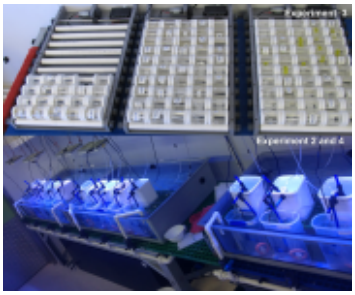
EATLAS DATA CATALOGUE (AIMS)

Cumulative effects of suspended sediments, temperature and nutrient enrichment on the early stages of development of Acropora tenuis (NESP TWQ 2.1.6, AIMS)



Metadata | Metadata (XML)
|

Title	Cumulative effects of suspended sediments, temperature and nutrient enrichment on the early stages of development of Acropora tenuis (NESP TWQ 2.1.6, AIMS)
Date	2019-02-22
Date type	Publication
Abstract	This dataset consists of one data file presenting data from 4 experiments conducted under aquarium controlled conditions manipulating levels of suspended sediments, temperature and nutrient enrichment. The experiments measured the conditions effect on early life history stages like gamete fertilisation success, embryo development, larval survivorship and larval settlement of the coral Acropora tenuis. The aim of this study was to assess the impacts of different levels of suspended sediments together with temperature or nutrient enrichment and estimate their size effect on different early life history stages of the coral Acropora tenuis and determine the stages that are more vulnerable to the combination of these stressors. Methods: Experiment 1: 5 levels of suspended sediments (0, 5, 10, 30 or 100 mg l-1) were combined with either 3 levels of nutrients (+0, +0.3, or +0.6 mg organic carbon (OC) l-1 filtered sea water (FSW)), or 3 levels of temperature (27, 30, or 32 °C) to produce 30 experimental treatments. For each treatment combination, twelve replicate 50 ml clear polypropylene chambers were prepared, each containing 25 ml of the modified seawater. Eggs were added to half of the chambers (~200 eggs per chamber), and sperm aliquots to the other half. Chambers were transferred into temperature incubators at the designated temperature. After 30 min, sperm and egg chambers were combined to initiate fertilisation, resulting in a total of 180 chambers across the 30 treatments (6 per treatment). The final sperm concentration was 5 × 104 ml-1. Chambers were returned into incubators, and gently shaken every 30 minutes to maintain sediments suspended. When the second cleavage was observed (1.5 h after fertilisation), 2 ml of zinc formalin fixative were added to terminate embryo development. Fertilisation success (proportion of eggs fertilised) was assessed under a stereomicroscope. Where NA, sample loss occurred due to spill out from the 50 ml clear polypropylene chambers during incubation. Experiment 2: Embryos fertilised under control conditions were exposed to the 30 treatment combinations from the early gastrula stage (8-h old) until they were ciliated larvae (~36-h old). Six water baths (400 l) were used to maintain seawater temperatures. For each treatment, four replicate experimental systems were set up and -250 embryos added to each experimental tank. Suspended sediment concentrations were derived from turbidity readings taken every 6 h in each experimental tank. After 28 h larvae were transferred to six-well polystyrene tissue culture plates maintained at 27 °C in a temperature-controlled room. Each well contained 10 ml FSW at 27 °C and ~10 larvae (n = 24 wells for each suspended sediment and nutrient enrichment combination, and n = 12 wells for each suspended sediment and temperature combination). When larvae where 5-d old, 2-mm2 chips of live crustose coralline algae (CCA) Porolithon onkodes were added to induce larval settlement. After 24 h, the number of settled larvae in each well was recorded. Where NA, sample loss occurred

due to spill out from the 50 ml clear polypropylene chambers prior to estimating settlement success.

Experiment 3: For each of the 30 treatment combinations, six replicate 100 ml clear polystyrene chambers were prepared containing 80 ml of the appropriately modified seawater and 3-d old larvae (n = 20 larvae per replicate). Chambers were placed in mechanical rollers to keep sediments suspended. Rollers were kept in temperature incubators to maintain target temperatures. Larvae were exposed to treatment conditions for 48 h, with one water change after 24 h. After exposure, larvae from each replicate were counted and transferred to six-well polystyrene tissue culture plates For experiment 3a, 7 replicates with 20 larvae each were used while experiment 3b had 14 replicates with 10 larvae each. CCA chips were added to each well and settlement success was assessed after 24 h. Where NA, sample loss occurred due to spill out from the 50 ml clear polypropylene chambers during incubation.

Experiment 4: The experimental setup from Experiment 2 was used to expose 5-d old larvae to each of the 30 treatment combinations. Larvae (n = 150) were added to each experimental tank, which also contained 15 aragonite substrata (~20 mm diameter) previously conditioned with CCA. The aragonite plugs were suspended in the experimental tanks, with the CCA-colonized surface facing downwards to prevent sediment accumulation. After 24 h, the number of settlers per plug was assessed under a stereomicroscope.
Data analysis. Generalised linear models were used to assess changes in fertilisation success, larval survivorship and settlement as a function of the three fixed factors: suspended sediments (numerical factor), nutrient enrichment (categorical factor) or temperature (categorical factor). Quasi-binomial errors and the log-link function were used when the model had overdispersion. All calculations were conducted using the package lme4 in R.

Format:
This dataset consist of an excel spreadsheet with the results of the 4 experiments.

Data Dictionary:

SEDIMENTS: suspended sediments concentration (mg l-1), [0, 5, 10, 30, 100 mg l-1] 5 levels of suspended sediments (0, 5, 10, 30 or 100 mg l-1) were combined with either 3 levels of nutrients (+0, +0.3, or +0.6 mg OC l-1 FSW), or 3 levels of temperature (27, 30, or 32 °C) to produce 30 experimental treatments
NUTRIENTS: nutrient level concentration (low (+0mg), medium (+0.3mg), high (+0.6mg), see nutrient enrichment preparation in materials and methods for details)
TEMPERATURE: in degree Celsius [27, 30, 32]
FERTILIZED EGGS: number of fertilized eggs
UNFERTILIZED EGGS: number of unfertilized eggs
ABNORMAL EMBRYOS: number of abnormal embryos
TOTAL: total number of eggs or embryos
REPLICATES: Number of replicates in a single treatment
LARVAE: total number of larvae after exposure
RECRUITS: total number of recruits after settlement

References:

Humanes A, Noonan SHC, Willis BL, Fabricius KE, Negri AP (2016) Cumulative Effects of Nutrient Enrichment and Elevated Temperature Compromise the Early Life History Stages of the Coral Acropora tenuis. PLoS ONE 11(8): e0161616. doi:10.1371/journal.pone.0161616

Data Location:

This dataset is filed in the eAtlas enduring data repository at: data\NESP \2.1.6_Cumulative_Impacts\Acropora-tenuis

Metadata language	eng
Character set	UTF8
Hierarchy level	Dataset

OnLine resource

Linkage	https://eatlas.org.au/data/uuid/921d81ce-2319-469b-bb4e-0cecabdfc899
Protocol	WWW:LINK-1.0-http--metadata-URL
Linkage	https://nesptropical.edu.au/index.php/round-2-projects/project-2-1-6/
Protocol	WWW:LINK-1.0-http--related
Linkage	https://eatlas.org.au/data/uuid/71127e4d-9f14-4c57-9845-1dce0b541d8d
Protocol	WWW:LINK-1.0-http--related
Linkage	https://eatlas.org.au/nesp-twq-2/gbr-cumulative-impacts-2-1-6
Protocol	WWW:LINK-1.0-http--related
Linkage	https://eatlas.org.au/pydio/public/au-nesp-twq-2-1-6-aims-cumulative-impacts-acropora-tenuis
Protocol	WWW:LINK-1.0-http--downloaddata

Point of contact

Individual name	Humanes, Adriana, Dr
Organisation name	School of Natural and Environmental Sciences, Newcastle University
Role	Point of contact

Topic category	Biota

Extent

Description	Australian Institute of Marine Science (AIMS)

File identifier	921d81ce-2319-469b-bb4e-0cecabdfc899
Metadata language	eng
Character set	UTF8

Metadata author

Individual name	eAtlas Data Manager
Organisation name	Australian Institute of Marine Science (AIMS)
Role	metadataContact

Date stamp	2019-02-22T05:37:20