Locations of satellite-tagged harbor seals in the San Juan Islands, WA from 2007-2009

Website: https://www.bco-dmo.org/dataset/3704
Data Type: Other Field Results
Version: 1
Version Date: 2012-11-28

Project
» Responses of Seals and Sea Lions to Increased Rockfish Density (Seal_response_to_prey)

Contributors	Affiliation	Role
Acevedo-Gutierrez, Alejandro	Western Washington University (WWU)	Lead Principal Investigator
Bromaghin, Jeffrey F	United States Geological Survey (USGS)	Co-Principal Investigator
Jeffries, Steven J	Washington Department of Fish and Wildlife	Co-Principal Investigator
Kennish, John M	University of Alaska, Anchorage (UAA)	Co-Principal Investigator
Lance, Monique M	Washington Department of Fish and Wildlife	Co-Principal Investigator
Levin, Philip S.	National Marine Fisheries Service (NMFS)	Co-Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Coordinates of tagged seals in the San Juan Islands are reported. Seals were captured and tagged during 2007 to 2009 at several sites in Padilla Bay and the Rosario Strait of the Pacific Northwest coast. Seals were tagged with satellite-linked time-depth recorders (TDR's) and GPS receivers.

Table of Contents

Coverage

Spatial Extent: **N**:28.597 **E**:-106.99 **S**:8.818 **W**:179.802
Temporal Extent: 2007-10-24 - 2009-08-03

Dataset Description

Coordinates of tagged seals in the San Juan Islands are reported. Seals were captured and tagged during 2007 to 2009 at several sites in Padilla Bay and the Rosario Strait of the Pacific Northwest coast. Seals were tagged with satellite-linked time-depth recorders (TDR's) and GPS receivers.

Data are in the PRV format, which means that there are time and location duplicates because all uplinks to the satellite are included.

Methods & Sampling

Seals were captured and tagged in April or May of 2007 and 2008 following the methods of Jeffries et al. (1993) at three sites: Padilla Bay, Bird/Belle Rocks, and Protection Island. In 2009, seals were captured on Protection Island. In 2007-2008, animals were tagged with time-depth recorders (TDR; Wildlife Computers, model Mk-9 or Mk-10F) and satellite tags. The TDR tags were placed on the dorsal midline of the animals and the satellite tags were placed on top the head. In 2009, animals were tagged with a combined satellite-linked TDR and Fastloc GPS receiver (Wildlife Computers, model Mk10AF). These instruments were epoxied to the animals on the dorsal midline so that satellite tags would be exposed to the air when the back of the seal reached the surface.

Position transmissions were received via the ARGOS satellite network. Tags transmitted locations daily. TDR sensors were programmed to sample every 10 seconds. TDR tags were equipped with a VHF transmitter to allow for the device to be recovered when it was shed during the animal's annual molt.

The Argos system provides 2 position estimates (lat/lon and lat2/lon2). Argos usually picks the correct lat/lon pair (of the two it generates), but occasionally it does not. When working with these data, one of the first steps is to check the lat/lon pairs to see if swapping out the lat/lon pair for the lat2/lon2 pair improves the data and is more biologically reasonable.

The Argos positioning system uses the following system for classifying location quality. These codes are used in the loc_q_flag column. Standard locations are those with > 4 uplinks from the tag; auxiliary locations are those with 4 or less uplinks from the tag.

loc_q_flag codes (according to Ward et al.):
Standard locations:
3 = 68th percentile predicted accuracy < 150 m
2 = 68th percentile predicted accuracy 150 - 350 m
1 = 68th percentile predicted accuracy < 1,000 m

Auxiliary locations:
0 = 4 uplinks, with > 1,000 m predicted accuracy
A = 3 uplinks, with no predicted accuracy
B = 2 uplinks, with no predicted accuracy

Data Processing Description

BCO-DMO made the following edits to the dataset:
- blanks were replaced with 'nd' to indicate 'no data';
- parameter names were modified to conform to BCO-DMO conventions;
- day, month, and year were separated from the original date column.

[table of contents | back to top]

Data Files

File	
seal_location_tracking.csv	(Comma Separated Values (.csv), 4.59 MB) MD5:89c95c9b89d5f95b120867d2fe0c974d
Primary data file for dataset ID 3704	

[table of contents | back to top]

Related Publications

Jeffries, S., Brown, R., & Harvey, J. (1993). Techniques for capturing, handling and marking harbor seals. Aquat Mamm 19: 21-25. Available from Aquatic Mammals journal. URL: https://www.aquaticmammalsjournal.org/index.php?option=com_content&view=article&id=38:volume-19&catid=3&Itemid=101
Methods

Thomas, A., Lance, M., Jeffries, S., Miner, B., & Acevedo-Gutiérrez, A. (2011). Harbor seal foraging response to a seasonal resource pulse, spawning Pacific herring. Marine Ecology Progress Series, 441, 225–239. doi:10.3354/meps09370
Methods

Ward, E. J., Levin, P. S., Lance, M. M., Jeffries, S. J., & Acevedo-Gutiérrez, A. (2011). Integrating diet and movement data to identify hot spots of predation risk and areas of conservation concern for endangered species. Conservation Letters, 5(1), 37–47. doi:10.1111/j.1755-263x.2011.00210.x
https://doi.org/10.1111/j.1755-263X.2011.00210.x
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
seal_id	Unique seal identification.	unitless
pttno	PTT tag number.	unitless
inst	Name of the instrument (MK10 or SPOT 5; both manufactured by Wildlife Computers).	unitless
lat	Primary latitude. (See Acquisition Description.)	decimal degrees
lon	Primary longitude. (See Acquisition Description.)	decimal degrees
lat2	Secondary estimate of latitude provided by Argos. (See Acquisition Description.)	decimal degrees
lon2	Secondary estimate of longitude provided by Argos. (See Acquisition Description.)	decimal degrees
month	Month of year (01 to 12).	mm
day	Day of month (01 to 31).	dd
year	4-digit year. in yyyy format	unitless
date	Date, in mm/dd/yyyy format.	unitless
time	Time, 24-hour clock.	HHMM
satellite	Identification of the Argos satellite transmitting the signal: A = METOP-A (MA); K = NOAA-15 (NK); L = NOAA-16 (NL); M = NOAA-17 (NM); N = NOAA-18 (NN); P = NOAA-N (NP). See more information.	unitless
loc_q_flaq	Location quality flag. The Argos system classifies points with decreasing precision: 3 > 2 > 1 > 0 > A > B. See Acquisition Description for code definitions.	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	SPOT5 Argos Transmitter
Generic Instrument Name	SPOT5 Argos Transmitter
Dataset-specific Description	In 2007-2008, SPOT5 transmitters were epoxied to the tops of seals heads. Satellite locations were obtained daily.
Generic Instrument Description	The SPOT5 is an Argos transmitter manufactured by Wildlife Computers (Redmond, WA) and designed for deployment on marine mammals, fish, or seabirds. SPOT5 devices use the Argos satellite network to transmit locations of animals with an accuracy of +/- 350-meters. See more information from the manufacturer.

Dataset-specific Instrument Name	Wildlife Computers TDR
Generic Instrument Name	Wildlife Computers Time-Depth Tag (TDR)
Dataset-specific Description	TDR's were epoxied to seals along the dorsal midline. All TDR tags were equipped with an Eco-tech floatation pack and a VHF radio transmitter to allow for tracking and retrieval of the device once it became detached from the animal. TDR sensors were set to sample every 10 seconds and record only dives >2 m in depth or >30 s in duration. In 2009, the TDR's used contained an MK10-AF Argos transmitter.
Generic Instrument Description	Time depth recorders (TDR's) manufactured by Wildlife Computers, Redmond WA) are designed for studies of seals, penguins, fish, and marine mammals. Standard TDR's are mounted externally on the animal's body, where they record temperature and depth. See more information from the manufacturer.

[table of contents | back to top]

Deployments

Seal_Captures

Website	https://www.bco-dmo.org/deployment/58849
Platform	shoreside San_Juan_Islands
Start Date	2007-04-04
End Date	2009-08-03
Description	Locations of seal captures and tagging for the project 'Responses of Seals and Sea Lions to Increased Rockfish Density' (PI: Alejandro Acevedo-Gutiérrez) In 2007 - 2008, seals were captured in Padilla Bay (approx. 48.5165, -122.5168), Bird/Belle Rocks (approx. 48.4860, -122.7602), and Protection Island (approx. 48.1278, -122.9306). In 2009, seals were captured on Protection Island . References:Thomas, AC; Lance, MM; Jeffries, SJ; Miner, BG; Acevedo-Gutierrez, A. 2011. Harbor seal foraging response to a seasonal resource pulse, spawning Pacific herring. Marine Ecology-Progress Series, v.441. p. 225. DOI: 10.3354/meps09370Ward, EJ; Levin, PS; Lance, MM; Jeffries, SJ; Acevedo-Gutierrez, A. 2012. Integrating diet and movement data to identify hot spots of predation risk and areas of conservation concern for endangered species. Conservation Letters, v.5, p. 37. DOI: 10.1111/j.1755-263X.2011.00210.x

[table of contents | back to top]

Project Information

Responses of Seals and Sea Lions to Increased Rockfish Density (Seal_response_to_prey)

Website: http://biol.wwu.edu/mbel/?page=research

Coverage: Salish Sea, USA and Canada

From NSF proposal:
This project is a collaborative study of the responses of harbor seals and other mammalian predators to changes in prey density in Puget Sound. The general study approach will involve multi-year field estimates to observe the responses of predators to rockfish density in protected areas, candidate marine reserves, and unprotected sites.

The collaborating investigators will estimate 1) rockfish density using visual and mark and recapture techniques; 2) predator abundance using aerials surveys and dedicated land observations; and 3) predator food consumption using scat to describe diet, tagging of harbor seals to describe individual foraging sites, and population-based and individual bioenergetics models to describe consumption of rockfish. The investigators will also take into account confounding factors that might explain predator behavior, such as environmental variables and alternative prey, by creating a GIS database from available information from the area. The different field observations and database estimates are explicitly linked through a common hypothesis and coordinated methodologies, and their results will be integrated into a model describing the impact of predation on rockfish populations. The responses of top predators to changes in prey density and their impact on fish populations of interest are unknown. This study will evaluate the effectiveness of MPAs as fish refugia, offer a framework for the management and conservation of marine resources, and provide an exciting opportunity for students to participate in ecological and conservation research.

Hypotheses:
1) Harbor seals and other pinniped species show aggregative responses to changes in prey density. Hence, their abundance will increase with fish density.
2) Harbor seals and other pinniped species show Type 2 or 3 functional responses to changes in prey density. Thus, their consumption rate of a particular prey type follows an asymptotic or sigmoidal curve relative to the prey's density, respectively.
3) Predation by harbor seals and other pinniped species is sufficiently intense that it impedes recovery of depleted fish populations.

Objectives:
1) Quantify the number of harbor seals and other pinniped species in relation to rockfish density and other environmental (confounding) factors.
2) Estimate the consumption rate of harbor seals and other pinniped species in relation to rockfish density and other prey species.
3) Correlatively estimate the influence of predation by harbor seals and other pinniped species on survivorship and population size of rockfish.

Publications resulting from this NSF award:
Bjorland, R. H., Pearson, S. F, Jeffries, S. J, Lance, M. M., Acevedo- Gutiérrez, A. & Ward, E. J. 2015. Stable isotope mixing models elucidate sex and size effects on the diet of a generalist marine predator. Marine Ecology Progress Series 526: 213-225. DOI: 10.3354/meps11230
Bromaghin, J. F., Lance, M. M., Elliott, E. W., Jeffries, S. J., Acevedo-Gutierrez, A. & Kennish, J. M. 2013. New insights into the diets of harbor seals in the Salish Sea of western North America revealed by quantitative fatty acid signature analysis. Fishery Bulletin 111: 13-26. DOI: 10.7755/FB.111.1.2
Buzzell, B.1, Lance, M. & Acevedo-Gutiérrez, A. 2014. Spatial and temporal variation in river otter (Lontra canadensis) diet and predation on rockfish (Genus Sebastes) in the San Juan Islands, Washington. Aquatic Mammals 40: 150- 161. DOI: 10.1578/AM.40.2.2014.150
Howard, S., Lance, M., Jeffries, S. & Acevedo-Gutierrez, A. 2013. Fish consumption by harbor seals (Phoca vitulina) in the San Juan Islands, WA. Fishery Bulletin 111: 27-41. DOI: 10.7755/FB.111.1.3
Lance, M. M., Chang, W.-Y., Jeffries, S. J., Pearson, S. F. & Acevedo-Gutierrez, A. 2012. Harbor seal diet in northern Puget Sound: implications for the recovery of depressed fish stocks. Marine Ecology Progress Series 464:257-271. DOI:10.3354/meps09880

Luxa, K. & Acevedo-Gutierrez, A. 2013. Food habits of harbor seals (*Phoca vitulina*) in two estuaries in the central Salish Sea. Aquatic Mammals 39: 10- 22. DOI: 10.1578/AM.39.1.2013.10
Peterson, S., Lance, M. M., Jeffries, S. J. & Acevedo-Gutierrez, A. 2012. Long distance movements and disjunct spatial use of harbor seals (*Phoca vitulina*) in the inland waters of the Pacific Northwest. PLoS ONE 7: e39046. DOI: 10.1371/journal.pone.0039046
Thomas, AC; Lance, MM; Jeffries, SJ; Miner, BG; Acevedo-Gutierrez, A. 2011. Harbor seal foraging response to a seasonal resource pulse, spawning Pacific herring. Marine Ecology-Progress Series, v.441. p. 225. DOI: 10.3354/meps09370
Ward, EJ; Levin, PS; Lance, MM; Jeffries, SJ; Acevedo-Gutierrez, A. 2012. Integrating diet and movement data to identify hot spots of predation risk and areas of conservation concern for endangered species. Conservation Letters, v.5, p. 37. DOI: 10.1111/j.1755-263X.2011.00210.x
Wilson, K.2, Lance, M., Jeffries, S. & Acevedo-Gutiérrez, A. 2014. Fine-scale variability in harbor seal foraging behavior. PLoS ONE 9: e92838. DOI: 10.1371/journal.pone.0092838.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0550443

[table of contents | back to top]