Boat-based counts of sea otters at specific sites in Southeast Alaska from 2017 and 2018

Website: https://www.bco-dmo.org/dataset/879061
Data Type: Other Field Results
Version: 1
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Project
» Trophic linkages in eelgrass ecosystems (TLEE)

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Abstract
This dataset is composed of counts of individual sea otters that were observed within a 2-nautical mile radius of specific intertidal sites. All counts were performed via boat-based operations; gender and the presence of pups were not recorded. Each observation is associated with a waypoint and the number of sea otters at that waypoint. These counts were conducted at 21 sites in Southeast Alaska on Prince of Wales Island in 2017 and 2018. These data were collected to compliment a larger, interdisciplinary project called APECS (Apex predators, Ecosystems, and Community Sustainability), the focus of which investigated the role that sea otters have on seagrass habitats, their ecological function, and influences on traditional and subsistence harvest of specified marine organisms.

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Coverage

Spatial Extent: **N**:56.4206 **E**:-132.0942 **S**:54.5281 **W**:-134.4531
Temporal Extent: 2017-06-13 - 2018-08-10

Dataset Description

Supporting files listed below are available from the following reference and accessible via the Related Datasets section:

Tiffany Stephens and Ginny Eckert. 2019. Boat-based counts of sea otters at specific sites in Southeast Alaska. KNBurn:uuid:b910f74b-171b-4d2b-b065-fb21823a8e84;

- *sea_otter_counts_METADATA.xlsx* - parameter definitions for the primary dataset descriped on this page

- *Otter_gps_2018.csv* - original otter count data by site during 2017; used to create the primary dataset descriped on this page

- *Otter_gps_2017.csv* - original otter count data by site during 2017; used to create the primary dataset descriped on this page

- *Otter_count_siteinfo.xlsx* - site specific metadata (geocoordinates, sampling year, square area)

- Subpop_density_Tinker.csv - file containing derived data (otter density)

- Shapefile-related files: **cpg, *dbf, *prj, *sbn, *sbx, *shp, *shx*

Methods & Sampling

Pre-fieldwork: The objective of the sea otter counts was to determine the number of sea otters that could reasonably access selected seagrass sites that are of interest to the objectives defined by the APECS project. Sea otter foraging behavior indicates that they can swim about 2 nautical miles (nm) while foraging for prey in one day. Thus, for each seagrass site we overlayed a circle with a 2-nm radius (centered on the seagrass site) on a map, which provided the boundaries for where we counted sea otters. Within these boundaries, the best path for covering all of the area (while avoiding land/rock features) was considered before heading into the field.

Fieldwork: Sea otters were counted using a boat-based approach (boat: 27' North River, dual 250cc engines). It was first necessary to determine the extent of the survey area relevant to the target seagrass site (as described in Step 1, above). Within this survey area, we used a meandering path approach to count sea otters, where we ensured that all points within the survey area were visually scanned for sea otters once (i.e. a single, meandering line rather than replicate transects standardized by distance). We conducted all surveys using a GPS-enabled iPad with navigational abilities (i.e. iNavX app); this allowed us (1) to record each sea otter event using distinct waypoints, (2) to display real-time spatial locations of counted sea otters to prevent double-counting during each survey, and (3) to record our boat path throughout the survey area to prevent covering the same section of water more than once. The speed at which the boat travelled during the sea otter survey was maintained at 8 knots (+ / - 0.5 knots fluctuations from wind/current influence). Ultimately, we converted these counts into densities (number of otters per square km) after calculating the total survey area of water surrounding each seagrass site (2-nm radius, no inclusion of land)

Only sea otters that were within 300 m of the boat (the distance at which objects could reliably be confirmed as sea otters using binoculars across multiple observers) were included for counting as the boat wove through the survey area. Surveys were cancelled if sea conditions exceeded 3 on the Beaufort Scale, and/or if visibility was too poor for navigation or observation at 300 m (including if rain affected the utility of the binoculars). Due to the variation in total area surveyed (dependent on the geographical features of each site), the duration of each survey ranged from approximately 35 min to 1.75 hrs.

The counts required at least four crew members: one boat captain, one recorder + observer, and two observers-only. The boat captain remained in the wheelhouse to navigate but would notify the recorder of any sea otters that were observed directly in front of the boat in case they dove below the surface as the boat approached. Both observer-only crew members were stationed on the back deck of the boat, one on the starboard and one on the port. The recorder was also on the back deck with the iPad to confirm sea otter sightings before entering the observation as a spatially accurate waypoint in iNavX (number of sea otters for that point was recorded in the comment section of the waypoint); the recorder also helped look for sea otters. If a fifth person was available, they sat inside the wheelhouse with the captain to keep constant watch over waters in front of the boat. All crew members were equipped with one pair of binoculars (10x42 specifications).

Data Processing Description

Sea otter density values reported in file Subpop_density_Tinker.csv accessible at KNB were calculated according to Tinker et al 2019 https://doi.org/10.1002/jwmg.21685

BCO-DMO Processing Notes:

- Rows 141 through 155 in the original file *sea_otter_counts_2017&2018_CLEANDATA.csv* contain date_DDMMYY observations that include the year 2017, even though the year column and the file name indicate 2018 as the year of sampling (the original file *Otter_gps_2018.csv* also contains these errors). These values were corrected during processing.
- The date_DDMMYY column values were formatted as both general text and as dates. All values converted to date datatypes during processing.

- Commas within individual cells were removed to conform with .csv formatting.

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Related Datasets

IsSupplementedBy

Tiffany Stephens and Ginny Eckert. 2019. Boat-based counts of sea otters at specific sites in Southeast Alaska. KNBurn:uuid:b910f74b-171b-4d2b-b065-fb21823a8e84.

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Parameters

Parameter	Description	Units
region	The general area that sea otters were counted.	unitless
site	Independent sites for which sea otters were counted.	unitless
latitude_N	Coordinates are North.	decimal degrees
longitude_E	Coordinates are East.	decimal degrees
date_DDMMYY	Date that sea otters were counted in each site. Format is DD/MM/YY.	
year	Year that sea otters were counted for each site.	
replicate	Duplicate counts of sea otters exist for each site (per year), replicate 1 and replicate 2.	unitless
ISO_Date	Date that sea otters were counted in each site as YYYYMMDD without delimiters.	

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Project Information

Trophic linkages in eelgrass ecosystems (TLEE)

Website: http://apecs-ak.org

Coverage: Southeast Alaska (55N, 133W)

NSF Award Abstract:
Seagrass meadows are one of the most widespread habitats in shallow coastal marine environments. They have been dubbed "blue carbon ecosystems" due to their disproportionately large role in the global capture and storage of carbon (C). The worldwide decline of these coastal vegetated habitats is particularly troubling because C-rich ecosystems provide critical services to humans, such as nutrient cycling and sequestering of carbon, reduce current and wave stress, and supply habitat for fishes, birds and invertebrate species, many of them commercially important. Recent evidence suggests that the top trophic level in these communities, known as apex predators, can play a critical role in preserving vegetated coastal habitats. Apex predators, such as sea otters, can facilitate top-down control in these ecosystems by consuming herbivores such as crabs and fish that are dominant grazers of coastal vegetation. Thus apex predators may indirectly conserve blue carbon stocks by reducing the number of herbivores through predation. This project will use the recolonization of sea otters in Southeast Alaska as a natural experiment to understand the trophic relationships and indirect effects of apex predators on seagrass ecosystems and carbon storage. This

research can inform societal decisions on how to manage these ecologically important seagrass communities as the apex predator range expands and sea otter hunting becomes more pervasive. Researchers will engage with Alaska Native villages on Prince of Wales Island in Southeast Alaska by training local field assistants and sharing results through regular meetings with various stakeholders in these communities that live with sea otters. This engagement will provide an avenue of communication for researchers and users of marine resources to understand the multifaceted role of sea otters in their ecosystem.

The ecological theory that top predators can drive ecosystem structure was developed in response to the question of why the world is green. In short, predators control herbivores, thus regulating the abundance of their plant prey. Through this trophic cascade, predators can play a critical role in maintaining carbon stocks stored by plants. Yet this view is limited to direct effects in the trophic hierarchy and does not consider the indirect role of higher order predators. The trophic linkages between apex predators and intermediate predators, such as crabs and fish that eat grazers, are much less studied. In Southeast Alaska, eelgrass (Zostera marina) is the dominant form of soft sediment nearshore aquatic vegetation and covers nearly 16,000 km of shoreline, which is 1.25 times greater than the entire shoreline of California, Oregon, and Washington combined. The researchers will use the geographical expansion of sea otters (Enhydra lutris) in Southeast Alaska, a region larger than the state of Maine, to investigate the role of apex predators on eelgrass community structure and carbon sequestration at a large temporal and spatial scale. Sea otters were historically distributed throughout the North Pacific and exterminated from northern California to Prince William Sound during the 19th century fur trade. The reintroduction and geographical expansion of sea otters in Southeast Alaska over the past 50 years is a natural experiment that researchers can use to better understand the role of apex predators in structuring marine ecosystems, because sea otter duration and density vary over space, allowing comparison of seagrass food webs along this sea otter gradient. Researchers will rigorously test for a trophic cascade linking apex predators and marine vegetation using this natural experiment combined with manipulative experiments that include alternative hypotheses of what is limiting seagrass and then quantify the role of this seagrass in C sequestration.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1635716

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