Ciona intestinalis, Mercenaria mercenaria and Mya arenaria size data from specimens used in stereoscopic particle image velocimetry (PIV) experiments (Inhalant flows project)

Website: https://www.bco-dmo.org/dataset/655604
Data Type: experimental
Version:
Version Date: 2016-08-25

Project
» A framework to characterize inhalant siphon flows of aquatic benthos (Inhalant flows)

Contributors	Affiliation	Role
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Coverage

Temporal Extent: 2014-12-09

Dataset Description

Measurements of the individuals used in the stereoscopic particle image velocimetry (PIV) experiments, including inhalant and exhalant siphon size, body length, wet and dry weight, and ash free dry weight.

Related Dataset: Suspension feeder PIV data

Data Processing Description

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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Data Files

File
susp_feed_sizes_all.csv (Comma Separated Values (.csv), 2.65 KB) MD5:64c69c893ca1b958c2dfa70e3f4267cd Primary data file for dataset ID 655604

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Parameters

Parameter	Description	Units
species	species used in PIV experiment	unitless
experiment	experiment identification number	unitless
date	experiment date formatted as yyyy-mm-dd	year-month-day
inh_siphon_d1	inhalant siphon mouth long axis diameter	mm
inh_siphon_d2	inhalant siphon mouth short axis diameter	mm
no_name	to be described	nd
inh_siphon_area	inhalant siphon mouth cross-sectional area	mm^2
inh_siphon_ECD	inhalant siphon mouth equivalent circular diameter = sqrt(in d1 * in d2)	mm
exh_siphon_d1	exhalant siphon mouth long axis diameter	mm
exh_siphon_d2	exhalant siphon mouth short axis diameter	mm
exh_siphon_area	exhalant siphon mouth cross-sectional area	mm^2
exh_siphon_ECD	exhalant siphon mouth equivalent circular diameter = sqrt(in d1 * in d2)	mm
length	Ciona total length or mollusc shell length	mm
width_shell	Mollusc shell width	mm
area_shell	Mollusc shell area	mm

wet_wgt	wet weight	g
dry_wgt	dry weight	g
AFDW	ash free dry weight	g
AFDW_no_shell	ash free dry weight minus shell	g

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	scale or balance
Generic Instrument Description	Devices that determine the mass or weight of a sample.

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Deployments

Jumars_2014

Website	https://www.bco-dmo.org/deployment/655630
Platform	lab University of Maine
Start Date	2014-11-11
End Date	2015-10-31
Description	PIV experiments

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Project Information

A framework to characterize inhalant siphon flows of aquatic benthos (Inhalant flows)

Coverage: Laboratory data to be generated at the Darling Marine Center and the University of Colorado

Description from NSF award abstract:
Inhalant siphon flows produced by benthic invertebrates such as clams and tunicates through suspension feeding and respiration can directly affect a wide range of physical and chemical processes in benthic marine ecosystems. These flows are energetically costly and influence the feeding and reproductive biology of the individual. Moreover, an understanding of siphon flows at multiple scales can be widely used not only to address questions of flow fields for other aquatic organisms and exchange processes, but that understanding has direct impacts on a variety of engineering problems such as sewer designs. Despite the importance of these flow fields in biology, relatively little research has been conducted on this topic, specifically on inhalant (vs. exhalant) flows. For this study, the PIs have modeled the flow outside the siphon entrance of several important benthic marine animals and have found radically different results from those commonly assumed.

Given these findings, the PIs propose to test the results of their numerical simulation on inanimate physical models, and then verify their accuracy using live organisms.

The proposed numerical modeling will examine and predict effects of several parameters including inhalant siphon wall thickness, siphon height, disturbances caused by exhalant flows, and sensitivity to ambient flows. Predictions will be initially tested by using inanimate analog models. To provide a broad ecological framework, the PIs will then focus on five model suspension feeders, each of which has been extensively studied, and include a species of benthic shrimp, a tunicate, a soft shelled clam, the parchment worm, and a tube-dwelling amphipod. This suite of species will provide a broad description of intake flows as the combination of feeding systems spans nearly the full range of Reynolds numbers observed in animals that produce siphon flows. The results of this study will improve current understanding the effects of organismal intake flows on near-bed processes such as vertical fluxes of organic and inorganic nutrients, an important aspect of benthic ecology. Direct deliverables will include verified quantitative models of inhalant flows of marine benthos, connecting form and function and detailing fluid mechanical costs of operation.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260199
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