# Nearshore Shallow Subtidal Macroalgal Preburn, Postburn and Ash-Free Dry Weight Data from October 2022 (Galapagos 2021 project)

**Website**: https://www.bco-dmo.org/dataset/904710
**Data Type**: Other Field Results
**Version**: 1
**Version Date**: 2023-07-18

**Project**
» Temperature Regulation of Top-Down Control in a Pacific Upwelling System (Galapagos 2021)



| Contributors | Affiliation | Role |
|---|---|---|
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**Abstract**
Increased standing macroalgal biomass in upwelling zones is generally assumed to be the result of higher nutrient flux due to upwelled waters, However, other factors can strongly impact macroalgal communities. For example, herbivory and temperature, via their effects on primary producers and the metabolic demands of consumers, can also influence macroalgal biomass and productivity, respectively. Although there is a fair number of studies looking at the interactive effects of herbivores and nutrients in both tropical and temperate regions, there is a lack of studies looking at these effects in tropical or subtropical upwelling regions. The purpose of this study was to measure the effects that herbivores, temperature, and nutrient availability have on standing macroalgal biomass. We manipulated nutrient availability and herbivory in six field experiments during contrasting productivity and thermal regimes (cool-upwelling and warm, non-upwelling season) on a subtidal nearshore rocky reef. Here, we present the macroalgal biomass raw data (Preburn, Postburn, and Ash-Free Dry Weight) collected in the nearshore shallow subtidal during an October 2022 field experiment.

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## Coverage

**Spatial Extent**: **Lat**:-0.87044 **Lon**:-89.58189
**Temporal Extent**: 2022-10 - 2022-10

### Methods & Sampling

**Methods & Sampling:**

Macroalgae accumulated in exclusion and open cages (deployed in the seafloor) was scraped and vacuumed into independent collection mesh bags after four-week trial in October 2022 (09/15 to 10/13). Ash-Free Dry Weight (AFDW) of the macroalgae samples was determined by drying each sample in an oven for 24 hours at 60 °C and then burning it in a muffle furnace for 4 hours at 500 °C.

**Data Processing Description**

**BCO-DMO Processing Notes:**

- In column names, spaces were replaced with underscores ("_")
- Non underscore special characters were removed from column header names

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## Related Publications

Brandt, M., Silva-Romero, I., Fernández-Garnica, D., Agudo-Adriani, E., Bove, C. B., & Bruno, J. F. (2022). Corrigendum: Top-down and bottom-up control in the Galápagos Upwelling System. Frontiers in Marine Science, 9. https://doi.org/10.3389/fmars.2022.1004011
*Methods*

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| Cage | replicate number | unitless |
| Treatment | Four types of experimental treatments were used: (All Present) Open pizzas (treatment cages of circular bases only) with full access to all grazers. (Urchins Only) Urchin inclusions, where two pencil urchins remained caged throughout the duration of each trial to maintain the identity and density of our herbivore of interest constant. (None Present) Full exclusions, preventing access to all macro-herbivores such as sea urchins, fishes, iguanas, and turtles, but not to meso-herbivores such as amphipods. These cages are covered with a top. (Procedural) Procedural control that included partial sides, designed to affect flow and light to a similar degree as other cages to test for experimental artifacts of the herbivore manipulation. | unitless |
| N | description | unitless |
| Algae_Type | Type of macroalgae in sample; algae type in data is either Red filamentous (RF) or Ulva (Ulva). | unitless |
| Foil_cup_weight_g | Weight of only the aluminum foil cup before placing the wet algae sample; blank data values indicate there was no growth of macroalgae for that specific replicate. | grams |

| | | |
|---|---|---|
| Sample_and_foil_cup_weight_g | Weight of algae sample and aluminum foil after the sample was dried in the drying oven; blank data values indicate there was no growth of macroalgae for that specific replicate. | grams |
| Preburn_weight_calculation_g | Subtraction of Foil_cup_weight_g from Sample_and_foil_cup_weight_g after the sample was dried in the drying oven; blank data values indicate there was no growth of macroalgae for that specific replicate. | grams |
| Ceramic_cup_weight_g | Weight of only the ceramic melting pot before placing the dried algae sample; blank data values indicate there was no growth of macroalgae for that specific replicate. | grams |
| Sample_and_ceramic_cup_weight_g | Weight of algae sample and ceramic melting pot after the sample was burned in the muffle furnace; blank data values indicate there was no growth of macroalgae for that specific replicate | grams |
| Postburn_weight_calculation_g | Subtraction of Ceramic_cup_weight_g from Sample_and_ceramic_cup_weight_g; blank data values indicate there was no growth of macroalgae for that specific replicate | grams |
| AFDW_Preburn_minus_Postburn_weight_calculation_g | Subtraction of Preburn weight from Postburn weight; blank data values indicate there was no growth of macroalgae for that specific replicate | grams |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | Drying Oven (Memmert UFE 400 Sterilizer Laboratory Oven) |
| **Generic Instrument Name** | Drying Oven |
| **Dataset-specific Description** | Macroalgae samples were dried in a drying oven for 24 hours at 60° C. |
| **Generic Instrument Description** | a heated chamber for drying |

| | |
|---|---|
| **Dataset-specific Instrument Name** | Optic Ivymen System Laboratory Furnace 8.2/1100 |
| **Generic Instrument Name** | muffle furnace |
| **Dataset-specific Description** | Macroalgae samples were burned in a muffle furnace for 4 hours at 500 °C. |
| **Generic Instrument Description** | A muffle furnace or muffle oven (sometimes retort furnace in historical usage) is a furnace in which the subject material is isolated from the fuel and all of the products of combustion, including gases and flying ash.  A type of jacketed enclosure that is used to heat a material to significantly high temperatures while keeping it contained and fully isolated from external contaminants, chemicals or substances. Muffle furnaces are usually lined with stainless steel, making them largely corrosion-resistant. |

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## Project Information

**Temperature Regulation of Top-Down Control in a Pacific Upwelling System (Galapagos 2021)**

**Coverage**: Galapagos Islands

*NSF Award Abstract:*
Nearly all the animals that inhabit the ocean are "cold-blooded" or ectothermic, meaning their body temperatures match the temperature of the ocean around them. This has important consequences for their physiology and more broadly for the way marine ecosystems function. When ectotherms warm up, their metabolism increases; meaning they breathe more rapidly, and eat more just to stay alive. This is bad news for prey since a warm predator is a hungry predator. But warming also enables prey species to crawl or swim away more quickly when being hunted. Thus, everything speeds up in warm water. Energy flows more quickly from the sun to seaweeds (via photosynthesis), to the herbivores, then on up to the large predators at the top of the food chain. The research team is testing these ideas in the Galápagos Islands to determine how temperature influences marine ecosystems. Ongoing work in this iconic natural laboratory is helping marine ecologists understand the role of temperature and how this and other ecosystems could function in the future as climate change warms the ocean. Other broader impacts of the project include student training and on-site outreach to tourists and the local community about ocean warming and some of the lesser-known species that inhabit the Galápagos.

The broad goal of this project is to understand the effect that temperature has on patterns and processes in upwelling systems. Specifically, the team is measuring the temperature-dependence of herbivory and carnivory in rocky subtidal habitats of the Galápagos. They are performing field experiments to measure the relative and interactive effects of temperature, herbivory, and nutrient flux on the productivity and standing biomass of benthic macroalgae. Additionally, they are using in situ predation assays across spatial and temporal temperature gradients and mesocosm experiments to determine the relationship between ocean temperature and predation intensity for predator-prey pairings including whelk–barnacle, sea star–urchin, and fish–squid.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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## Funding

| Funding Source | Award |
| --- | --- |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-2128592 |


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