/3.
16 June: Set up RI-2 and set up and sample SI-2, McCarty Fjord. Conduct MBM transects. Sample BLOY transect RI-2.
17 June: Set up RI-5 and set up and sample SI-5, Harris Bay. Conduct MBM transects. Collect sea otter forage data at Otter Cove RI-5. Survey BLOY transect RI-5. Continue field testing kelp and eel grass SOP.
18 June: MBM. Sample BLOY transect RI-1. Collect sea otter forage data at Pederson Lagoon, RI-1.
19 June: Set up RI-1 and set up and sample SI-1, Aialik Bay. Conduct MBM transects. Collect sea otter forage data at Pederson Lagoon, RI-1.

20 June: Complete MBM transects, Resurrection Bay, return Seward 1200 hrs.

Katmai NP
Personnel
Jim Bodkin
Jennifer Coffey
Heather Coletti
Chris Ehrler
George Esslinger
Alan Fukuyama
Claudette Moore

Vessel: F/V Susitna
Skipper: John Rogers

26 June-5 July 2007

26 June: Depart Homer 1200 am. Conduct MBM surveys. Sea otter carcass collections, Shakun Is.
27 June: Conduct MBM surveys, Survey BLOY transect RI-1. Collect sea otter forage data at Devils Cove (RI-1).
28 June: Set up and sample SI-5, and sample RI-5, Takli Is. Conduct MBM surveys. Conduct BLOY transect RI-5. Initiate field testing of kelp and eel grass SOP at RI-5.
29 June: Set up and sample SI-4, and sample RI-4, Amalik. Conduct MBM surveys. Complete survey of BLOY transects RI-5 and RI-4. Collect sea otter forage data at Mink Is. (RI-4/5).
30 June: Conduct MBM surveys. Survey BLOY transect RI-3. Collect sea otter forage at Mink Is. (RI-4/5). Initiate field testing of kelp and eel grass SOP at RI-4.
1 July: Set up and sample SI-3 and sample RI-3, Kinak. Conduct MBM surveys. Survey BLOY transect RI-2. Initiate field testing of kelp and eel grass SOP at RI-3.
2 July: Set up and sample SI-2 and sample RI-2, Kaflia. Conduct MBM surveys. Collect sea otter forage data at Cape Gull (RI-2).
3 July: Set up and sample SI-1 and sample RI-1, Kukak. Conduct MBM surveys. Sea otter carcass collections Ninagiak. Sea otter carcass collections Ninagiak Is. Survey BLOY transect at Ninagiak. Initiate field testing of kelp and eel grass SOP at RI-2.
4 July: Set up and sample SS-1 and set RS-1, Ninagiak. Conduct MBM surveys. Sea otter carcass survey Hallo Bay.
5 July: Return Homer 1100 AM.

Summary of Activities by Sampling Protocol

Black Oystercatcher breeding territory occupancy and chick diet

Kenai Fjords NP

We sampled 5 black oystercatcher transects corresponding to each of the 5 rocky intertidal intensive sampling locations RI-1-RI-5. No nests were located on RI-2. We mapped 7 black oystercatcher nests on the 5 transects, 6 that were classified as active and 1 as failed. The number of nests ranged from 0 to 4/transect. Ten eggs and 4 chicks were located. We recovered dietary prey remains from 4 of the 7 nest sites, two from active nests with chicks and two from an active nest with eggs, but we presumed prey items were from a previous year. More than 350 prey items were identified to species and measured. Limpets (*Tectura* and *Lottia* spp) and mussels (*Mytilus*) dominated the dietary remains.

The sampling protocol was successfully implemented, however transect widths could be extended offshore some distance (~1 km) to encompass islands and offshore rocks that are not part of the original survey design. The sampling of each transect required about 3-4 hours for 2 persons (6-8 person hours). Care was taken to minimize disturbance to eggs/chicks.

Katmai NP

We sampled 5 black oystercatcher transects corresponding to each of the 5 rocky intertidal intensive sampling locations R1-I-R5-I, and one addition transect associated with the selected site at Ninagiak Is. in Hallo Bay. We mapped 19 black oystercatcher nests on the 5 intensive transects, 11 that were classified as active, 2 as failed, and 6 as inactive (but were active in 2006). We mapped 13 nests along the Ninagiak Isl. transect, 9 classified as active, 2 classified as failed and 2 unknowns. The number of nests ranged from 3 to 13/transect. Twenty seven eggs and 10 chicks were located across the six transects. We recovered dietary prey remains from 8 of the 32 nest sites, or 5 of 6 nests where chicks were present. More than 1,000 prey items were identified to species and measured. Limpets (*Tectura* and *Lottia* spp) and mussels (*Mytilus*) dominated the dietary remains.

The sampling protocol was successfully implemented, transect widths could be extended offshore (~1km) to encompass islands and offshore rocks that are not part of the original survey design. The proportion of eggs to chicks (27:10, or 73% eggs) was higher in 2007 compared to 2006 (11:13, or 46%). The sampling of each transect required about 3-4 hours for 2 persons (6-8 person hours). Continued care should be taken to minimize disturbance to eggs/chicks.

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 a total of forage data from more than 35 bouts that included a total of

over 400 dives. Diet was dominated numerically by mussels (*Mytilus trossulus*, observed on roughly 50% of the dives. Clams were identified on < 30% of the dives observed. Sea otter diet includes a diverse array of other invertebrates including, cucumbers, chitons, stars, and snails.

This sampling protocol was successfully implemented. Data collection will be constrained to sites where sea otters are present in relatively high densities and to where visual access to feeding animals is possible. Two observers spent about 22 hours (44 observer hours) acquiring feeding data from 35 forage bouts (0.8/hr) and about 400 dives (~9/hr). The reduced data recovery rate at Kenai Fjords compared to Katmai possibly reflects lower sea otter density and may indicate the need for additional effort at Kenai Fjords to obtain the target of 50 forage bouts.

Katmai NP

We collected foraging data on sea otters associated with 4 of the 5 rocky intertidal intensive sites; RI-1 (Kukak Bay), RI-2 (Kaflia) 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. We observed over 50 foraging bouts, at Kukak Bay, Kaflia, and near Amalik Bay and Takli Island, that consisted of over 400 dives. Diet was dominated numerically by clams (>60%) 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 (<2%).

This sampling protocol was successfully implemented. Data collection will be constrained to sites where sea otters are present in relatively high densities and to where visual access to feeding animals is possible.

Collection of marine bird and mammal abundance data

Kenai Fjords NP

We surveyed all marine birds and mammals along 39, roughly 2.5-5 km transects systematically selected. All transects were located 100 m offshore from the shoreline and included sampling offshore islands. 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, resulting in an average survey speed of about 10 knots.

This sampling protocol was successfully implemented. Data have been reviewed in their digital format. A skiff large enough to accommodate three standing persons and incorporating a navigation/steering console should be used exclusively as a survey platform, both for safe navigation and to provide suitable observation conditions. Because we only sample a 200-m strip contiguous with the shoreline, some species that occupy shallow nearshore habitats > 200m offshore may be underrepresented. Establishment of marine bird and mammal transects that sample > 200m offshore should

be considered. Additionally, 5 km transects centered at each of the intensive intertidal sites should be established as well as the addition of offshore transects to sample pelagic species.

Katmai NP

We surveyed all marine birds and mammals along 38, roughly 2.5-5 km transects systematically selected. All transects were located 100 m offshore from the shoreline and included sampling offshore islands. 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, resulting in an average survey speed of about 10 knots.

This sampling protocol was successfully implemented. Data have been reviewed in their digital format. A skiff large enough to accommodate three standing persons and incorporating a navigation /steering console should be used exclusively as a survey platform, both for safe navigation and to provide suitable observation conditions. 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, nine offshore transects were added to the survey design and completed this year. Additionally, 5 km transects centered at four of the five intensive intertidal sites were added to the survey design as well and completed.

Coastline surveys of birds and mammals, animal carcasses, debris, and other resources

Kenai Fjords NP

The full coastline survey protocol was not completed in Kenai Fjords NP due to the lack of available appropriate habitat. However, sea otter scat data was collected in Otter Cove (RI-5), Tonsina Bay (RI-4) and McCarty Fjord (RI-2). Mussel was the predominant prey seen in the scat data collected in 2007. One sea otter skull was collected by an NPS employee after the completion of the trip in Otter Cove. A tooth was extracted and sent to a lab for age analysis. Recommendations are to continue to collect 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 2007, we recovered 44 sea otter carcasses, 11 on Shakun Island, 24 at

Ninagiak, 5 at Hallo Beach, 2 in Kukak Bay and 2 on Kiukpilik Isl. Teeth were collected from 40 of the 44 skulls for age analysis.

Sampling of intertidal invertebrates and algae on sheltered rocky shores

Kenai Fjords NP

In 2007 we set up five sheltered rocky intertidal sites in Nuka Passage, the West Arm of Nuka Bay, McCarty Fjord, Harris Bay and Aialik Bay. One rocky intensive site, RI-4, was sampled as well. Permanent stainless steel tags with the site numbers inscribed were installed at each site at the +0.5 m and +1.5 m tidal elevation height. These marked the beginning of 50 m long transects. Hobo temperature recording devices were placed next to the +0.5 m tidal elevation transect marker at each site.

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. Approximately 240 mussels were collected from a tidal elevation of approximately 2 to 3 m MLLW, near the center of their vertical distribution. About 120 of the 240 mussels were collected systematically from 6 locations along the 50 m transect at the +2-3 m tidal elevation to estimate their size distribution. The remaining 120 mussels were selected by size (greater than 35 mm shell length when possible) and collected from each site and frozen for later contaminant analysis.

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 may be sampled in alternate years to the sampling of soft sediment sites. We were generally able to set up a rocky site with three people in one tide cycle.

Katmai NP

In 2007 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 was set up at Ninagiak Island (RS-1). Permanent stainless steel tags with the site numbers inscribed that were installed in 2006 were relocated at each site at the +0.5 m and +1.5 m tidal elevation height. These marked the beginning of 50 m long transects (reduced from 100 m originally established and sampled due to safety considerations). Two Hobo temperature recording devices installed in 2006 were recovered in 2007. A new Hobo temperature recording device was placed next to the +0.5 m tidal elevation transect marker at each site in 2007. All transect and quadrat data were entered into an Access database. Preliminary observations suggest that, as expected, there was considerable intersite variation. In general, dominant algae included *Fucus gardneri*, *Neorhodomela oregonia*, *Ulva* sp., and *Palmaria* sp. Dominant invertebrates included barnacles (primarily *Balanus/Semibalanus* spp.) *Littorina sitkana*, and small limpets.

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. Approximately 240 mussels were collected from a tidal elevation of approximately 2 to 3 m MLLW, near the center of their vertical distribution. About 120 of the 240 mussels were collected systematically from 6 locations along the 50 m transect at the +2-3 m tidal elevation to estimate their size distribution. The remaining 120 mussels were selected by size (greater than 35 mm shell length when possible) and collected from each site and frozen for later contaminant analysis.

We were generally able to sample one site a day with four people in about 4-5 hours

Sampling of infaunal intertidal invertebrates on gravel, sand/gravel beaches

Kenai Fjord NP

We established transects and sampled infaunal invertebrates at five locations within Kenai Fjords NP. Soft sediment sampling locations were identified by proximity to the sheltered rocky intertidal sampling sites (RI-1-RI-5) and the presence of appropriate habitat. Each transect was 50 m in length, located at the +0.5 m tidal elevation and marked by rebar stakes and GPS coordinates. Twelve 0.25 m^2 quadrats were excavated to 25 cm depths and sieved through a 10 mm screen. From each quadrat clams were identified to species, measured to the nearest mm, and released. All *Protothaca staminea* were collected for later age analysis.

We were generally able to sample one site a day with two to three people in about 3 hours.

Katmai NP

We established transects and sampled infaunal invertebrates at six locations within Katmai NP. Soft sediment sampling locations were identified by proximity to the sheltered rocky intertidal sampling sites (RI-1-RI-5) and the presence of appropriate habitat. Each transect was 50 m in length, located at the +0.5 m tidal elevation and marked by rebar stakes and GPS coordinates. Twelve 0.25 m^2 quadrats were excavated to 10 cm depths and sieved through a 10 mm screen. From each quadrat clams were identified to species, measured to the nearest mm, and released. All *Protothaca staminea* were collected for later age analysis.

We were generally able to sample one site a day with two to three people in about 3 hours.

Surveys of the extent of eelgrass and kelp canopies

Kenai Fjord NP

A final sampling protocol has not yet been established for estimating the size of eelgrass and kelp canopies. We visited several potential eelgrass and kelp beds identified in prior aerial video shoreline surveys (Harper and Morris).

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. GPS points were taken along transect lines crossing the bed as well as around the perimeter. We chose eelgrass beds in close proximity to the sheltered rocky sites. A total of 3 eelgrass beds were sampled. There were no eelgrass beds within several km of our rocky intertidal sampling sites at either Harris Bay or McCarty Fjord.

Several methods were explored in estimating density and cover by kelp. Boundaries of all beds examined were determined using a GPS. Density of kelp within the boundaries was determined based on down looking sonar, underwater video camera, and by visual counting of plants on the surface. In general, visual counts of number of plants on the surface provided the best estimates of density. A total of 4 kelp beds were sampled. There were no kelp beds within several km of our rocky intertidal sampling site at Aialik.

Katmai NP

A final sampling protocol has not yet been established for estimating the size of eelgrass and kelp canopies. We visited several potential eelgrass and kelp beds identified in prior aerial video shoreline surveys (Harper and Morris). In general, bull kelp (*Nereocystis luetkana*) was widely distributed on exposed rocky headlands between Kukak Bay and Amalik Bay and the distribution was very similar to that described by Harper and Morris. In some cases *Nereocystis* was mixed with canopy forming *Alaria*. Eelgrass beds were less widely distributed, and visits to many sites identified as eelgrass habitat by Harper and Morris revealed little of no eelgrass present. However, we were able to identify eelgrass beds in relatively close proximity to most sheltered rocky sites.

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. GPS points were taken along transect lines crossing the bed as well as around the perimeter. We chose eelgrass beds in close proximity to the sheltered rocky sites. A total of 4 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.).

Several methods were explored in estimating density and cover by kelp. Boundaries of all beds examined were determined using a GPS. Density of kelp within the boundaries was determined based on down looking sonar, underwater video camera, and by visual counting of plants on the surface. In general, visual counts of number of plants on the surface provided the best estimates of density. A total of 3 kelp beds were sampled in three areas associated with RI-2 (Kaflia Bay), RI-4 (Amalik Bay) and RI-5 (Takli Isl.).

Suggested revisions

1. Sea otter foraging: Increase effort in Kenai Fjords NP to obtain desired sample size of 50 bouts. Relatively low sea otter densities throughout Kenai Fjords resulted in a relatively low rate of data recovery. Review bird and mammal transects and sea otter aerial survey results to identify additional observation locations.
2. Sheltered Rocky intertidal sampling: Review existing data to determine dominant species and if sample size (#/quadrats per transect) can be reduced without reducing power. Design sampling to provide improved estimates of large (>20mm) limpet and mussel densities and size distributions. Initial efforts in 2008 should include mapping *Mytilus* distribution at the five RI sites in each block. This mapping effort should inform the design of mussel and limpet sampling in 2009. The increased effort in estimating mussel and limpet densities and sizes will require revision of the algal and invertebrate sampling in the rocky intertidal sampling to allow 3 persons to conduct that sampling bi-annually and six persons to conduct the complete rocky intertidal sampling in alternating years.
3. Soft sediment intertidal sampling: Review 2007 soft sediment clam data for sample sizes and species composition. Consider substitution of sites sampled in 2007 with few or no clams with other potential soft sediments where clams densities may approach a threshold density (2-3/ 0.25/ m2), that are in proximity to GRTS selected rocky sites. Consider revising site establishment to include tidal elevations between 0.0 and +0.5 m to increase sample sizes in terms of clam densities and species composition.
4. Black Oystercatcher: Consider extending BLOY transect widths offshore to include islets that provide appropriate oystercatcher nesting habitats. 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.
5. Coastline surveys: Consider methods to focus sea otter carcass collections near locations of relatively high sea otter abundance. Review bird and mammal transect and sea otter aerial survey data.
6. Kelp: Review kelp bed sampling efforts. Consider using only infrequent shorezone mapping data to examine distribution and abundance of kelp.
7. Eelgrass: Review 2007 eelgrass data and establish survey SOP. Consider searching for suitable eelgrass beds in those areas where none where sampled in 2007. Use shorezone mapping for landscape-scale examination of distribution and abundance.

Table illustrating estimated hours spent per SOP during the 2007 field season.

	KATMAI	KENAI FJORDS
SOP	**PERSON HRS**	**PERSON HRS**
Sea otter forage	45	44
*Bloy txs	(3 people) 30-40	(3 people) 30-40
Rocky set up	.	(3 people) 60
*Rocky sampling	(3 people) 90	.
*Soft set up and sampling	(3 people) 54	(3 people) 45
Eelgrass mapping	(2 people) 10	(2 people) 10
Kelp survey	(2 people completed 2 sites) 4	(2 people completed 5 sites) 10
MBM txs	26	26
*Coastline survey (carcass)	40	15
Sea otter aerial survey	.	20

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)