Bulk raw isotopic data from tissue samples from three species of tunas collected in the eastern tropical Pacific Ocean onboard commercial tuna purse-seine vessels from 2003-2005

Website: https://www.bco-dmo.org/dataset/675055
Data Type: Cruise Results
Version: 1
Version Date: 2017-01-17

Project
» CAMEO 2009 - A novel tool for validating trophic position estimates in ecosystem-based fisheries models (CAMEO_Trophic_Position)

Program
» Comparative Analysis of Marine Ecosystem Organization (CAMEO)

Contributors	Affiliation	Role
Olson, Robert	Inter-American Tropical Tuna Commission (IATTC)	Principal Investigator, Contact
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Abstract
Bulk raw isotopic data from tissue samples from three species of tunas collected in the eastern tropical Pacific Ocean onboard commercial tuna purse-seine vessels.

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Coverage

Spatial Extent: **N**:8.9 **E**:-92.57 **S**:-4.18 **W**:-139.82
Temporal Extent: 2003-10-15 - 2005-07-05

Dataset Description

Bulk raw isotopic data from tissue samples from three species of tunas collected in the eastern tropical Pacific Ocean onboard commercial tuna purse-seine vessels.

Methods & Sampling

Sampling Methodology: Three species of tuna, yellowfin (Ta.; *Thunnus albacares*), skipjack (Kp.; *Katsuwonus*

pelamis), and bigeye (To.; *Thunnus obesus*) tunas, were sampled year-round during 2003-2005 by observers of the Inter-American Tropical Tuna Commission onboard purse-seine fishing vessels. Samples of dorsal white muscle were taken from each fish adjacent to the second dorsal fin. Fish of uniform size were used for analysis: skipjack tuna 450-550 mm, yellowfin tuna 500-700 mm, and bigeye tuna 450-550 mm. All samples were stored frozen until further processing in the laboratory.

Analytical Methodology: Methods are described in Hetherington et al. (2016). Briefly: Isotopic analysis of bulk muscle tissue of the tunas was performed at the University of Hawaii's Isotope Biogeochemistry Laboratory. Stable isotope values of nitrogen were determined using an on-line carbon-nitrogen analyzer coupled with an isotope ratio mass spectrometer (FinniganConFlo II/Delta-Plus). Isotope values are reported in conventional delta-notation relative to the international standards, atmospheric N2 and V-PDB, for N and C, respectively. Mean accuracy of all stable isotopic analyses was < +/- 0.1 ‰ (1 sd) based on triplicate analysis of in-house reference materials (glycine standard and tuna muscle) with known δ15N values.

Data Processing Description

Data Processing: Stable isotope analysis of carbon and nitrogen isotopes measures the ratio of the heavier, rare isotope to the lighter, more common isotope (13C:12C or δ13C;15N:14N or δ15N) expressed as parts per mil (‰) relative to a standard (air for N, V-PDB for C).

BCO-DMO Processing:
- modified parameter names to conform with BCO-DMO naming conventions;
- re-formatted date to yyyy-mm-dd;
- replaced spaces with underscores in species name column.

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Data Files

File	
bulk_raw_isotopes_tunas.csv	(Comma Separated Values (.csv), 3.08 KB) MD5:69c68ba19006fb53024f6f27a8720f95
Primary data file for dataset ID 675055	

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Related Publications

Choy, C. A., Popp, B. N., Hannides, C. C. S., & Drazen, J. C. (2015). Trophic structure and food resources of epipelagic and mesopelagic fishes in the North Pacific Subtropical Gyre ecosystem inferred from nitrogen isotopic compositions. Limnology and Oceanography, 60(4), 1156–1171. doi:10.1002/lno.10085
General

Hetherington, E. D., Olson, R. J., Drazen, J. C., Lennert-Cody, C. E., Ballance, L. T., Kaufmann, R. S., & Popp, B. N. (2016). Spatial food-web structure in the eastern tropical Pacific Ocean based on compound-specific nitrogen isotope analysis of amino acids. Limnology and Oceanography, 62(2), 541–560. doi:10.1002/lno.10443
Methods

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Parameters

Parameter	Description	Units
species	name of the species	unitless
sample_number	alphanumeric sample identification number; 2 letter codes representing genus/species names (see species column) followed by sequential numbers 1-15.	unitless
set_number	arbitrary set number (purse-seine sets that caught tunas). Note: IATTC confidentiality rules prohibit divulging the fishing activities of individual vessels.	unitless
lat	latitude of catch location; decimal degrees with S latitude as negative numbers	decimal degrees
lon	longitude of catch location; decimal degrees with W longitude as negative number	decimal degrees
date	date on which tuna were captured and sampled formatted as yyyy-mm-dd	unitless
length	fork-length of tuna in millimeters	millimeters (mm)
sex	sex of the tuna. 1=male, 2=female, 3=undetermined.	numeric (1 to 3)
replicate	replicate number for sets from which replicate samples (up to 3 individuals) were taken	unitless
d15N	delta 15 N. Isotope values are reported in conventional d-notation relative to the international standard atmospheric N2.	parts per thousand (per mil, ‰)
d13C	delta 13 C. Isotope values are reported in conventional d-notation relative to the international standard V-PDB.	parts per thousand (per mil, ‰)
Molar_C_to_N	molar carbon to nitrogen ratio	dimensionless (ratio)

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Instruments

Dataset-specific Instrument Name	Carbon-Nitrogen Analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Stable isotope values of nitrogen were determined using an on-line carbon-nitrogen analyzer coupled with an isotope ratio mass spectrometer (FinniganConFlo II/Delta-Plus).
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	Isotope-ratio Mass Spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Stable isotope values of nitrogen were determined using an on-line carbon-nitrogen analyzer coupled with an isotope ratio mass spectrometer (FinniganConFlo II/Delta-Plus).
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).

Dataset-specific Instrument Name	Purse-seine Fishing Gear
Generic Instrument Name	Purse-seine Fishing Gear
Dataset-specific Description	Three species of tuna were collected using purse-seine gear from commercial fishing vessels.
Generic Instrument Description	A purse seine is a large wall of netting deployed in a circle around an entire school of fish. The seine has floats along the top line with a lead line of chain along the bottom. Once a school of fish is located, a skiff pulls the seine into the water as the vessel encircles the school with the net. A cable running along the bottom is then pulled in, "pursing" the net closed on the bottom, preventing fish from escaping by swimming downward. The catch is harvested by bringing the net alongside the vessel and brailing the fish aboard.

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Deployments

IATTC_03-05

Website	https://www.bco-dmo.org/deployment/675077
Platform	Fishing Vessels
Start Date	2003-01-01
End Date	2005-12-31
Description	Three species of tuna, yellowfin (Ta.; Thunnus albacares), skipjack (Kp.; Katsuwonus pelamis), and bigeye (To.; Thunnus obesus) tunas, were sampled year-round during 2003-2005 by observers of the Inter-American Tropical Tuna Commission onboard purse-seine fishing vessels.

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Project Information

CAMEO 2009 - A novel tool for validating trophic position estimates in ecosystem-based fisheries models (CAMEO_Trophic_Position)

Website: http://cameo.noaa.gov/pres_bpopp.html

Coverage: Subtropical North Pacific Ocean

(*From NSF Award Abstract*)

Evidence increasingly demonstrates that selective removal of marine life can induce restructuring of marine food webs. Trophic structure is the central component of mass balance models, widely used tools to evaluate fisheries in an ecosystem context. Food web structure is commonly determined by stomach contents or by bulk tissue stable isotope analyses, both of which are limited in terms of resolution and versatility. The investigators will refine a tool, Amino Acid Compound-Specific Isotopic Analyses (AA-CSIA), which can be broadly applicable for quantifying the time-integrated trophic position (TP) of consumers. Differences in source and trophic nitrogen isotopic composition for specific amino acids will provide an unambiguous and integrated measure of fractional trophic TP across multiple phyla, regardless of an animal's physiological condition or of the biogeochemical cycling at the base of the food web. AA-CSIA will allow testing of the efficacy of trophic position estimates derived from ecosystem-based models and promote the evolution of these models into decision-support tools.

This project has three goals: 1. To validate the application of AA-CSIA across multiple marine phyla under differing physiological conditions. 2. To compare the application of AA-CSIA across systems with contrasting biogeochemical cycling regimes. 3. To develop the use of AA-CSIA TP estimates for validating trophic models of exploited ecosystems. The investigators will test and refine the approach using a combination of laboratory feeding experiments and field studies across regions with differing biogeochemical cycling regimes. They will determine the applicability of the AA-CSIA approach in a variety of marine organisms assessed in controlled studies. Subsequently, ecosystem components will be sampled from the eastern tropical Pacific, coastal California and the subtropical Pacific gyre. They will also test the effects of sample preservation on the isotopic composition of individual AA to determine whether the approach can be used on archived samples. This tool will allow testing of the efficacy of ecosystem-based models currently used to gain insight into the ecological effects of fisheries removals and improve the reliability of future models required to manage marine resources. In addition to the goal of developing AA-CSIA for use as a TP indicator, the information obtained through this project will provide important species-specific biological data on the feeding behavior of marine organisms that could have implications for their resilience to anthropogenic pressures and climate change.

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Program Information

Comparative Analysis of Marine Ecosystem Organization (CAMEO)

Website: http://www.nsf.gov/geo/oce/programs/CAMEO_Webpage.jsp

CAMEO Science Plan (2012).

The Comparative Analysis of Marine Ecosystem Organization (CAMEO) program was implemented as a partnership between the NOAA National Marine Fisheries Service and National Science Foundation Division of Ocean Sciences. The purpose of CAMEO was to strengthen the scientific basis for an ecosystem approach to the stewardship of our ocean and coastal living marine resources. The program supported fundamental research to understand complex dynamics controlling ecosystem structure, productivity, behavior, resilience, and population connectivity, as well as effects of climate variability and anthropogenic pressures on living marine resources and critical habitats. CAMEO encouraged the development of multiple approaches, such as ecosystem models and comparative analyses of managed and unmanaged areas (e.g., marine protected areas) that can ultimately form a basis for forecasting and decision support. Central to the program was the emphasis on collaborations between academic and private researchers and federal agency scientists with mission responsibilities to inform ecosystem management activities. (adapted from CAMEO website)

This funding opportunity implemented CAMEO research by supporting the development of research tools and strategic approaches through the following types of proposals:

1. Development of strategies and methodologies for comparative analyses that can be applied consistently across spatial and temporal scales and ecosystems, and that facilitate the design of decision support tools for marine populations, ecosystems and habitats.

2. Development of models that address key scientific questions by comparing ecosystems and ecosystem processes. Models that are geographically and temporally portable, and that incorporate assessment of modeling skill, are particularly encouraged.

3. Retrospective studies that analyze, re-analyze or synthesize existing information (historic, time-series, ongoing program, etc.) using a comparative approach.

4. Studies that integrate the human dimension within ecosystem dynamics. The CAMEO program seeks to promote interdisciplinary research using comparative approaches to link marine ecosystem research with the social and behavioral sciences in new and vital ways.

To guide program priorities, a Science Steering Committee was formed through Dr. Linda Deegan and the initial Scientific Planning Office at the Marine Biological Laboratory in Woods Hole, MA. This Committee was designed to provide scientific advice and broad direction to NOAA and NSF regarding the CAMEO program.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1040810

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