

Nautical Area Scattering Coefficients (NASC) from R/V New Horizon cruises NH1106 and NH1006 in the Guaymas Basin in 2010 and 2011 (Jumbo Squid Physiology project)

Website: <https://www.bco-dmo.org/dataset/4013>

Data Type: Cruise Results

Version: 1

Version Date: 2013-08-15

Project

» [Hypoxia and the ecology, behavior and physiology of jumbo squid, *Dosidicus gigas*](#) (Jumbo Squid Physiology)

Contributors	Affiliation	Role
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Abstract

Integrated, area scattering values, or Nautical Area Scattering Coefficients (NASC) are provided from two cruises in the Guaymas Basin that occurred in June 2010 and June 2011. Also included are the time (UTC) and location at the start and end of each integration bin, mean depth of the exclusion line for each bin, and the average thickness of the integrated cell. Raw acoustic scattering data (.raw files) are extremely large. These are archived at Oregon State University and will be shared using physical media upon request.

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Coverage

Spatial Extent: N:28.8788278 E:-110.904157 S:27.2431833 W:-113.2795402

Temporal Extent: 2010-06-04 - 2011-06-22

Dataset Description

Integrated, area scattering values, or Nautical Area Scattering Coefficients (NASC) are provided from two cruises in the Guaymas Basin that occurred in June 2010 and June 2011. Also included are the time (UTC) and location at the start and end of each integration bin, mean depth of the exclusion line for each bin, and the average thickness of the integrated cell.

Raw acoustic scattering data (.raw files) are extremely large. These are archived at Oregon State University and will be shared using physical media upon request.

Methods & Sampling

Acoustic data were collected nearly continuously using Simrad EK60s at 4 frequencies (38, 70, 120, and 200 kHz). Split beam transducers (Simrad model numbers: 38-12, 70-7c, 120-7c, 200-7c) were mounted 1.5 m below the surface on a rigid pole. Each transmitted a 512 us pulse as frequently as possible for the water depth. Raw data were stored using Simrad ER60 software.

Noise from splash down, electrical interference, and CTD casts were flagged as 'bad data' using Echoview software before integration. Acoustic backscattering values at 38 kHz that were greater than -75 dB were integrated in 1 km horizontal bins from depths of 5m to 500m or 1 m above the bottom, whichever was shallower. These integrated, area scattering values or Nautical Area Scattering Coefficients (NASC: $m^2 nmi^{-2}$) are provided.

Data Processing Description

BCO-DMO Processing Notes:

- Modified parameter names to conform with BCO-DMO naming conventions.
- Replaced values of '999' in the lat and lon columns with 'nd' to indicate 'no data'.
- Reformatted display of time from HH:MM:SS to HHMM.mmmm

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Data Files

File
acoustics.csv (Comma Separated Values (.csv), 585.33 KB) MD5:db8b348d6adf296199190094e0df94a3 Primary data file for dataset ID 4013

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Parameters

Parameter	Description	Units
cruise_id	Cruise identifier.	text
cruise_start_date	Year, month, and day cruise began in YYYYmmdd format.	unitless
cruise_end_date	Year, month, and day cruise ended in YYYYmmdd format.	unitless
date_start	Date at start of integration bin in YYYYmmdd format.	unitless
time_start	Time (UTC) at start of integration bin in hours, minutes, and decimal minutes.	HHMM.mmmm
date_end	Date at end of integration bin in YYYYmmdd format.	unitless
time_end	Time (UTC) at end of integration bin in hours, minutes, and decimal minutes.	HHMM.mmmm
NASC	Nautical Area Scattering Coefficient (NASC).	m ² nmi ⁻²
lat_start	Latitude at start of integration bin.	decimal degrees
lon_start	Longitude at start of integration bin.	decimal degrees
lat_end	Latitude at end of integration bin.	decimal degrees
lon_end	Longitude at end of integration bin.	decimal degrees
exclusion_line_mean_depth	Mean depth of the exclusion line for each bin.	meters
integration_layer_thickness_mean	Average thickness of the integrated cell.	meters

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Instruments

Dataset-specific Instrument Name	Simrad EK-60 echosounder
Generic Instrument Name	Simrad EK-60 echosounder
Dataset-specific Description	Acoustic data were collected nearly continuously using Simrad EK60s at 4 frequencies (38, 70, 120, and 200 kHz). Split beam transducers (Simrad model numbers: 38-12, 70-7c, 120-7c, 200-7c) were mounted 1.5 m below the surface on a rigid pole.
Generic Instrument Description	A split-beam scientific echosounder primarily designed for fisheries research. It can operate seven frequencies simultaneously ranging from 18 to 710 kHz. Real time echo integration and target strength analysis in an unlimited number of layers is provided as well as storage of raw data for replay or analysis in one of several post-processing software packages such as Simrad's BI60.

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Deployments

NH1106

Website	https://www.bco-dmo.org/deployment/59060
Platform	R/V New Horizon
Start Date	2011-06-04
End Date	2011-06-22
Description	Cruise information and original data are available from the NSF R2R data catalog. Additional pre-cruise information is available from Scripps Institution of Oceanography Ship Operations & Marine Technical Support.

NH1006

Website	https://www.bco-dmo.org/deployment/59062
Platform	R/V New Horizon
Start Date	2010-06-03
End Date	2010-06-16
Description	Pre-cruise information is available from Scripps Institution of Oceanography Ship Operations & Marine Technical Support.

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Project Information

Hypoxia and the ecology, behavior and physiology of jumbo squid, *Dosidicus gigas* (Jumbo Squid Physiology)

Coverage: Guaymas Basin, Gulf of California, Mexico (27 N 112 W) and Monterey Bay, CA (36 N 123 W)

This project concerns the ecological physiology of *Dosidicus gigas*, a large squid endemic to the eastern Pacific where it inhabits both open ocean and continental shelf environments. Questions to be addressed include:

- 1) How does utilization of the OML by *D. gigas* vary on both a daily and seasonal basis, and how do the vertical distributions of the OML and its associated fauna vary?
- 2) What behaviors of squid are impaired by conditions found in the OML, and how are impairments compensated to minimize costs of utilizing this environment? and
- 3) What are the physiological and biochemical processes by which squid maintain swimming activity at such remarkable levels under low oxygen conditions?

The investigators will use an integrated approach involving oceanographic, acoustic, electronic tagging, physiological and biochemical methods. *D. gigas* provides a trophic connection between small, midwater organisms and top vertebrate predators, and daily vertical migrations between near-surface waters and a deep, low-oxygen environment (OML) characterize normal behavior of adult squid. Electronic tagging has shown that this squid can remain active for extended periods in the cold, hypoxic conditions of the upper OML. Laboratory studies have demonstrated suppression of aerobic metabolism during a cold, hypoxic challenge, but anaerobic metabolism does not appear to account for the level of activity maintained. Utilization of the OML in the wild may permit daytime foraging on midwater organisms. Foraging also occurs near the surface at night, and *Dosidicus* may thus be able to feed continuously. *D. gigas* is present in different regions of the Guaymas Basin on a predictable year-round basis, allowing changes in squid distribution to be related to changing oceanographic features on a variety of time scales.

This research is of broad interest because *Dosidicus gigas* has substantially extended its range over the last decade, and foraging on commercially important finfish in invaded areas off California and Chile has been reported. In addition, the OML has expanded during the last several decades, mostly vertically by shoaling, including in the Gulf of Alaska, the Southern California Bight and several productive regions of tropical oceans, and a variety of ecological impacts will almost certainly accompany changes in the OML. Moreover, *D. gigas* currently supports the world's largest squid fishery, and this study will provide acoustic methods for reliable biomass estimates, with implications for fisheries management in Mexico and elsewhere.

This award is funded under the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). This is a Collaborative Research project encompassing three NSF-OCE awards.

Background Publications:

Stewart, J.S., Field, J.C., Markaida, U., and Gilly, W.F. 2013. Behavioral ecology of jumbo squid (*Dosidicus gigas*) in relation to oxygen minimum zones. *Deep Sea Research Part II: Topical Studies in Oceanography*, 95, 197-208. doi:[10.1016/j.dsr2.2012.06.005](https://doi.org/10.1016/j.dsr2.2012.06.005).

Gilly, W.F., Zeidberg, L.D., Booth, J.A.T, Stewart, J.S., Marshall, G., Abernathy, K., and Bell, L.E. 2012. Locomotion and behavior of Humboldt squid, *Dosidicus gigas*, in relation to natural hypoxia in the Gulf of California, Mexico. *The Journal of Experimental Biology*, 215, 3175-3190. doi: [10.1242/jeb.072538](https://doi.org/10.1242/jeb.072538).

Related Project: [Physiological limits to vertical migrations of the pelagic, jumbo squid, *Dosidicus gigas* in the Gulf of California](#)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0851239

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