# Binned CTD data from R/V New Horizon cruise NH1106 in Guaymas in 2011 (Jumbo Squid Physiology project)

**Website**: https://www.bco-dmo.org/dataset/471773
**Version**: 20 Nov 2013
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**Project**
» Hypoxia and the ecology, behavior and physiology of jumbo squid, Dosidicus gigas (Jumbo Squid Physiology)

| Contributors | Affiliation | Role |
|---|---|---|
| Gilly, William | Stanford University | Principal Investigator |
| Rauch, Shannon | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

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## Dataset Description

1-meter binned CTD data from 20 casts made during the NH1106 cruise in the Guaymas Basin. Data include figures of each cast (as PDF files) made using the Seabird SeaPlot program of SBE Data Processing.

## Methods & Sampling

See the header file (.txt) from CTD cast 01.

**Calibration Sheets (PDF files):**
primary temperature sensor (SBE3)
primary conductivity sensor (SBE4)
oxygen sensor (SBE43)
PAR sensor (Biospherical QSP-2300)

## Data Processing Description

1 m binning was carried out with SBE Data Processing. Oxygen was processed using tau and hysteresis corrections (as recommended by Seabird for the SBE43 sensor).

BCO-DMO Processing Notes: parameter names modified to conform with BCO-DMO naming conventions; removed 'flag' column (all values were 0).

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## Data Files

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| File |
|------|
| **ctd_NH1106.csv** (Comma Separated Values (.csv), 5.08 MB)<br>MD5:5865f6a3b3258f152fca87b64185cb94<br><br>Primary data file for dataset ID 471773 |

## Parameters

| Parameter | Description | Units |
|-----------|-------------|-------|
| cast | Cast number. | dimensionless |
| date_start_utc | Date (UTC) at start of cast. | YYYYmmdd |
| time_start_utc | Time (UTC) at start of cast. | HHMM.xx |
| date_start_local | Date (local time) at start of cast). | YYYYmmdd |
| time_start_local | Time (local) at start of cast. | HHmm.xx |
| lat_start | Latitude at start of cast. Positive = North. | decimal degrees |
| lon_start | Longitude at start of cast. Negative = West. | decimal degrees |
| PDF | PDF file containing graph of temp, O2, sal, and fluor vs. depth from the CTD cast. | dimensionless |
| depth | Depth; originally named 'depSM'. | meters |
| temp | Temperature from primary sensor (SBE3); originally named 't090C'. | degrees Celsius (ITS-90) |
| sal | Salinity; originally named 'sal00'. | practical salinity units (PSU) |
| O2_umol_kg | Oxygen from SBE43; originally named 'sbeox0Mm/Kg'. | micromoles per kilogram (umol/kg) |
| O2_sat_pcnt | Percent saturation of oxygen from SBE43; originally named 'sbeox0PS'. | % |
| time_elapsed | Time elapsed since start of cast. Originally named 'timeS'. | seconds |
| fluor | Fluorescence from Seapoint fluorometer. Originally named 'flSP'. Range: 0-50 ug/L. Gain was set at 3X. | micrograms per liter (ug/L) |
| par | PAR/irradiance from Biospherical QSP-2300. | microEinsteins per square meter per second (uE/m2*sec) |

## Instruments

| Dataset-specific Instrument Name | CTD SBE 911plus |
|---|---|
| Generic Instrument Name | CTD Sea-Bird SBE 911plus |
| Generic Instrument Description | The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics |

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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 Scipps 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 predicable year-round basis, allowing changes in squid distribution to be related to changing oceanographic features on a variety 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.
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.

Related Project: Physiological limits to vertical migrations of the pelagic, jumbo squid, Dosidicus gigas in the Gulf of California

## Funding

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