Visual estimates of seal abundance from aerial surveys conducted by a Cessna-185 in the San Juan Islands, Salish Sea in 2007 (Seal_response_to_prey project)

Website: https://www.bco-dmo.org/dataset/3706
Version: 16 Nov 2012
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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
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Table of Contents

- Dataset Description
  - Methods & Sampling
  - Data Processing Description
- Data Files
- Parameters
- Instruments
- Deployments
- Project Information
- Funding

Dataset Description

Number of seals counted during several aerial surveys of the Salish Sea between March and October of 2007. Data are also available from 2008 surveys.

Related publications: (Both available from Alejandro Acevedo's lab website.)

Howard, S. 2009. Seasonal energy budgets to model energy use and prey consumption in harbor seals (*Phoca vitulina*) in the San Juan Islands, WA. MSc thesis, Department of Biology, Western Washington University, Bellingham, WA.
Hardee, S. 2008. Movements and home ranges of harbor seals (*Phoca vitulina*) in the Georgia Basin: implications for marine reservinland waters of the Pacific Northwest. MSc thesis, Department of Biology, Western Washington University, Bellingham, WA.

Methods & Sampling

Following protocol from Jeffries et al. (2003), with collaboration from the Washington Department of Fish and Wildlife, surveys were flown in a Cessna 185 at 200 to 300 m, moving at 90 kt, on two or three consecutive days during moderately low tides. Flights were made over the region moving with the tide, to cover the entire

area within +/- 2 h from low tide. Visual counts were taken on sites with < 25 seals and digital photographs and visual counts were taken concurrently at sites with > 25 animals, using a Nikon D100 with a 200 mm lens. The time was documented on the survey log for all haul-out counts, haul-out estimates and photographs. Surveys were conducted under permit 782-1702 awarded to the Washington Department of Fish and Wildlife by the Office of Protected Resources.

Selection of flight times was not only dependent on tidal conditions but also on time of day. If one chooses tidal heights that are extremely low, there is a risk that the survey underestimates the number of seals in the region because normal haul-out sites may be inaccessible (Jeffries, pers. comm.). Additionally, fog may become problematic for flying if the tide window, especially in August, is too early in the morning. These factors were taken into account when selecting the survey dates.

References:
Jeffries SJ, Huber HR, Calambokidis J, Laake J (2003) Trends and status of harbor seals in Washington State: 1978-1999. Journal of Wildlife Management 67:208-219. Available online from Washington Department of Fish and Wildlife.
Huber HR, Jeffries SJ, Brown RF, DeLong RL, Van Blaricom G (2001) Correcting aerial survey counts of harbor seals (*Phoca vitulina richardsi*) in Washington and Oregon. Marine Mammal Science 17:276-293.
DOI: 10.1111/j.1748-7692.2001.tb01271.x

Data Processing Description

The estimation of seal population size based on haul-out counts requires a correction factor to account for seals in the water at the time of the survey (Huber et al. 2001, Jeffries et al. 2003), however, correction factors have NOT been applied to these data.

BCO-DMO made the following edits to the dataset:
- Blanks and 'NA' were replaced with 'nd' to indicate 'no data';
- Parameter names were modified to conform with BCO-DMO conventions;
- Added day, month, and year columns using dates in original data provided.

[table of contents | back to top]

Data Files

File
seal_counts_2007.csv (Comma Separated Values (.csv), 80.48 KB) MD5:995eb1ce0bd73cb3ad1392694650f330 Primary data file for dataset ID 3706

[table of contents | back to top]

Parameters

Parameter	Description	Units
date	Month, day, and year in mmddyy format.	mmddyy
month	2-digit month of year.	mm (01 to 12)
day	2-digit day of month.	dd (01 to 31)
year	4-digit year.	YYYY
site	Name of the haulout/sampling site.	text
site_code	Numeric identifier for the sampling site.	unitless
lat	Latitude; North = positive.	decimal degrees
lon	Longitude; West = negative.	decimal degrees
region	Region identification number.	unitless
count_total	Total number of seals.	unitless
count_non_pup	Number of seals, excluding pups.	unitless
count_pups	Number of pups.	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Camera
Generic Instrument Name	Camera
Dataset-specific Description	Photos were taken with a Nikon D100 with a 200 mm lens.
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

[table of contents | back to top]

Deployments

Aerial_Survey_2007_SRtP

Website	https://www.bco-dmo.org/deployment/58886
Platform	Cessna-185
Start Date	2007-03-20
End Date	2007-10-25
Description	With collaboration from the Washington Department of Fish and Wildlife, aerial surveys of harbor seals were flown in a Cessna 185 at 200 to 300 m. Points represent the locations where surveys took place. Nine flights were made over the same locations between 03/20/2007 and 10/25/2007 in support of the project "Responses of Seals and Sea Lions to Increased Rockfish Density".

[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
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[table of contents | back to top]