

# Behavioral metrics of swimming Hydromedusae in a turbulence generator near Friday Harbor dock and laboratory in 2012 (Jellyfish predation in turbulence project)

**Website:** <https://www.bco-dmo.org/dataset/650006>

**Data Type:** experimental

**Version:**

**Version Date:** 2016-07-06

## Project

» [Influence of organism-scale turbulence on the predatory impacts of a suite of cnidarian medusae](#) (jellyfish predation in turbulence)

| Contributors                            | Affiliation   | Role                        |
|---|---|-----------------------------|
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## Dataset Description

Swimming behaviors of four species of cnidarian hydromedusae (*Aequorea victoria*, *Mitrocoma cellularia*, *Stomatoca atra*, *Aglantha digitale*) exposed to two flow conditions in a laboratory turbulence generator - still water and turbulent ( $\epsilon \sim 10^{-7} \text{ m}^2 \text{ s}^{-3}$ ).

### Related Datasets:

[HydroSwimParams\\_N](#)  
[ANOVA means](#)

## Methods & Sampling

The x and z position of the most aboral point on the bell were digitized in ImageJ (NIH, Bethesda, Maryland, USA) at 1-s intervals to produce trajectories from a total of 82 individual hydromedusae from 34 tank trials. Resultant data don't agree well with in situ measurements suggesting that there may have been tank artifacts.

Measured swimming parameters from each individual hydromedusa included depth in the tank, observed speed, acceleration, the net-to-gross displacement ratio (NGDR), time spent swimming and swimming direction.

## Data Processing Description

### BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO and BODC standards

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## Data Files

| File  |
|---|
| <b>HydroSwimParams_indstats.csv</b> (Comma Separated Values (.csv), 1.00 KB)<br>MD5:daf52706869af4a0ea8afd45cfac1dda<br>Primary data file for dataset ID 650006 |

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## Parameters

| Parameter      | Description   | Units               |
|----------------|---|---------------------|
| species        | hydromedusa genus   | unitless            |
| treatment      | treatment: still or turbulent water   | unitless            |
| num_indiv      | number of individuals   | each                |
| speed          | speed of specimen   | cm/sec              |
| speed_sd       | speed of specimen standard deviation  | cm/sec              |
| speed_mean_max | maximum swimming speed  | cm/sec              |
| speed_max_sd   | maximum swimming speed standard deviation                                     | cm/sec              |
| accel          | acceleration rate   | cm/sec <sup>2</sup> |
| accel_sd       | acceleration rate   | cm/sec <sup>2</sup> |
| depth_mean     | depth in turbulence generator (maximum depth of turbulence generator = 30 cm) | cm                  |
| depth_sd       | standard deviation  | cm                  |
| NGDR_mean      | mean net-to-gross displacement ratio  | unitless            |

|                   |  |          |
|-------------------|--|----------|
| NGDR_mean_sd      | mean net-to-gross displacement ratio standard deviation  | unitless |
| pcent_timeswim    | percent time spent swimming faster than 0.2 cm/sec   | unitless |
| pcent_timeswim_sd | percent time spent swimming  | unitless |
| dir_mean_degr     | mean swimming direction  | degrees  |
| dir_mean_degr_sd  | mean swimming direction  | degrees  |
| Ua                | average speed of plankton based on all instantaneous speeds  | cm/sec   |
| Ua_mean           | Motility number: the ensemble average swim speed Ua divided by 2 component turbulence velocity q (Gallager 2004). $q = 0.27$ | cm/sec   |

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## Instruments

|   |   |
|---|---|
| <b>Dataset-specific Instrument Name</b> |   |
| <b>Generic Instrument Name</b>          | Camera  |
| <b>Dataset-specific Description</b>     | Sony HDR-HC9 camcorder (1920 x 1080 pixels, 30 frames s <sup>-1</sup> ; Sony Electronics Inc., Fort Myers, FL, USA) with a 16 x 9 cm field-of view. |
| <b>Generic Instrument Description</b>   | All types of photographic equipment including stills, video, film and digital systems.  |

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## Deployments

### FHL\_Sutherland

|                   |   |
|-------------------|---|
| <b>Website</b>    | <a href="https://www.bco-dmo.org/deployment/649916">https://www.bco-dmo.org/deployment/649916</a> |
| <b>Platform</b>   | Friday_Harbor   |
| <b>Start Date</b> | 2012-06-01  |
| <b>End Date</b>   | 2016-06-30  |

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## Project Information

**Influence of organism-scale turbulence on the predatory impacts of a suite of cnidarian medusae (jellyfish predation in turbulence)**

## Coverage: Friday Harbor Labs, WA

Bloom-forming jellyfish are increasing in number, frequency and magnitude, in part due to anthropogenic impacts, underscoring a need for enhanced understanding of trophic exchanges in jellyfish-dominated ecosystems. Interactions between jellyfish and their prey are driven by morphology, behavior, and unique fluid signatures that result in species-specific prey selection patterns. Fluid signatures generated by predators entrain prey, and motile prey organisms have evolved to sense and respond to these stereotyped fluid signatures. The shape and coherence of these unique fluid signatures are strongly mediated by turbulence, which is ubiquitous in the ocean. Yet, the effects of turbulence are almost always neglected in feeding studies. This three-year project will investigate the influence of turbulence on predator-prey interactions using a suite of cnidarian hydromedusae with unique morphologies, fluid signatures and prey selection patterns collected in the region of Friday Harbor Laboratory, WA.

This project seeks to establish a detailed, mechanistic understanding of the effects of turbulence on organism-scale predator-prey interactions using gelatinous zooplankton predators with contrasting predation modes. The PI will investigate prey selection under varying levels of turbulence by studying swimming behavior, wake structure, and predator-prey interactions in a laboratory turbulence generator designed for fragile plankton. The PI will also make in situ measurements of turbulence and observations of organism behavior using a Self-contained Underwater Velocimetry Apparatus (SCUVA). This is a fully submersible instrument for flow visualization, and its use will provide a cross-calibration of field and laboratory rates and behaviors. The influence of turbulence on trophic position among the different species of hydromedusae will be quantified through field studies of prey selection patterns. The proposed comparative approach using species with distinct predation modes will provide insights applicable to other planktonic predators that can be similarly grouped.

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## Funding

| Funding Source   | Award                       |
|--|-----------------------------|
| <a href="#">NSF Division of Ocean Sciences (NSF OCE)</a> | <a href="#">OCE-1155084</a> |

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