

Sperm whale skin bulk C and N isotopes from the California Current System, 1972 to 2005

Website: <https://www.bco-dmo.org/dataset/653047>

Data Type: Other Field Results

Version: 1

Version Date: 2016-08-02

Project

» [A novel approach for evaluating temporal and spatial changes in trophic structure of the mesopelagic eastern Pacific](#) (Sperm Whale SI Ratios)

Contributors	Affiliation	Role
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Abstract

This dataset includes sperm whale skin bulk C and N isotopes. A total of 18 skin samples were analyzed. The sperm whale skin tissue came from the California Current System, 1972 to 2005.

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Coverage

Spatial Extent: N:46.97 E:-117.35 S:32.47 W:-129.82

Temporal Extent: 1972-12 - 2005-07

Acquisition Description

Materials and methods for analysis are described in detail in the Ruiz_Cooly et al (2014). Bulk isotope values were analyzed by continuous flow isotope ratio mass spectrometry (IRMS; Thermo Finnigan) and standardized relative to Vienna-Pee Belemnite (V-PDB) for carbon and atmospheric N₂ for nitrogen. Results are expressed in part per thousand (‰) and standard notation: $dHX = [(R_{\text{sample}}/R_{\text{standard}})] \times 1000$, where H is the mass number of the heavy isotope, X is either C or N, and R_{sample} and R_{standard} are the ratio of ¹³C/¹²C or ¹⁵N/¹⁴N in the sample and standard, respectively.

Processing Description

Regression analyses were conducted to evaluate linear relationship between time and each isotopic tracer.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard

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Related Publications

Ruiz-Cooley, R. I., Koch, P. L., Fiedler, P. C., & McCarthy, M. D. (2014). Carbon and Nitrogen Isotopes from Top Predator Amino Acids Reveal Rapidly Shifting Ocean Biochemistry in the Outer California Current. *PLoS ONE*, 9(10), e110355. doi:[10.1371/journal.pone.0110355](https://doi.org/10.1371/journal.pone.0110355)
Results

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Related Datasets

IsRelatedTo

Koch, P. L., McCarthy, M. D. (2016) **Compound-specific carbon isotopes from sperm whale skin tissue from the UC-Santa Cruz labs of P. Koch and M. McCarthy (Sperm Whale SI Ratios project)**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2016-08-02 <http://lod.bco-dmo.org/id/dataset/653106> [[view at BCO-DMO](#)]

Koch, P. L., McCarthy, M. D. (2016) **Compound-specific nitrogen isotopes from sperm whale skin tissue from the UC-Santa Cruz labs of P. Koch and M. McCarthy (Sperm Whale SI Ratios project)**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2016-08-02 <http://lod.bco-dmo.org/id/dataset/653061> [[view at BCO-DMO](#)]

Koch, P. L., McCarthy, M. D. (2016) **Sperm whale skin tissue samples analyzed for C and N at UC-Santa Cruz: date and location of collection from the California Current System**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2016-08-02 <http://lod.bco-dmo.org/id/dataset/653118> [[view at BCO-DMO](#)]

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Parameters

Parameter	Description	Units
SWFSC_id	identification number assigned to sample at Southwest Fisheries Science Center	unitless
UCSC_id	identification number assigned to sample at UC Santa Cruz	unitless
date_collected	date sample was collected; format: yyyy-mm	year; month
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
d13C	delta 13 C. Isotope values are reported in conventional d-notation relative to the international standard V-PDB.	parts per thousand
d15N	delta 15 N. Isotope values are reported in conventional d-notation relative to the international standard atmospheric N2.	parts per thousand

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Thermo Finnigan DeltaPlus XP isotope ratio mass spectrometer (Thermo Scientific, Bremen, Germany)
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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Deployments

lab_UCSC_Koch

Website	https://www.bco-dmo.org/deployment/652950
Platform	UCSC
Start Date	2012-03-01
End Date	2016-03-01
Description	whale isotope studies

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Project Information

A novel approach for evaluating temporal and spatial changes in trophic structure of the mesopelagic eastern Pacific (Sperm Whale SI Ratios)

Coverage: California Current, Eastern Tropical Pacific, and the Peru-Humboldt Current

Description from NSF award abstract:

Anthropogenic and natural climatic perturbations drive changes in population dynamics of species, the structure and function of food webs, and biogeochemical processes. The PIs propose a comparative analysis of three major ecosystems to investigate temporal change in the structure of mesopelagic food webs.

The PIs will investigate temporal changes in the structure of mesopelagic food webs in three major ecosystems: the California Current, Eastern Tropical Pacific, and the Peru-Humboldt Current over the past 50 years using a globally distributed apex predator as an indicator species. The predator is the sperm whale, *Physeter macrocephalus*, and the PIs will use stable isotope ratios of carbon and nitrogen as indicators of habitat and diet. Isotope values from bulk tissues of teeth and skin (C and N) as well as specific amino acids (N) will be used to address two primary objectives: (a) examine temporal patterns in the trophic position of sperm whales (as an indicator of changes in mesopelagic trophic structure) and baseline isotopic values (as indicators of nutrient cycling); and (b) use isotopic values, which vary among systems, to define the population structure of sperm whales from past and present times, and connectivity among populations.

This project will be conducted by researchers from academia and NOAA/NMFS with expertise in stable isotope analysis, trophic ecology, and ecosystem-based management of protected species. As such, it represents an opportunity for collaboration between scientists with complementary skills and from diverse institutions to compare structure and function of ecosystems across the eastern Pacific. Moreover, it represents a collaboration between academia and a federal agency with research and management responsibilities. The project will support a postdoctoral scholar (Iliana Ruiz-Cooley), a Ph.D. student, and undergraduate students to enhance their career and collaborative opportunities. The PIs anticipate that the results of their study will provide unique data to evaluate the effects of perturbations within and among mesopelagic ecosystems. This information may allow the scientific community to relate trends in climate to changes in trophic position of top predators and nutrient cycling, allowing more robust understanding of possible responses to future warming. Finally, as the first systematic applications of compound-specific stable isotope analysis to marine mammals, the project should be highly instructive for future evaluations of the feeding ecology, population structure and dynamics of endangered marine mammals. As such, this novel approach and unique historic perspective will be directly applicable for stock assessment and management.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1155728

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