

# Cyprinodon variegatus offspring growth rate from parental contribution experiments conducted on wild caught Atlantic specimens during 2014.

**Website:** <https://www.bco-dmo.org/dataset/709815>

**Data Type:** experimental

**Version:** 1

**Version Date:** 2017-07-25

## Project

» [Beyond maternal effects: Transgenerational plasticity in thermal performance](#) (ThermaITGP)

| Contributors                   | Affiliation                                            | Role                               |
|--------------------------------|--------------------------------------------------------|------------------------------------|
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## Abstract

Cyprinodon variegatus offspring growth rate from parental contribution experiments conducted on wild caught Atlantic specimens during 2014.

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## Coverage

**Spatial Extent:** N:41.58657 E:-68.291877 S:31.817571 W:-81.14672

**Temporal Extent:** 2014 - 2014

## Dataset Description

Offspring growth rate from the parental contribution experiment.

## Methods & Sampling

We caught wild juvenile sheepshead minnows (*Cyprinodon variegatus*) from South Carolina (SC), Maryland (MD) and Connecticut (CT) in mid-August in 2014. All fish were transferred to acclimation aquaria at 24 deg C at the NOAA Fisheries Science Center, Santa Cruz, California. These temperatures represent the range experienced by sheepshead minnows from SC, MD and CT during a normal non-breeding season. Daily care

followed standard protocols (Cripe et al. 2009, Salinas and Munch 2012), including ad libitum feeding of TetraMin flakes (Tetra Holding, Blacksburg, VA, USA). Salinity was maintained at 20 ppt, but was reduced to 10 ppt for two days prior to egg collection. The photoperiod was 14L:10D. Each day we changed 10% of the total volume of water.

For the experiments of thermal transgenerational plasticity, all eggs were divided in half and transferred to either same temperature with parent or different temperature with parent: for example, if we collected eggs from 26 deg C parents, then a half of eggs were at 26 deg C and another half of eggs were at 32 deg C. Upon hatching we randomly selected up to four larvae from each treatment group. We measured standard body length from photographs of the fish obtained with a Canon 40D digital camera with Image J (Rasband 2016). At the end of experiment, we measured wet-mass, and them removed and weighted the testes and gonad.

## Data Processing Description

Growth rate was calculated as the difference in length at 8 weeks after hatching and length at 2 weeks post-hatching divided by time because growth was linear over this period.

### BCO-DMO Data Processing Notes:

- reformatted column names to comply with BCO-DMO standards
- filled all blank cells with nd

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## Data Files

| File                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------|
| <b>parental_contribution.csv</b> (Comma Separated Values (.csv), 49.57 KB)<br>MD5:b4b16e46e3ad76f06f762e2cecdb1f58 |
| Primary data file for dataset ID 709815                                                                            |

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## Related Publications

Cripe, G. M., Hemmer, B. L., Goodman, L. R., & Vennari, J. C. (2008). Development of a Methodology for Successful Multigeneration Life-Cycle Testing of the Estuarine Sheepshead Minnow, *Cyprinodon variegatus*. *Archives of Environmental Contamination and Toxicology*, 56(3), 500–508. doi:[10.1007/s00244-008-9204-8](https://doi.org/10.1007/s00244-008-9204-8)  
*Methods*

Salinas, S., & Munch, S. B. (2011). Thermal legacies: transgenerational effects of temperature on growth in a vertebrate. *Ecology Letters*, 15(2), 159–163. doi:[10.1111/j.1461-0248.2011.01721.x](https://doi.org/10.1111/j.1461-0248.2011.01721.x)  
*Methods*

Schneider, C. A., Rasband, W. S., ... (n.d.). ImageJ. US National Institutes of Health, Bethesda, MD, USA. Available from <https://imagej.nih.gov/ij/>  
*Software*

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## Parameters

| Parameter  | Description                                 | Units              |
|------------|---------------------------------------------|--------------------|
| MomID      | Mother ID                                   | unitless           |
| DadID      | Father ID                                   | unitless           |
| MomL       | Mother's standard body length               | millimeters        |
| DadL       | Father's standard body length               | millimeters        |
| MomT       | Mother's temperature                        | degrees Celsius    |
| DadT       | Father's temperature                        | degrees Celsius    |
| OffspringT | Offspring's temperature                     | degrees Celsius    |
| Sex        | Code of Offspring sex; 1 - male; 2 - female | unitless           |
| GR         | Mean growth rate                            | millimeter per day |
| WK2        | Standard body length at week 2              | millimeters        |
| Mass       | Wet-body mass at week 9                     | gram               |
| Gonad      | Gonad mass at week 9                        | gram               |
| GSI        | Gonadosomatic index                         | percent            |

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## Instruments

|                                         |                                                                                                                      |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Dataset-specific Instrument Name</b> | Aquarium                                                                                                             |
| <b>Generic Instrument Name</b>          | Aquarium                                                                                                             |
| <b>Dataset-specific Description</b>     | Used to acclimate juvenile sheepshead minnows                                                                        |
| <b>Generic Instrument Description</b>   | Aquarium - a vivarium consisting of at least one transparent side in which water-dwelling plants or animals are kept |

|                                         |                                                                                        |
|-----------------------------------------|----------------------------------------------------------------------------------------|
| <b>Dataset-specific Instrument Name</b> | Canon 40D digital camera with Image J                                                  |
| <b>Generic Instrument Name</b>          | Camera                                                                                 |
| <b>Dataset-specific Description</b>     | Photographs used to determine fish body length                                         |
| <b>Generic Instrument Description</b>   | All types of photographic equipment including stills, video, film and digital systems. |

|                                         |                                                           |
|-----------------------------------------|-----------------------------------------------------------|
| <b>Dataset-specific Instrument Name</b> | Used to measure temperature                               |
| <b>Generic Instrument Name</b>          | digital thermometer                                       |
| <b>Dataset-specific Description</b>     | Used to measure water temperature and/or body temperature |
| <b>Generic Instrument Description</b>   | An instrument that measures temperature digitally.        |

|                                         |                                                                                                                                                           |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Dataset-specific Instrument Name</b> | Salinity Sensor                                                                                                                                           |
| <b>Generic Instrument Name</b>          | Salinity Sensor                                                                                                                                           |
| <b>Dataset-specific Description</b>     | Used to maintain salinity in aquaria                                                                                                                      |
| <b>Generic Instrument Description</b>   | Category of instrument that simultaneously measures electrical conductivity and temperature in the water column to provide temperature and salinity data. |

|                                         |                                               |
|-----------------------------------------|-----------------------------------------------|
| <b>Dataset-specific Instrument Name</b> | Scale                                         |
| <b>Generic Instrument Name</b>          | scale                                         |
| <b>Dataset-specific Description</b>     | Used to measure wet-mass, testes, and gonads. |
| <b>Generic Instrument Description</b>   | An instrument used to measure weight or mass. |

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## Deployments

### Mangel\_2014

|                    |                                                                                                   |
|--------------------|---------------------------------------------------------------------------------------------------|
| <b>Website</b>     | <a href="https://www.bco-dmo.org/deployment/704753">https://www.bco-dmo.org/deployment/704753</a> |
| <b>Platform</b>    | shoreside Eastern United States                                                                   |
| <b>Start Date</b>  | 2014-07-01                                                                                        |
| <b>End Date</b>    | 2014-09-30                                                                                        |
| <b>Description</b> | Estuaries in South Carolina, Maryland, and Connecticut                                            |

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## Project Information

### **Beyond maternal effects: Transgenerational plasticity in thermal performance (ThermaITGP)**

**Coverage:** Nearshore waters of Florida, South Carolina, Maryland, & Connecticut

#### *Description from NSF award abstract:*

Many marine species are currently undergoing significant range shifts and exceedingly rapid changes in phenotype driven, potentially, by warming, ocean acidification, and human-induced evolution. Dramatic shifts in body size and maturation have been observed in many marine fishes worldwide. There is considerable debate over whether these changes are the result of rapid evolution or physiological responses to changes in environmental variables. Attempts to address these issues typically assume that thermal physiology is fixed or slow to evolve. Transgenerational plasticity (TGP) occurs when the environment experienced by the parents directly translates, without any changes in DNA sequences, into significant changes in offspring. TGP in thermal performance provides a mechanism for a rapid response to climate change that has, to date, been demonstrated only in terrestrial plants. This project will provide the first test of thermal TGP in marine systems and will explore its implications for forecasting responses to human-induced evolution and climate change. First, the PIs will test for thermal TGP in four taxonomically distinct fishes. Then, using sheepshead minnows as a model, they will study the dependence of transgenerational responses on the predictability of the thermal environment and test whether disparate thermal environments select for different levels of TGP. With these data they will develop the first stochastic population model including TGP and use it to understand life history evolution and predict responses to climate change.

The existence of thermal TGP poses a serious challenge to the idea that changes in thermal physiology are slow to evolve and can safely be ignored in modeling population responses to climate change or harvest selection. By extension, virtually all field estimates of heritability and physiological measurements will need to be reconsidered in light of thermal TGP, as will conclusions regarding rapid evolution in shifting environments. The research team has made significant contributions to theoretical and empirical work on the evolutionary, behavioral, and physiological ecology of growth in many different species and environments. Together, the team has substantial prior experience in all aspects of the proposed research and has worked together successfully for many years.

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## Funding

| Funding Source                                           | Award                       |
|----------------------------------------------------------|-----------------------------|
| <a href="#">NSF Division of Ocean Sciences (NSF OCE)</a> | <a href="#">OCE-1130483</a> |

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