

# Summary of prey groups found in harbor seal scat samples from the San Juan Islands analyzed at the Acevedo lab at Western Washington University during 2005-2008 (Seal\_response\_to\_prej project)

**Website:** <https://www.bco-dmo.org/dataset/3786>

**Data Type:** Other Field Results

**Version:** 1

**Version Date:** 2012-12-12

## Project

» [Responses of Seals and Sea Lions to Increased Rockfish Density](#) (Seal\_response\_to\_prej)

Contributors	Affiliation	Role
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## Abstract

Frequency of occurrence of taxonomic groups of prey identified in harbor seal scat samples collected from 2005 to 2008, summarized by region and season. Four regions of the San Juan Islands of Washington state were sampled: Eastern Bays, Rosario Strait, San Juan Channel, and the Southern Strait of Georgia.

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## Coverage

**Temporal Extent:** 2005 - 2008

## Dataset Description

Frequency of occurrence of taxonomic groups of prey identified in harbor seal scat samples collected from 2005 to 2008, summarized by region and season. Four regions of the San Juan Islands of Washington state were sampled: Eastern Bays, Rosario Strait, San Juan Channel, and the Southern Strait of Georgia.

Also see the related dataset, seal\_prej\_species\_counts (<https://www.bco-dmo.org/dataset/3817>), where

counts are provided for individual species by season (with no distinction between sampling regions).

Data and methods, including sample sizes, are described in:

**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](https://doi.org/10.3354/meps09880)

## Methods & Sampling

### From Lance et al.:

From 2005 to 2008, fecal samples (scats) were collected seasonally over 3 collection periods: March to early June ('spring'), late July to September ('summer/fall'), and January to February ('winter'). Scats were collected from 23 haul-out locations during daytime low tides. The sites were dispersed throughout the study area, represented various habitat types used by harbor seals, were the largest haul-outs where adequate sample sizes could be collected, and were easily accessible by boat. Two or three collection trips were made each season, with a target sample size of 60 scats per season per region.

Samples were stored frozen. In the lab, samples were enclosed in fine mesh paint-strainer bags and cleaned using a washing machine or nested sieves. Hard parts were cleaned and stored dry. Prey were identified to lowest possible taxon using a dissecting microscope, reference fish bone collections, and published keys. Fish species from fecal samples were placed into 11 non-overlapping prey groups based on taxonomy. Taxonomic resolution (species vs. family or genus) was based on resolution of the prey remains. The category 'other' included for all remaining prey species with unweighted occurrence frequencies <5%. Rockfish were included as a prey group despite an overall low occurrence frequency because of conservation interest and the objectives of the present study. To gain insights into seasonal diet variation, the frequencies were weighted by the numbers of seals present in each region in the spring and summer/fall

## Data Processing Description

BCO-DMO made the following modifications:

- Changed parameter names to conform with BCO-DMO convention.
- Replaced spaces with underscores.

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## Data Files

File
<b>seal_preby_region.csv</b> (Comma Separated Values (.csv), 4.63 KB) MD5:b99bf4e00ed76e69a177b4adbf682d0
Primary data file for dataset ID 3786

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## Related Publications

Lance, M., Chang, W., Jeffries, S., Pearson, S., & Acevedo-Gutiérrez, 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](https://doi.org/10.3354/meps09880)  
*Methods*

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## Parameters

Parameter	Description	Units
region	Name of the geographical sampling region.	text
taxon	Name of the prey group.	text
freq_of_occurrence	Frequency of occurrence (FO). Proportion of the number of occurrences of the fish species out of the total number of scat samples.	%
season	Sampling season:  Spring = March to early June,  Summer/Fall = late July to September,  Winter = January to February.	text

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## Deployments

### lab\_Acevedo

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58897">https://www.bco-dmo.org/deployment/58897</a>
<b>Platform</b>	WWU
<b>Start Date</b>	2005-03-01
<b>End Date</b>	2008-02-01
<b>Description</b>	Marine Behavior and Ecology Lab at Western Washington University, led by Alejandro Acevedo-Gutierrez, lead PI for the project "Responses of Seals and Sea Lions to Increased Rockfish Density" (NSF OCE-0550443). Address: Department of Biology Western Washington University 516 High St. Bellingham, WA 98225

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## Project Information

### Responses of Seals and Sea Lions to Increased Rockfish Density (Seal\_response\_to\_preys)

**Website:** <http://biol.wvu.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 aerial 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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/10.1371/journal.pone.0092838).

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## **Funding**

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0550443</a>

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