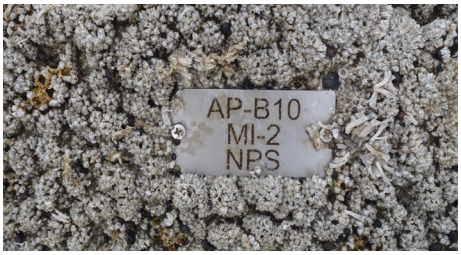
Intertidal Communities

Changes in Mussel Dynamics

Since 2006, we observed substantial changes in mussel dynamics across our study areas in the Gulf of Alaska. We documented reductions in numbers of mussels at mussel sampling sites in Katmai National Park (KATM) and western Prince William Sound (WPWS); however, results vary more for Kenai Fjords National Park (KEFJ) sites. An apparent decrease in percent cover of mussels at the majority of the rocky intertidal sites over the course of our sampling coincided with a decrease in the proportion of mussels in sea otter diets in KEFJ & WPWS during our study period, while remaining low at KATM. Mussel trends suggest decreases in all areas studied, possibly affecting population density and consumption by sea otters and black oystercatchers, a nearshore bird species that relies heavily on mussels as a food resource. Given the high variation we observed in mussels, we initiated studies to try to understand the role mussels play in black oystercatcher productivity and fle ging success as well as understand the importance of mussels in sea otter diets.



Barnacle spat covering a mussel bed site in Kaflia Bay, KATM.

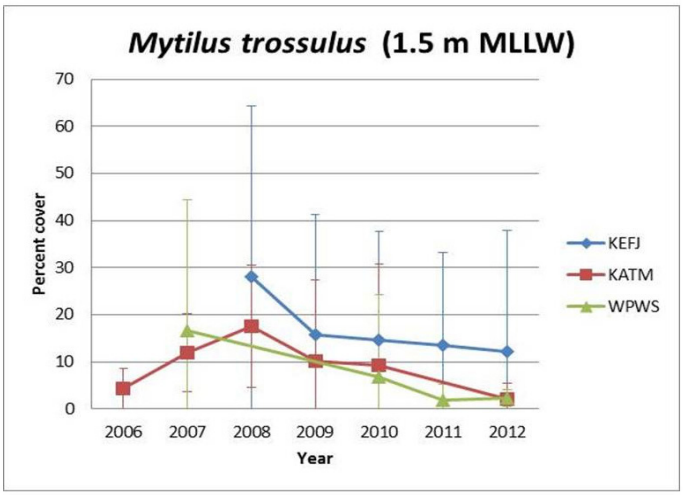


Figure 1. Percent cover of *Mytilus* at the 1.5 m MLLW in KATM, KEFJ, and WPWS, 2006-2012. Error bars indicatd 95% CI.

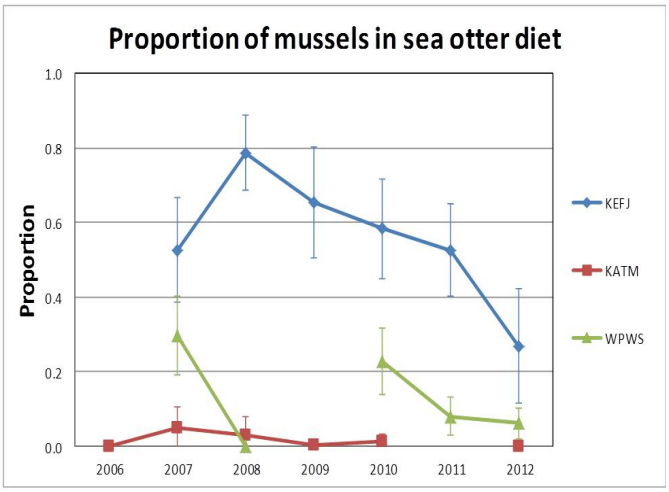


Figure 2. Proportion of mussels in sea otter diets in KATM, KEFJ and WPWS, 2006-2012. Error bars indicate 95% CI.

2008 KATM, Kaflia Bay mussel bed

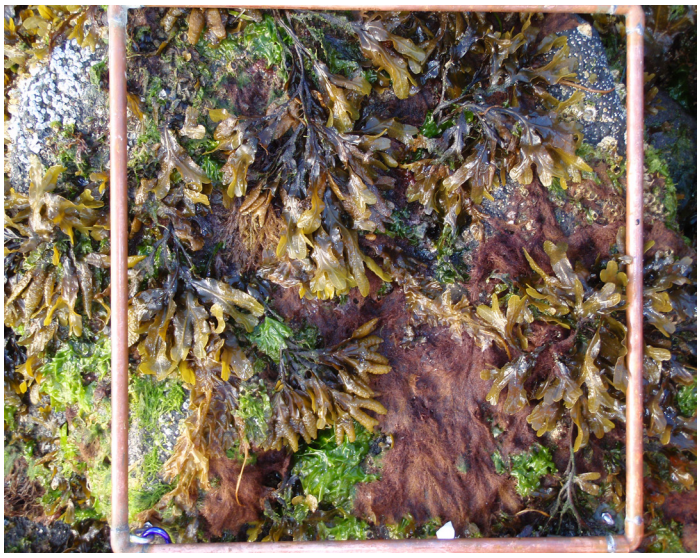
2012 KATM, Kaflia Bay mussel bed site, now covered in barnacle spat.

In our study regions, mussels (*Mytilus trossulus*) are ubiquitous. They serve as an important link in the intertidal trophic web by filtering detrital and planktonic material from the water and providing a food resource for other invertebrates (sea stars, predatory snails) as well as for a variety of birds and mammals that reside in the nearshore environment. Additionally, by forming large mats, mussels provide habitat for other intertidal occupants that reside within or subsurface to mussel beds. Because mussels are so common in the intertidal and are a major food source, mussels can serve as a sentinel species to assess health and environmental change in the nearshore.

Monitoring Approach

SWAN, along with other partners in the Gulf Watch Alaska (GWA) program, monitors several components of the intertidal ecosystem in multiple locations across the Network and Gulf of Alaska in order to gain a holistic understanding of the structure and variation of intertidal communities. SWAN began its partnership with GWA in 2012. GWA is the long-term ecosystem monitoring program of the Exxon Valdez Oil Spill Trustee Council. The current five-year, $12 million program began in February 2012 and is in the first increment of a program anticipated to span a 20-year period. The program is organized into four related ecosystem monitoring components, with data management, modeling, and synthesis projects pro-viding overall integration across the program. SWAN and our partners play a significant role in the benthic comnponent of GWA. Elements of intertidal monitoring efforts include studying invertebrate communities in rocky and soft-sediment intertidal areas, intertidal algal species, blue mussels, and eelgrass. Specifically, intertidal community sampling aims to assess changes in the relative abundance and distribution of algae and sessile invertebrates as well as motile invertebrates in the intertidal zone over space and time. Sampling also includes metrics such as size distribution of limpets (*Lottia persona*) and mussels (*Mytilus trossulus*), the con-centration of contaminants in mus-sel tissue, and intertidal temperature (either sea or air depending on tidal stage). The goal of mussel bed sampling is to assess changes in the abundance of mussels over time. These data are primarily to be used as an indicator of mussel availability as prey for a variety of predators such as sea stars, sea ducks and sea otters. The goal of eelgrass sampling is to assess changes in the extent and density of eelgrass over time.

Sampling intertidal algae and invertebrates in Kinak Bay, KATM 2012.



Quadrat sampling for percent ocover of algae in rocky habitats.

Importance

Intertidal and subtidal communities provide an important source of production; are an important conduit of energy, nutrients, and pollutants between terrestrial and marine environments; provide resources for subsistence, sport, and commercial harvests; and are important for recreational activities such as wildlife viewing and fishing. The intertidal is particularly susceptible to human disturbance including oil spills; trampling by recreational visitors; harvesting activities; pollutants from terrestrial, airborne and marine sources; and shoreline development. Marine invertebrates provide a critical prey resource for shorebirds, ducks, fish, bears, sea otters, and other marine invertebrate predators. Changes in species composition, abundance, contaminant levels, and biomass of intertidal invertebrates can indicate important changes in the coastal ecosystems of which they are a part and can have effects that cascade to other trophic levels. Kelps and eelgrasses are “living habitats” that serve as nutrient filters and provide understory and ground cover for planktivorous fish, clams, urchins, and a physical substrate for other invertebrates and algae. Kelps and eelgrasses also provide spawning and nursery habitats for forage fish and juvenile crustaceans. Kelps are the major primary producers in the marine nearshore and because they are located in shallow water, they are prone to be more impacted by oil spills and other human-related activities.

Eelgrass bed in Kukak Bay, KATM.

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