Integrating Upper Trophic Species into Ecosystem Studies along the Kenai Coast

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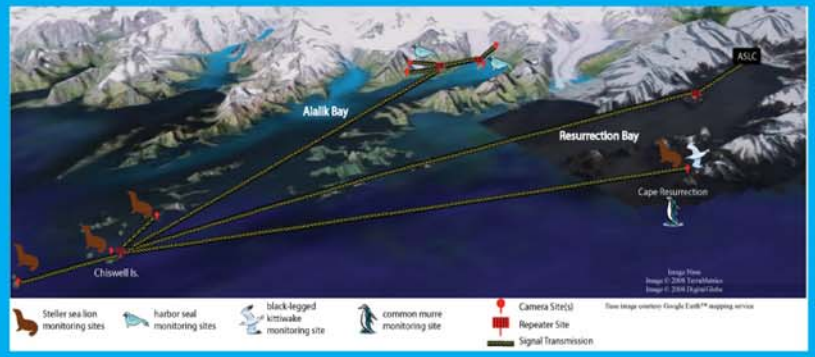
Summary:

Long-term data series of individual marine species is providing valuable information about stability and dynamics of populations, vital rates, and demographics. Along the coast of the southern Kenai Peninsula, the Alaska SeaLife Center has conducted research on multiple marine species, including Steller sea lions, harbor seals, seabirds, and fishes. Steller sea lion behavior, diet, and population dynamics have been monitored for more than a decade, harbor seal population dynamics, habitat use, and productivity has been monitored for three decades, phenology, productivity, and habitat use of selected seabirds has been monitored for 3 years, and seasonal and interannual changes in the diet of commercially important fish (salmon and halibut) for 2 years. These studies will be expanded and integrated into ecosystem studies on bottom-up and top-down processes within a coastal marine food web. Concurrent, multidecadal studies on physical processes and lower trophic level dynamics conducted by University of Alaska Fairbanks provide unique opportunities for comparative and integrated ecosystem studies on upper trophic level species responses to environmental variability. Integrating comparative information across species and trophic levels with data on environmental drivers and conditions provides opportunities to understand how ecosystem components interact with each other in this dynamic coastal marine ecosystem along the Kenai Peninsula, involving coastline of the Kenai Fjords National Park, glacial fjord ecosystems, and areas influenced by the Alaska Coastal Current.



Video Observation Room at ASLC

Video Network:

Upper trophic level animals are studied at a variety of locations along coastal Kenai using a remote video network installed and maintained by SeeMore Wildlife Systems, Inc. Video cameras are equipped with pan, tilt, and zoom functions and are controlled and viewed in real time from the convenience of an office at the ASLC. At the remote locations, equipment is powered by 12-V battery banks which are kept charged with solar panels and wind generators.

Steller sea lions:

We have been monitoring Steller sea lions at the Chiswell Island rookery since 1999 and neighboring haulouts since 2000 using the remote-control video system. Long-term behavioral and population studies consist of maternal care, vital rates (survival and natality), sources of neonatal mortality, and population trends. Remote video studies are complemented with field work relating to diet and health of the animals with an observed history. Permanent marking, morphometrics, and sampling of neonate pups which occurred in 2005, 2007, 2008, and 2010 help identify factors that relate to survivorship. Long-term collection of scat samples and blubber biopsies can also help identify correlations between prey selection and changes in natality, survivorship, and prey availability.

Seabirds:

A black-legged kittiwake colony in the vicinity of Cape Resurrection has been monitored for the past 3 years via the remote video system. Digital video clips of nest plots are taken at regular intervals throughout the summer to determine nesting and fledging success of kittiwake pairs. Greater than 100 nests have been monitored in each year with noticeable changes in productivity between years which may relate to varying environmental conditions.

Barwell Island, adjacent to Cape Resurrection holds one of the largest common murre colonies along the Kenai coast. We began monitoring murres at this location in 2011 via time-lapse still cameras. Images were captured every 4 hr throughout the summer to assess nesting success. We intend to install remote video cameras at this location in the future which can be used to estimate provisioning rates of chicks and identify prey items in addition to determining nesting success.

Harbor seals:

Harbor seals using glacial ice for resting and pupping in Aialik Bay have been monitored since 1979 by the National Park Service in association with the University of Alaska and the Alaska SeaLife Center. During that time harbor seals using ice near Aialik Glacier declined more than 90% despite Aialik Glacier's stability. From 2002-2011, remotely controlled video cameras have documented (1) numbers and productivity of seals, (2) glacier status and ice availability, and (3) the responses of seals to human activities near Aialik and Pedersen Glaciers. Results have shown increased use of ice near Pedersen Glacier during the molt coinciding with recession of Pedersen Glacier. Numbers of seals near Aialik Glacier have stabilized; however, productivity was potentially diminished by environmental conditions accompanying cold water temperature from 2007-2009. Human disturbance of seals has decreased since 2002 (vessels) and 2005 (kayaks). Two-way communication and collaborations with commercial operators and guides have helped sustain reduced impacts of vessels and kayaks on wildlife at this site.

Fish:

Diets of predatory fish such as salmon and halibut have been assessed for the past 3 years via examination of stomach contents. Fish stomachs are collected from the charter vessel fishing fleet at the Seward harbor throughout the summer and represent a large portion of the Kenai coast from Prince William Sound to Nuka Bay. Fish are measured and stomachs excised for examination in the lab. Subsets of prey items are preserved for subsequent measurements to estimate size. Seasonal and interannual changes in prey taken by predatory fish can reflect fluctuations in the availability of different forage fishes and other prey.

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