Olympia oyster mortality samples from cultures in 50 unique combinations of temperature, salinity, pCO2 at Shannon Point Marine Center in May 2018

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Project
» RUI: Will climate change cause 'lazy larvae'? Effects of climate stressors on larval behavior and dispersal (Climate stressors on larvae)

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Abstract
Olympia oyster mortality samples from cultures in 50 unique combinations of temperature, salinity, pCO2 at Shannon Point Marine Center in May 2018.

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Coverage

Temporal Extent: 2018-05-04 - 2018-05-21

Dataset Description

Olympia oyster mortality samples from cultures in 50 unique combinations of temperature, salinity, pCO2 at Shannon Point Marine Center in May 2018.

Acquisition Description

We cultured Olympia oyster larvae in 50 unique combinations of temperature, salinity, and pCO2. Larvae were collected on the day of release from Puget Sound Restoration Fund, and overnight shipped to Shannon Point Marine Center, rehydrated, and dispensed into treatment cups. Culture cups were housed in a custom-build head gradient flow-through water bath ranging from ambient (~12°C) to ~30°C and assigned a random salinity value (9-36, by threes). Also available is the dataset of cup chemistry.

To measure mortality in culture cups, we sampled larvae prior to water changes every two-three days of the experiment (Mon/Wed/Fri). Samplers condensed larval cups into small bowls, mixed larvae inside to suspend dead and alive larvae, and took 0.5-1ml aliquots on Sedgewick rafter counting cells. Our aim was to capture at least 20 live larvae in each sample. If fewer than 20 live larvae were sampled, the counter would take another aliquot and add numbers. If more, all larvae in aliquot we're counted. Live and dead larvae were counted, and the live ones were collected for later size measurement (see growth experiment datasheet). The developmental stage was noted by the visual presence of eyespots on larval shells (though these were recounted in size samples later to improve consistency, so eye counts from this data sheet were not used), and presence of settled larvae on culture cup surfaces.

Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- re-formatted date from mdyy to yyyy-mm-dd

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Parameters

Parameter	Description	Units
Cup	Treatment cup representing a unique temperature/salinity/pCO2 combination	unitless
Date	Sample date from May 4 - May 21 2018; formatted as yyyy-mm-dd	unitless
Cup_Date	Concatenated cup label and date; formatted as Label_mmddyy	unitless
Alive	Number of live larvae in sample aliquot	Larvae
Dead	Number of dead larvae in sample aliquot	Larvae
Eyed	Number of larvae with visible eye spots. Eyes were later recounted in photographic size sampling (Growth dataet)	Larvae
Counter	Initials of sampler	Initials
Mortality	Percent mortality (total dead / total sampled)	unitless
Percent_eyed	Percent eyed (total eyed / total sampled)	unitless
Settlers	Presence of settled larvae in culture cup: yes/no	unitless
SettlersCount	Number of settlers in culture cup	Individuals
Notes	Notes on physical data sheet	unitless

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Instruments

Dataset-specific Instrument Name	Leica Stereoscope
Generic Instrument Name	Microscope-Optical
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

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Project Information

RUI: Will climate change cause 'lazy larvae'? Effects of climate stressors on larval behavior and dispersal (Climate stressors on larvae)

Coverage: Coastal Pacific, USA

In the face of climate change, future distribution of animals will depend not only on whether they adjust to new conditions in their current habitat, but also on whether a species can spread to suitable locations in a changing habitat landscape. In the ocean, where most species have tiny drifting larval stages, dispersal between habitats is impacted by more than just ocean currents alone; the swimming behavior of larvae, the flow environment the larvae encounter, and the length of time the larvae spend in the water column all interact to impact the distance and direction of larval dispersal. The effects of climate change, especially ocean acidification, are already evident in shellfish species along the Pacific coast, where hatchery managers have noticed shellfish cultures with 'lazy larvae syndrome.' Under conditions of increased acidification, these 'lazy larvae' simply stop swimming; yet, larval swimming behavior is rarely incorporated into studies of ocean acidification. Furthermore, how ocean warming interacts with the effects of acidification on larvae and their swimming behaviors remains unexplored; indeed, warming could reverse 'lazy larvae syndrome.' This project uses a combination of manipulative laboratory experiments, computer modeling, and a real case study to examine whether the impacts of ocean warming and acidification on individual larvae may affect the distribution and restoration of populations of native oysters in the Salish Sea. The project will tightly couple research with undergraduate education at Western Washington University, a primarily undergraduate university, by employing student researchers, incorporating materials into undergraduate courses, and pairing marine science student interns with art student interns to develop art projects aimed at communicating the effects of climate change to public audiences As studies of the effects of climate stress in the marine environment progress, impacts on individual-level performance must be placed in a larger ecological context. While future climate-induced circulation changes certainly will affect larval dispersal, the effects of climate-change stressors on individual larval traits alone may have equally important impacts, significantly altering larval transport and, ultimately, species distribution. This study will experimentally examine the relationship between combined climate stressors (warming and acidification) on planktonic larval duration, morphology, and swimming behavior; create models to generate testable hypotheses about the effects of these factors on larval dispersal that can be applied across systems; and, finally, use a bio-physically coupled larval transport model to examine whether climate-impacted larvae may affect the distribution and restoration of populations of native oysters in the Salish Sea.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1538626

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