**ATTACHMENT C** ***EVOSTC Annual Project Report Form***

Form Rev. 10.3.14

**1. Program Number:** *See,* Reporting Policy at III (C) (1).

15120114-L

**2. Project Title:** *See,* Reporting Policy at III (C) (2).

Long-term monitoring of ecological communities in Kachemak Bay: a comparison and control for Prince William Sound

**3. Principal Investigator(s) Names:** *See,* Reporting Policy at III (C) (3).

Brenda Konar, Katrin Iken, Angela Doroff

**4. Time Period Covered by the Report:** *See,* Reporting Policy at III (C) (4).

February 1, 2015 – January 31, 2016

**5. Date of Report:** *See,* Reporting Policy at III (C) (5).

March 1, 2016

**6. Project Website (if applicable):** *See,* Reporting Policy at III (C) (6).

www.gulfwatchalaska.org

**7. Summary of Work Performed:** *See,* Reporting Policy at III (C) (7).

***Intertidal Monitoring***

***Sampling Conducted in 2015***

Work during this period included intertidal field monitoring in Kachemak Bay, conducted 3-8 May 2015. We monitored five rocky intertidal sites (Port Graham, Outside Beach, Cohen Island, Bluff Point, and Bishop's Beach) and four seagrass sites (Homer Spit, Jakolof Bay, Pederson Bay, and Herring Island). Data collection at the rocky sites included four strata (high, mid, low and -1 m) at which percent cover of all sessile organisms, counts of all kelp stipes, and mobile organisms over 2 cm, and substrate classification were assessed. Limpet (*Lottia persona*) and mussel (*Mytilus trossulus*) size-frequency distributions were measured at three (limpets: Port Graham, Outside Beach, and Cohen Island) and six (mussels: Port Graham, Outside Beach, Cohen Island, Elephant Island, Bluff Point, Bishop's Beach) of the rocky sites. Rocky sites were also surveyed for the occurrence of seastar wasting disease, which was extended to more sites during the University of Alaska Fairbanks (UAF) "Marine Biology and Ecology Field Class" in June. At the seagrass sites, data collected included percent cover of all sessile organisms, and counts of all seagrass plants, kelp stipes, and mobile organisms over 2 cm. Clams were monitored at four soft sediment beaches from 10 replicate 50 x 50 x 50 cm excavations: Jakolof Bay, China Poot Bay, Port Graham, Bear Cove. The Jakolof Bay and China Poot collections were done in conjunction with the UAF "Marine Biology and Ecology Field Class."

### *Rocky Intertidal Communities*

Similar species were found at rocky intertidal sites in 2015 as in previous years. Comparing kelp coverage as one indicator metric in low and -1 m intertidal strata over the Gulf Watch Alaska (GWA) monitoring site since 2012, we found that kelp coverage was highly variable among sites and years. In the low intertidal zone, kelp coverage did not vary over years in Port Graham, increased (until 2014) in Outside Beach and decreased at Cohen Island. Kelp cover at the -1 m stratum was highly variable among years within each site. However, one common trend we observed was that kelp coverage was low in 2015 at all sites and strata (asterisks in Figure 1). This could possibly be related to warm waters in 2015 associated with the Pacific "blob" phenomenon and/or the ongoing intense El Niño event that started in 2015.

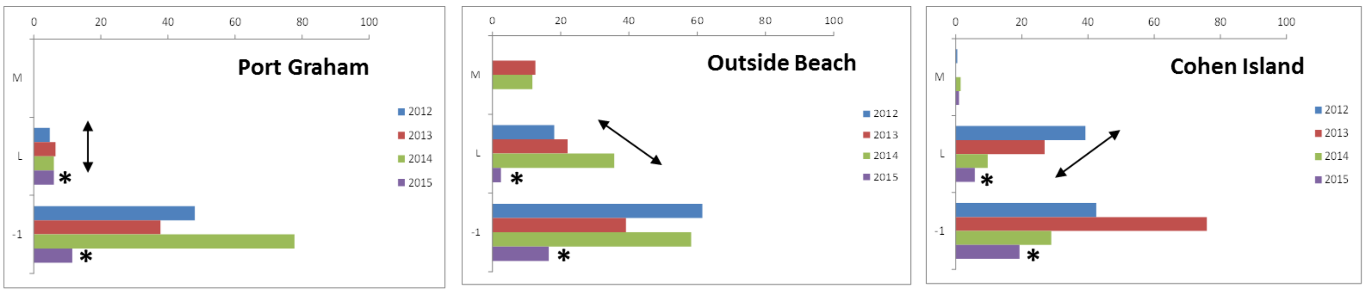


Figure 1. Kelp cover (%) in mid (M), low (L) and -1 m intertidal strata at three rocky sites in Kachemak Bay from 2012 to 2015. While kelp cover was highly variable, all sites exhibited low kelp cover in 2015, possibly associated with warm water temperatures that year.

### *Mussel Density and Size-frequency*

Total mussel density (# mussels 0.0625 $m^{-2}$) over time varied strongly across sites and time (Figure 2). This was particularly obvious at the Port Graham site, where mussel density average was nearly twice as high in some years than others. Much of this high variability was driven by small mussels (≤ 5 mm), likely dependent on the annual recruitment strength at any given site. Annual variability within and across sites was still noticeable but much muted when mussels ≤ 5 mm were excluded (Figure 2).

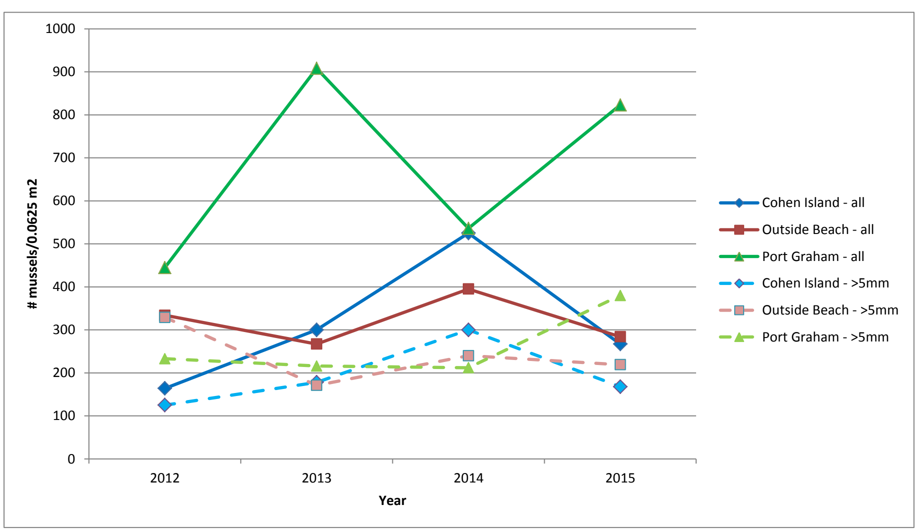


Figure 2. Average mussel density ((# mussels 0.0625 $m^{-2}$) at three rocky intertidal sites from 2012 – 2015. Solid lines/dark symbols represent all mussels while dashed lines/light symbols represent only mussels > 5 mm.

Individual mussel size ranged from 1-52 mm, with most mussels being less than 30 mm in length. Recruitment of small mussels (<5 mm) was particularly strong at Port Graham, as had already been observed in 2013 at that site. However, strong peaks of what may be a second size class or may be a slightly larger version of this first size class (indicated as 1* in Figure 3) were observed at several sites, particularly prominent at Bishop's Beach. Across sites, 2-3 size class cohorts can be identified, but only at Elephant Island was it visible as distinct modal peaks in the distribution.

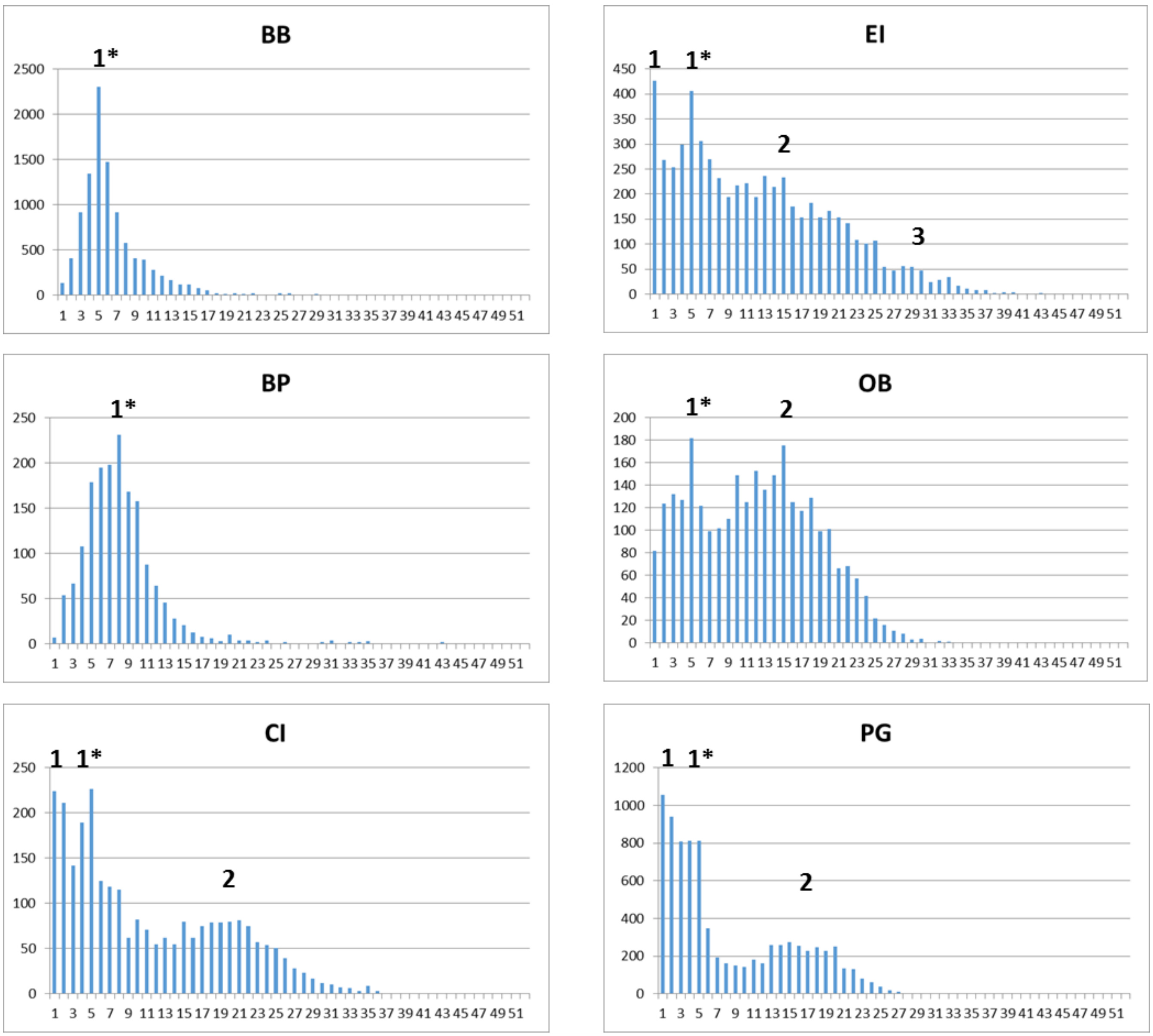


Figure 3. Size-frequency distribution of mussels at six rocky intertidal sites (Bishop's Beach [BB], Bluff Point [BP], Cohen Island [CI], Elephant Island [EI], Outside Beach [OB], and Port Graham [PG]). Approximate modal size peaks indicated by number, where it is uncertain if classes 1 and 1* are separate or slightly modified versions of the same class.

***Seagrass Surveys***

Seagrass cover (% cover) was compared over time for one of the monitoring sites, Jakolof Bay. We have seen a steady decrease in seagrass cover at that site over the past years and 2015 was the first year where there was a slight increase since 2009 (Figure 4). Observations suggested that seagrass at the site seemed to be not only denser but also more robust and greener.

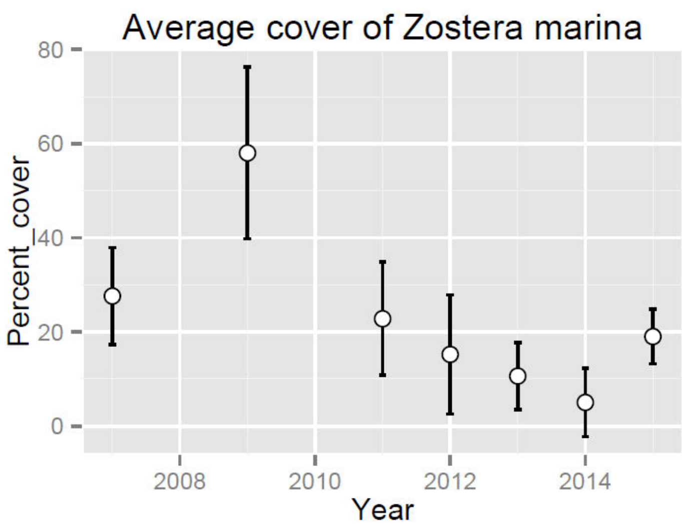


Figure 4. Seagrass cover (%) of *Zostera marina* at the Jakolof Bay site. Survey data from before the beginning of the Gulf Watch Alaska monitoring program were included here.

***Sea Star Wasting Surveys***

Eleven sites (10 rocky, 1 seagrass bed) were surveyed in Kachemak Bay for the occurrence of sea star wasting. Wasting was observed at 7 sites (Figure 5). Sixty-seven of 1132 (5.7%) stars exhibited wasting disease symptoms, with infection rates varying from 0-27% among sites. Among the different species we found infected stars to be: 59 *Evasterias troschelii*, 4 *Pycnopodia helianthoides*, 3 *Leptasterias hexactis* and 1 *Orthasterias koehleri*. Infected stars were recognizable by the severe white skin lesions, and sometimes complete disintegration of arms (see pictures). No disease had been detected during similar surveys in 2014; either the disease took time to reach these northern regions or the warm water conditions during 2015 accelerated or even promoted in the first place, the spreading of the disease.

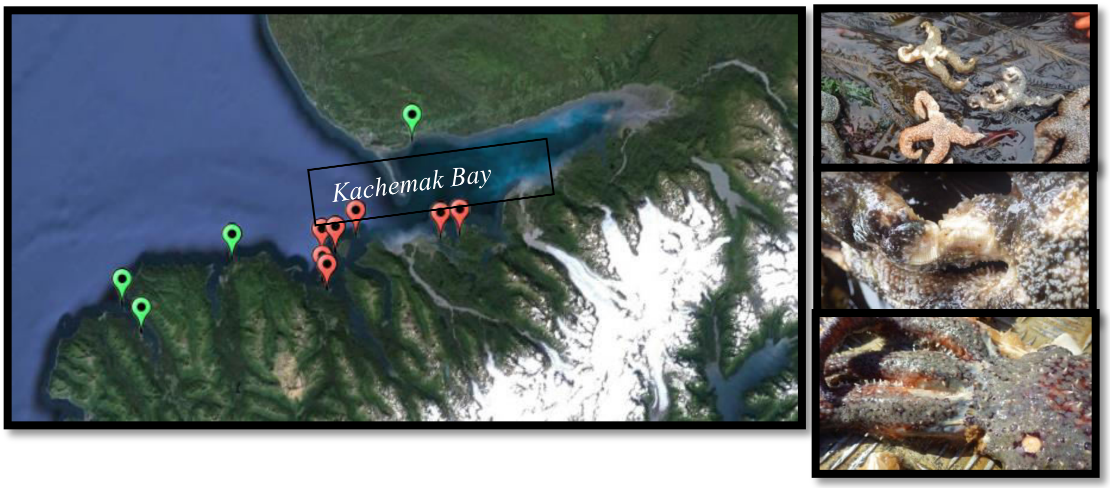


Figure 5. Sites in Kachemak Bay with observed sea star wasting disease (red markers), while no disease was detected at green sites. Pictures are of diseased *Evasterias troschelii* (top and middle) and *Pycnopodia helianthoides* (bottom).

### *Sea Otter Surveys*

#### *Sea Otter Population Assessments*

Since 2012, there have been no new sea otter (*Enhydra lutris kenyoni*) surveys conducted in Kachemak Bay; the best estimate of sea otter abundance in this region remains at 5,927 ± 672 until results are finalized by the US Geological Survey (USGS); survey methods are documented in Gill et al. (2009). In the US Fish and Wildlife Service (USFWS), the southwest population stock (inclusive of the lower Cook Inlet and Kodiak Archipelago) remains a high priority area for sea otter abundance surveys. During 2014, the Kodiak National Wildlife Refuge conducted an aerial survey for sea otters around the Kodiak Archipelago. Preliminary survey results indicate an abundance estimate of 13,274 ± 1,885 (SE), which was not significantly different from the 2004 estimate of 11,005 ± 2,138. In 2015, USFWS initiated sea otter population surveys for lower Cook Inlet and Kamishak Bay but were unable to complete them due to weather; plans to complete a survey in this region are being set for 2016 (Joel Garlich-Miller, personal communications).

Given the sea otter population survey data to date, it is difficult to assess where the Kachemak Bay/ lower Cook Inlet sea otter population is relative to equilibrium density. Through 2012, we were estimating an approximate population growth of 13% $yr^{-1}$, which is below the maximum for the species given unlimited food resources but well above recorded estimates recolonizing populations in nearby the Kodiak Archipelago.

#### *Sea Otter Mortality*

The Alaska Marine Mammal Stranding Network in Homer, AK in collaboration with the USFWS, Marine Mammals Management Office has been collecting year-around data on sea otter carcass recovery, causes of mortality, and managing live animal strandings since the beginning of this study. The local marine mammal stranding network is voluntary. This year the local stranding coordinators were Marc Webber, Debbie Tobin, and three Kachemak Bay Campus student interns.  Last year, we reported 95 sea otter strandings in Kachemak Bay and lower Cook Inlet. Of these, the interim results indicated that Strep Syndrome was a primary cause of sea otter mortality in the region; however, only 18% of the cases at the reporting time were directly related to Strep Syndrome (K. Worman, personal communications). Strep Syndrome in this context is described as a syndrome caused by bacterial streptococcal infection and it manifests itself in a variety of ways such as valvular endocarditis, septicemia, or encephalitis. During 2015, a record 170 dead sea otters were recovered in Kachemak Bay and lower Cook Inlet (Figure 6) and 83% of the recovered animals necropsied presented with Strep Syndrome, a dramatic increase. The USFWS has been tracking a streptococcus illness in Kachemak Bay area otters since the Unusual Mortality Event in 2006 and found that sea otters dying from the syndrome in late 2015 appear healthier than in past years and they are looking into viral infections that may be playing a contributing role. More details can be found on the USFWS investigations in the following post: http://kbbi.org/post/streptococcus-syndrome-main-cause-sea-otter-deaths

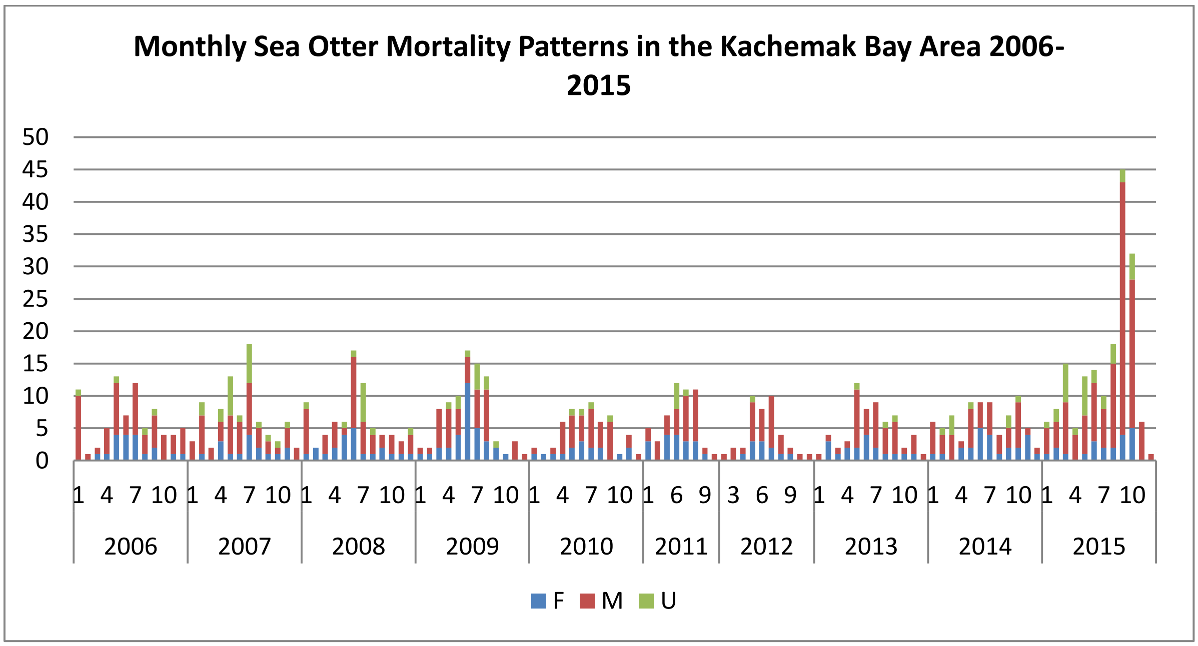


Figure 6. Number of dead sea otters recovered by the Marine Mammal Stranding Network of volunteers in Kachemak Bay and lower Cook Inlet during 2006-2015 summarized by month by year and determined from Level A stranding report forms. The histogram denotes females in blue, males in red, and unknown sex in green.

In Kachemak Bay, most of the marine mammal stranding response effort occurs on the northern side of the Bay near Homer along the Homer Spit. The number of dead sea otters recovered in 2015 increased dramatically compared with previous years (Figure 6). We do not think that this is an artifact of sampling effort. The USFWS and the Kachemak Bay Campus have provided a fairly consistent platform for integrating student interns and seasonal hires to help respond to reported sea otter strandings. During 2006-2012, USFWS provided a seasonal paid internship to respond to sea otter stranding and mortalities and since 2013student internships have helped respond to local marine mammal strandings. Because the most intensively monitored region for the stranding network corresponds with male sea otter habitats, it is not surprising that most of the dead animals recovered are male. We also looked at the age structure of 2015 mortality event; it was biased toward adult animals (Figure 7). In general, a mortality age structure reflective of a well-established population (at numeric equilibrium with the habitat) is composed of older adults and young of the year animals that are more vulnerable to disease and environmental stressors (Ballachey et al. 2014). In the Level A stranding forms, prime age adults and old adults are presented in the same category (all animals ≥4 years of age) so it is difficult to assess if more of the adult animals were aged without the tooth age for each animal. The USFWS does age each stranded animal and those data will be forthcoming. The mortality peak in late fall, however, included a relatively small proportion of first-year animals. Most other regions sampled in the GWA studies, Western Prince William Sound, Kenai and Katmai coasts, conduct mortality surveys in the early spring and report only the overwinter mortality. Future work would include reviewing the dying population structure by tooth age estimations and compare and contrast this to the spring data collected across the region. In Kachemak Bay, it would be advantageous to develop a study site to monitor annual mortality patterns in a region used by reproductively mature female sea otters; in a study on sea otter survival in Kachemak Bay, Doroff and Badajos (2010) found this sex age class to be sensitive to disease.

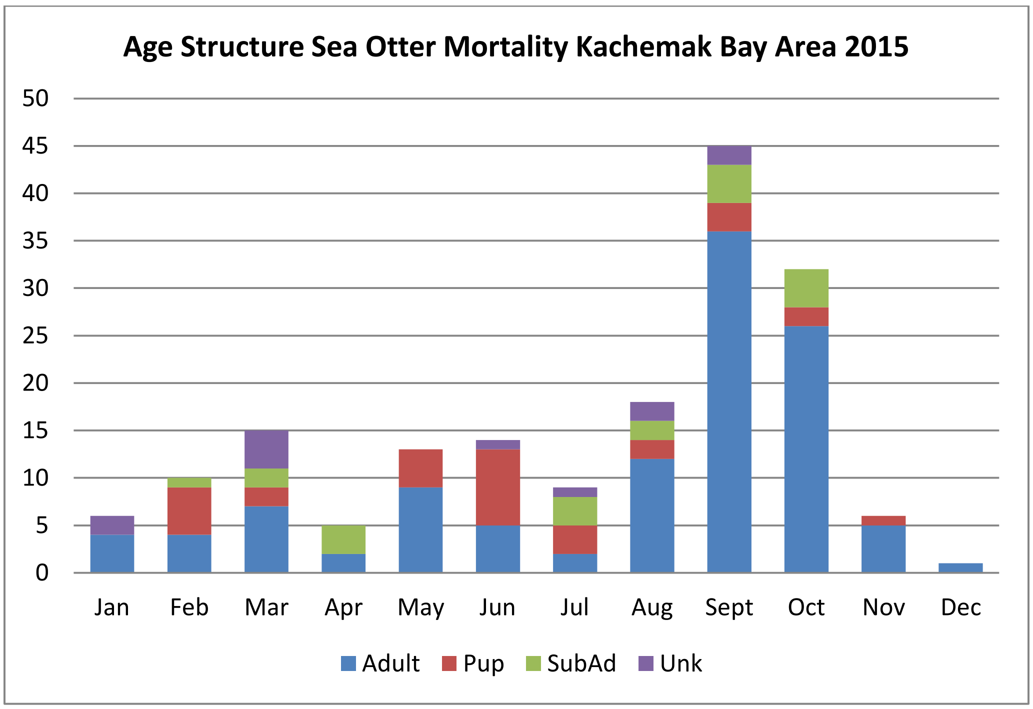


Figure 7. The number of dead sea otters recovered and reported on national marine mammal stranding Level A data forms by month and age class; ages are estimated at the time of necropsy. Age estimates from dental annuli were not available. In this chart, Adult = adult (≥4yrs); SubAd = subadult (1-3yrs); Pup = pup (0-1yrs); Unk = unknown age.

***Sea Otter Prey Assessment***

*Student involvement: University of Alaska, Kachemak Bay Campus, Semester by the Bay students Madison Lytle and Elaina Marcotte, and a University of Alaska, Fairbanks graduate student, Sarah Traiger, contributed valuable field work and interpretation to this year's sea otter prey assessment report.*

Sea otters use different areas along the coast based on age, sex, and reproductive status. In 2007-2010, VHF radio transmitters were implanted in 44 animals (all sex/age classes) of sea otter in Kachemak Bay; foraging sea otters used all habitats in the Bay and were frequently found in open water areas (>1 km for shoreline) (Doroff and Badajos 2010). When sea otters forage more than 1 km from shore, it limits data collection by shore-based observation methods.

*Visual Observations:* All current and historical focal animal sampling data on sea otter diet were archived and sent to USGS to be included in the sea otter program's database for GWA; no independent assessments are provided in this report. For data from previous studies in Kachemak Bay see: http://www.otterspecialistgroup.org/Bulletin/Volume29/Doroff_et_al_2012.pdf. It is important to note that the relative proportions of prey types identified in sea otter diet vary by the methods used to assess diet. Based on visual observations in Kachemak Bay we identified clam, mussel, and crab to make up 38%, 14%, and 2%, respectively, based on foraging dives where prey was identifiable (Doroff et al. 2012).

*Scat Analyses:* We continued to collect monthly sea otter scat samples in Little Tutka Bay, located along the south shore of Kachemak Bay, during the winter months of 2012-2016 through citizen science and collaboration with the land/dock owners (see Doroff et al., 2012 for sample collection and methods).

We collected 24 sea otter scat samples between October 2014 and December 2015 which were processed during this reporting period; sample collection is still ongoing for this winter. Student interns Madison Lytle and Elaina Marcotte processed the scat samples and summarized the data. We sorted each scat sample by prey type and assigned a percentage frequency using a 1 – 6 ranking (1 = 1 – 5%; 2 = 5 – 25%; 3 = 25 – 50%; 4 = 50 – 75%; 5 = 75 – 95%; 6 = 95 – 100%). To summarize the categorical data on diet from scat samples, we used the median value for each category and averaged by winter period (Figure 8). Sample collection is ongoing for the current winter period. As discussed in Doroff et al. 2012, sea otter scat allows for the identification of small, hard-shell prey that passes through the intestine and provides an indication of the relative proportion of mussel, crab, urchin in the diet among years.

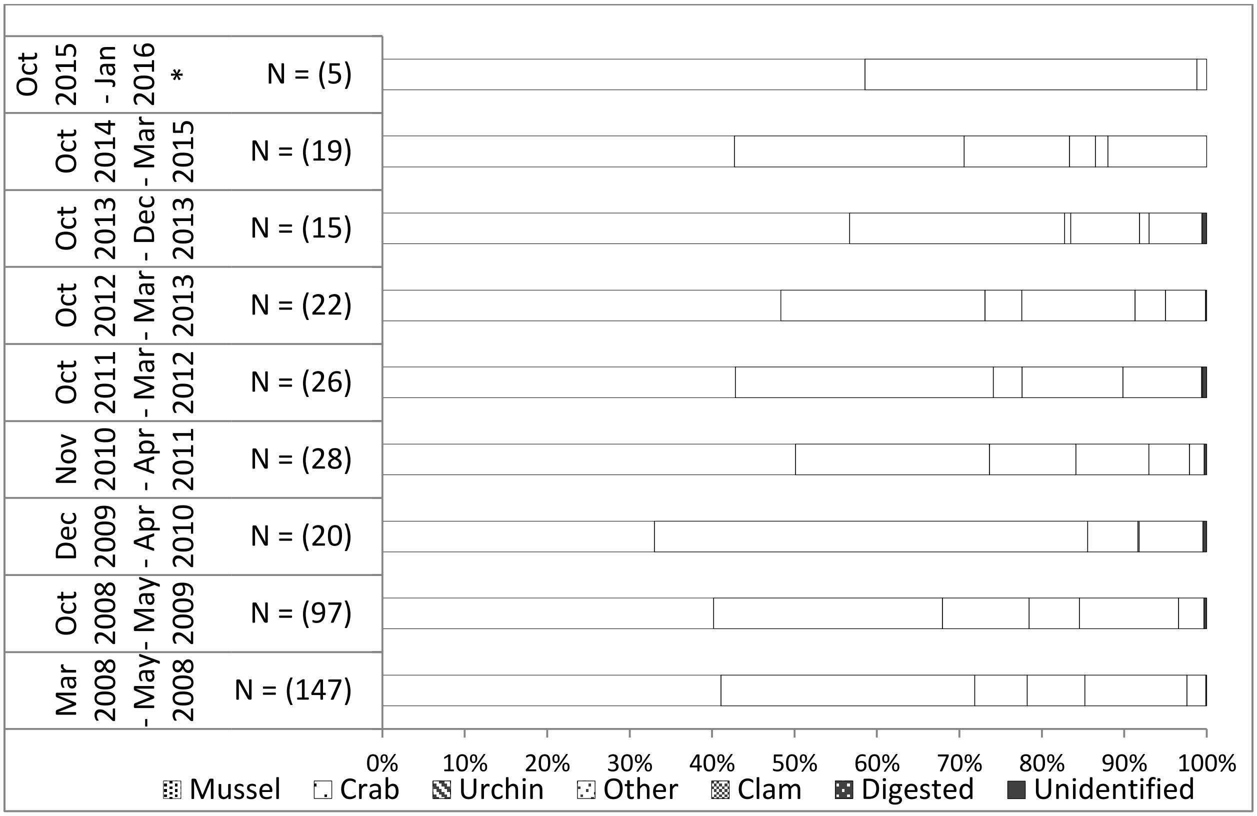


Figure 8. Relative prey composition from sea otter scat collected during 2008-2015 during the winter months in Kachemak Bay, Alaska. Prey composition of individual scat samples was averaged by "winter period" and compared over time. In 2008-2009, scats were collected and processed from multiple sampling sites; however, 2009-2015 a single site was sampled monthly from late fall through the spring. Sampling period Oct 2015-Jan 2016* represents a partial sampling period; sample collection was ongoing at the time of this report.

In November 2015 we partnered with the UAA Kachemak Bay Campus and deployed a Reconyx wildlife game camera on a floating dock known to be used as a haulout site for sea otters during winter months; the site is in proximity to the Little Tutka Bay site. The camera is motion sensitive and allows us to identify the animals using the floating dock during the daylight and night time hours. Thus far, the camera has been an excellent tool and we will be able to document the frequency of occurrence of females with pups and single sea otters hauling out during the week of scat collections at this site (Figure 9). As we move forward, we will be able to pair camera imagery with the scat data. This additional step will provide much more context to scat analyses in the future. In addition to sea otters, we have also identified that river otters use this site (Figures 10 and 11); we have documented a first sea otter and river otter interaction (Figure 11); and when neither otter species was present, we have identified another small mustelid that has used the raft on more than one occasion, very likely a mink given the behavior of the animal.


Figure 9. This is a fairly typical image from the Reconyx wildlife motion sensor camera. Sea otters tend to haul out more at night (though not exclusively); this image shows three adult-sized otters and two dependent pups on a floating raft.


Figure 10. This image shows four North American river otters (*Lontra canadensis*) hauled out on the same float as in Figure 9 during daylight hours. River otters generally (though not exclusively) are using this resting area during daylight.


Figure 11. This image captures our first sea otter and river otter interaction. The river otters approached the resting sea otter multiple times without physical contact. The sea otter hissed at the two river otters but gave no further sign of disturbance.

***Field Observations:*** *It was such an unusual year in Kachemak Bay that we thought we would share some of the anecdotal observations and pilot work we did in 2015 to help round out the environmental picture. Below are observational data on sea otter haulout sites, stomach health contents from moribund sea otters, and unusual prey items for Kachemak Bay. We also provide a short summary of other concurrent mortality events in the Gulf of Alaska.*

*Unusual Haulout site and diet for moribund sea otters*: During November 2015, we noticed more sea otters hauling out at the base of the Homer Spit at Mariner Park. This is an unusual and relatively new haulout site for sea otters. Sea otter scat densities were high; as a rough indication, 81 scats were counted in a 6x20 m area of the beach at mean high water mark. Many of these scats had digested blood and often large, undigested pieces of soft-bodied prey (Figure 12), which indicates an absorption problem for these animals. This area was also one of the most frequent sites for dead and live stranded animal recoveries this year. A local resident who frequents this area of the beach said he had started noticing sea otter scats on this section of beach in approximately 2012 and undigested clam parts were a common feature. Dead and dying sea otters were also common on the Mud Bay Spit, a land feature on the north side of the Homer Spit. While responding to moribund sea otters during the fall, additional sea otter scat samples were recovered and processed by our Semester on the Bay student interns. Diet by scat analysis for sea otters hauling out in Mud Bay was primarily blue mussel (54%) and crabs (40%), whereas overwinter diet at our Little Tutka Bay site was more diverse and averaged 32% blue mussel and 27% crab in 2015. We evaluated Mud Bay as a new monthly scat collection site during fall 2015. Sea otter scat samples are washed away with each tide that covers the Spit; tidal heights are variable throughout the month but it would be possible to identify periods where sea otter scat could be collected for multiple days during October –April.

Figure 12. An example of fresh sea otter scat on Mariner Park Beach, November 2015. Digestia (soft brown material) is common when sea otters are eating exclusively soft-bodied prey. It is very unusual to see undigested soft-bodied prey (in this case, clam meat) in the scat samples. Photo taken by Angela Doroff.

*Stomach Analyses*: Student interns Elaina Marcotte and Madison Lytle analyzed the stomach contents of 13 sea otters necropsied as part of the mortality event. In all cases, the stomachs were empty of food items and noted to be abnormal in one regard or another. There were ulcerations that may have been part of the dying process; however, this observation is consistent with the bloody stools noted on the Mariners Beach in November. One sample had significant growths on the external surface of the stomach wall (Figure 13). Future directions are to look at the frequency of occurrence of stomach ulcerations and relative body condition indices from all necropsies conducted since 2006.

Figure 13. Two brown masses with white speckles on outside of a sea otter stomach wall. Masses were chunky and similar to a skin tab; the larger measured 3 inches long and 1 ½ inches wide. Both masses felt granulated. Photo taken by Eliana Marcotte.

*Opportunistic Foraging on Fish?* Sea otter diet can and does include forms of fish (Pacific spiny lumpsucker (*Cyclopteridae*) and sandlance (*Ammodytidae*), for example) but these observations are usually from areas where the sea otter population is limited by food availability. During 2015, we had unconfirmed reports from coastal communities of sea otters eating salmon in Kachemak Bay; unfortunately, we were never able to observe this directly. Seldovia Village Tribe documented areas where salmon were unable to migrate upstream during early summer and they were dying in the nearshore waters where they were likely an easy food source for many animals (Michael Opheim personal communications). The extremely low water levels in these streams resulted, in part, from reduced snow pack in the previous winter and low precipitation levels during the spring and early summer.

*Concurrent Mortality Events in the Gulf of Alaska*: Concurrent with the sea otter mortality event were an Unusual Mortality Event for baleen whales (record number of fin whales (*Balaenoptera physalus*) and humpback whales (*Megaptera novaeangliae*)) and breeding colony failure and a mass mortality event for common murres (*Uria aalge*) in the Gulf of Alaska. It has also been an uncommon year for forage fish to the benefit of some species, like killer whales in Prince William Sound and foraging humpback whales in Kachemak Bay (Craig Matkin personal communication and personal observation). There were some significant sea surface warming and biotoxin events in 2015. Sea surface temperatures in Kachemak Bay were above the 10-year average for 11 months of the year; the last time similar sea surface temperatures were observed in this area was in 2005 (National Estuarine Research Reserve System-wide Monitoring Program water temperature monitoring 2001-2015). Waters inside Kachemak Bay mirrored warm water temperatures in the Gulf of Alaska and the North Pacific Ocean. In early summer, Kachemak Bay had bloom conditions for *Pseudo-nitzschia*, a phytoplankton species that has the potential to produce domoic acid. The Kachemak Bay Research Reserve and its partners monitored levels of toxicity in Kachemak Bay and domoic acid was not detected at harmful levels. However, the extent and toxicity of the bloom was unprecedented in offshore waters and included much of north Pacific nearshore waters. Later in the fall, Kachemak Bay experienced a paralytic shellfish toxin bloom in the inside waters. The linkages between the warm water and biotoxin events are more readily understood than how these events were connected to the marine mammal and bird mortalities and more work in these areas is needed.

Our abilities to link changing ocean conditions to population-level responses in the upper trophic levels are still very coarse given the extensive and remote regions of coastal waters. Given their life history, sea otters are an ideal candidate to assess expected climate change signals such as ocean acidification, frequency and duration of storm events, toxic algal blooms, marine invasive species, and disease events. The following characteristics make this species a sensitive indicator of climate change stressors:

1. Sea otters have very high metabolic rates, which are an adaptation to living in cold Pacific waters and they rely very heavily on bivalves in lower Cook Inlet and Kachemak Bay as a food source. We are uncertain of how ocean acidification will be impacting the recruitment and maintenance of bivalve populations in Alaska; bivalve populations have declined significantly for razor clam (*Siliqua patula*), butter clam (*Saximdomus giganteus*), and little neck clams (*Leukoma staminea*) over the past two decades (Brooks 2001, 2004; Brooks et al. 2001; Salomon et al. 2007; Seaman 2012; Dennis Lees, personal communications; Gulf Watch Alaska, unpublished data; Glen Seaman and Patrick Norman Traditional Ecological Knowledge Presentation [Kachemak Bay Bivalve Workshop 2014], and evidenced by ADF&G emergency clam harvest closures in 2013, 2014, and 2015 [ADF&G website]). Glacier melt water in mid-summer can be particularly corrosive and may impact larval stages of clams (AOOS website).

2. A strong driver of population dynamics for sea otters is the first year survival of dependent/independent pups (Monnet and Rotterman 1995; Ballachey et al. 2003). Persistent storm events can cause mother/pup separations, which is lethal for a small dependent pup. Survival post weaning can be quite low in a severe winter.

3. Sea otters can detect some toxins accumulated in their prey such as paralytic shellfish poisoning in butter clams (Kvitek et al. 1991); however, it may restrict forage availability and we are unclear on their ability to detect all toxins produced and accumulated (Kvitek and Bretz 2004). In an analysis of data from marine mammal stranding networks, mortality events due to biotoxins have become more prevalent (Gulland and Hall 2007). To date, we have found non-lethal amount of both dioxin and saxitoxin in stranded sea otters and other marine mammals in Alaska (Lefebvre et al. 2016).

4. In 2006, we investigated an unusual mortality event for sea otters in Kachemak Bay. A range of factors was involved in immune suppression that led to coining the descriptive term Strep Syndrome (U.S. Fish and Wildlife Service unpublished data). During field investigations in Alaska, we found a strain of phocine distemper in sea otters that typed out most closely to an outbreak in seals in Europe (Goldstien et al. 2009); we do not know the pathway for sea otters acquiring the phocine distemper but it may have had multiple carriers over the Arctic.

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Seaman, G.A. 2012. Port Graham Natural Resource Project: A Tribal Initiative to Promote Collaborative Research and Restore Marine Invertebrates in Port Graham Bay. Center for Cross-Cultural Studies, MA Project: http://ankn.uaf.edu/Curriculum/Masters_Projects/GlennSeaman/.

Salomon, A.K., S.N. Tanape, and H.P. Huntington. 2007. Serial depletion of marine invertebrates leads to the decline of a strongly interacting grazer. Ecological Applications , 17(6): 1752-1770.

| Deliverable/Milestone | Status |
|---|---|
| Sample intertidal communities in Kachemak Bay | Completed May 2015 |
| Collect monthly sea otter scat samples | Ongoing for this winter period |
| Conduct sea otter observations | Completed |
| Present work at Alaska Marine Science Symposium | Completed |

**8. Coordination/Collaboration:** *See,* Reporting Policy at III (C) (8).

Text description of needed content:

- Item 8A would cover collaboration and coordination both within your program and between the two programs.

  We continue to coordinate our work with other partners in the nearshore GWA Program. This has resulted in a manuscript submission to a peer-reviewed journal.

- Item 8B would include coordination with other EVOSTC funded projects (e.g. marine debris, harbor protection, or PIGU projects).

  N/A

- Item 8C would include coordination with our trust agencies.

  N/A

**9. Information and Data Transfer:** *See,* Reporting Policy at III (C) (9).

**Presentations at the Alaska Marine Science Symposium 25-28 January 2016:**

Coletti HA, Esler D, Ballachey BE, Bodkin JL, Dean TA, Esslinger G, Iken K, Kloecker KA, Konar B, Lindeberg M, Monson DH, Weitzman B. Long-term monitoring of nearshore marine ecosystems in the Gulf of Alaska: Detecting change and understanding cause. (poster presentation)

Konar B, Iken K, Vanderwaal S. Testing the use of unmanned aircraft systems for intertidal surveys – proof of concept. (poster presentation)

Pister B, Ballachey B, Coletti H, Dean T, Iken K, Konar B, Lindeberg M, Weitzman B. Multi-agency Efforts to Monitor Sea Star Wasting Disease in Alaska: Results and Recommendations for Future Efforts. (poster presentation)

Traiger S, Konar B, Doroff A, Caslin L. Sea otters versus sea stars as major clam predators: evidence from foraging pits and shell litter. (poster presentation)

**Presentation at the Annual Coastal Marine Institute Review (29 January 2016):**

Iken K, Konar B, Vanderwaal S. Testing unmanned aircraft systems in intertidal surveys. (oral presentation)

**Other presentations:**

Marcotte E, Lytle M. 2015. Sea otter diet in Kachemak Bay 2015. Oral presentation in fulfillment of thesis research credits. University of Alaska, Kachemak Bay campus

Konar B, Iken K, Coletti H, Dean T, Monson D. Static habitat attributes influence biological variability in intertidal communities in the central Gulf of Alaska. Kachemak Bay Science meeting, Homer AK, 5-7 March 2015. (oral presentation)

**Publications:**

Traiger S, Konar B, Doroff A, McCaslin L. Sea otters versus sea stars as major clam predators: evidence from foraging pits and shell litter. In review at *Marine Ecology Progress Series*

Konar B, Iken K, Coletti H, Dean T, Monson D, Weitzman B. Influence of static habitat attributes on local and regional rocky intertidal community structure. In revision at *Estuaries and Coasts*

**10. Response to EVOSTC Review, Recommendations and Comments:** *See,* Reporting Policy at III (C) (10).

N/A

**11. Budget:** *See,* Reporting Policy at III (C) (11).

Please see provided program work book.