MAR 13, 2024

OPEN ACCESS

DOI:
dx.doi.org/10.17504/protocols.io.j8nlko76xv5r/v1

Protocol Citation: Marcella Welter, Eva Louise Gibbs-Zehnder, Kat Osborn, Melissa Andico Murphy 2024. Strawberry Hermit Crabs & Pisonia Leaves . **protocols.io** https://dx.doi.org/10.17504/protocols.io.j8nlko76xv5r/v1

Protocol status: Working
We use this protocol and it's working

Strawberry Hermit Crabs & Pisonia Leaves

Marcella Welter[1], Eva Louise Gibbs-Zehnder[1], Kat Osborn[1], Melissa Andico Murphy[1]

[1]University of California, Berkeley

Marcella Welter
University of California, Berkeley

ABSTRACT

The Strawberry Hermit Crab experiment is useful to understand more about the repercussions of nutrient depletion on motus in Tetiaroa with invasive species- particularly Tiaraunu and Tahuna Iti. With the understanding of the crab species' eating habits, we can determine how nutrients are cycling within a certain area. However, the study was inconclusive and did not convey a significant preference for nutrient rich leaves.

GUIDELINES

How to hold a hermie without getting pinched:
Hold the shell and press your thumb firmly over the pinchers to avoid squirming and pinching.

MATERIALS

Pisonia Leaves, plastic bags, fish tanks, scissors

SAFETY WARNINGS

Watch out for the hermie pinchers! Hold them from the back of their shells so they can't reach you.
Watch out for bird guano when collecting leaves!

ETHICS STATEMENT

Handle the hermit crabs with care. Hold them over surfaces so you don't drop them from far distances. Do not have them fast for longer than 1.5 days. Collection and experiments with local fauna must follow guidelines of the local and national authorities for conducting fieldwork.

Created: Mar 11, 2024

Last Modified: Mar 13, 2024

PROTOCOL integer ID: 96525

Keywords: strawberry hermit crabs, pisonia leaves, French Polynesia, Tetiaroa, nutrient cycling

BEFORE START INSTRUCTIONS

Pack lots of water and sunscreen!
Bring a rain jacket!

Introduction

1 What is the problem?

- Repercussions of nutrient depletion on atolls (Tiaraunu and Tahuna Iti) with invasive species like rats

Why is that a problem we care about?

- Strawberry Hermit Crabs are a vital species on Tetiaroa and it is important that they get enough nutrients to support a stable population on the island
- Nutrient cycling
- Species imbalance

Background Literature Review

2

- Jayna Devore wanted to replicate a study she had done measuring nutrient preference with a different leaf (heliotropium, guettarda) and her colleagues had found similar results with Pisonia, therfore Jayna wanted to replicate these results with the help of UC Berkeley undergrads
- Evaluate nutrient cycle and depletion due to species interaction
- Specifically, the Rattus rattus which lowes bird populations → lack of guano → nutrient availability go down

Research Design

3 The ISP Class and Jayna collected Pisonia leaves from two sites varying in nutrient richness and collected hermit crabs in order to better understand trophic interactions and the role of nutrients within atoll ecosystems.

3.1 Collect 31 Strawberry Hermit Crabs ranging from 5 to 7 cm in shell length

- tap the front of the shell in order transport the crabs within the shells

3.2 Collect around 60 leaves of Pisonia Grandis, around half from nutrient-rich site (Tahuana Iti) and half from nutrient-depleted site (Tiaranu)

3.3 Keep the leaves in freezer to preserve them before preparing them for the crabs.
Cut leaves into 3 cm by 3 cm squares using an exacto knife, and label each leaf (T or I depending on which motu it came from) with a Sharpie.
Measure the mass of the leaf with a scale and the width with a ruler.

4 Measured confidence by placing crabs in clear cube and timing how long it took for the crabs to come out of their shell

4.1 Set up camera on tripod to record four cells with no shadows, wet towels and place at bottom of cells for traction

4.2 Record for a maximum of five minutes and step away from the space

4.3 Measure Crab size by their front claw and weight

5 Place crabs in individual 30x10cm cells of plexi glass and placed 3x3cm squares of leaves in each box

6 Recorded the percentage leaf consumed of each type of leaf at 24 hours and 168 hours

Expected Results

7 For this experiment, we hypothesize that the Hermit Crabs would be more interested in the leaves coming from Tahuna Iti since this is bird island and birds create guano, producing more nutrients in the ecosystem. Guano is an important aspect in the nutrient cycle for the islands and is a key factor in producing a healthy ecosystem. The Pisonia leaves from Tahuna Iti should have more nitrogen than carbon making the Pisonia leaves taste better to crabs- ultimately showing that the crabs had more of a liking towards the Pisonia leaves coming from Tahuna Iti.

Timeline

8 Jan 19, 2024: Class collects strawberry hermit crabs on Ahu Roa and Honuea.

9 Jan 20, 2024: Class collects fallen pisonia leaves on two different motus - Tiaraunu and Tahuna Iti.

10 January 20-21, 2024: Crabs are isolated in their own aquariums and fast for 1.5 days.

11 Jan 21, 2024: In the lab, prepare the leaves for the experiment. Leaves will be cut into 4 3x3 squares, measure mass and width, label either T or I. Two squares (1 of each) will be placed in each aquarium. Measure the crabs' weight, front claw length, and their confidence (time ti take for them to emerge from their shell).

12 Jan 22, 2024: Observe the percentage eaten of each leaf in each aquarium after 24 hours.

13 Jan 29, 2024: Observe the percentage eaten of each leaf in each aquarium after a week. Compare which motu had the tastiest pisonia leaf.

Broader Impacts

14 After discovering that most of the Hermit Crabs preferred the Pisonia leaves collected on Tahuna Iti (bird island) than Tiaraunu we confirmed our hypothesis that the more nutrient dense leaves were more desirable. Why is it important to know what kind of leaves the Hermit Crabs prefer to eat? Are most of the Motus that different from bird island?After discovering that most of the Hermit Crabs preferred the Pisonia leaves collected on Tahuna Iti (bird island) than Tiaraunu we confirmed our hypothesis that the more nutrient dense leaves were more desirable. Why is it important to know what kind of leaves the Hermit Crabs prefer to eat? Are most of the Motus that different from bird island?