

Differential response of oysters: polyploidy and environmental stress

Mentoring Plan

Introduction

This 10-week research internship will focus primarily on the study of Pacific oysters, specifically investigating how environmental stress factors and triploidy - the condition of having three sets of chromosomes - affect these bivalve mollusks. The Pacific oyster, a key species in marine ecosystems and global aquaculture, possesses a remarkable ability to adapt to a wide range of environmental conditions. However, the increasing stressors resulting from climate change, such as ocean acidification and temperature fluctuations, pose significant challenges to their survival and reproductive success. Furthermore, many Pacific oysters are deliberately bred to be triploid to enhance growth and survival rates. Throughout the internship, we will rigorously examine these interactions, employing a blend of laboratory experimentation and data analysis to explore these intricate dynamics. This research opportunity will provide a comprehensive understanding of the delicate balance between genetic variation, environmental stress, and survival in Pacific oysters, offering valuable insights for future conservation strategies and sustainable aquaculture practices.

Objectives

- Document prior research that offers explanation of physiological difference in triploid and diploid oysters
- Characterize differential gene expression in triploid oysters compared to diploid oysters in response to environmental stress.
- Evaluate differences in gene copy number variation between diploid and triploid oysters.

Work Plan

Week 1

Readings

- Lab Culture @ <https://robertslab.github.io/resources/>
- Review week 3-5 @ <https://sr320.github.io/course-fish274-2022/schedule/>
- <https://www.biorxiv.org/content/10.1101/2023.03.02.530828v1>

Tasks

Get familiar with GitHub, Slack, electronic labnotebook, Handbook.

Have experimental system established. Plan environmental stress

Milestones

Have oyster tanks set up

Week 2

Readings

- [Opportunities in Functional Genomics: A Primer on Lab and Computational Aspects](#)
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Tasks

Maintain oysters

Set-up repo for copy number variation analysis

Confirm supplies in inventory

Milestones

Run environmental stress experiment and samples oysters.
Start copy number variation analysis.

Week 3

Readings

Find 5 papers discussing physiology of triploid and oysters.

Tasks

Write summary of two papers in notebook and indicate how they relate to project

Extract RNA

Order Primers

Have initial CNV analysis done

Milestones

Have RNA from experiment

Week 4

Readings

- TBD

Tasks

Write summary of two papers found in week 3 in notebook and indicate how they relate to project

Make cDNA, run test qPCR

Milestones

Run qPCR

Write Methods Section(s)

Week 5

Readings

- TBD

Tasks

Run qPCR

Functional annotation of CNV results

Find 5 papers discussing physiology of copy number variation in marine invertebrates

Milestones

Have preliminary results figure from

Write Results Section(s)

Week 6

Readings

Read two papers on CNV found in Week 5

Tasks

Write summary of two CNV papers

Create final figure for qPCR

Milestones

Write Discussion Section(s)

Week 7

Readings

Read two papers on CNV found in Week 5

Tasks

Write summary of two CNV papers

Identify 3-4 key points related to results of both efforts - start Discussion.

Milestones

Write Discussion Section(s)

Week 8

Readings

TBD

Tasks

Present results to lab group for feedback

Write Introduction

Milestones

Write Introduction Section(s)

Draft Poster

Week 9

Readings

TBD

Tasks

TBD

Milestones

Practice Presentation

Week 10

Readings

TBD

Tasks

Ensure all data and products are archived, metadata is accurate.

Milestones

Presentation

Expectations

- Spend approximately 8 hours of effort a day on project
- Meet minimally once a week with Mentor
- Ask Mentor / lab members questions all the time.
- Attend Weekly Lab meetings
- Post in lab notebook on daily basis. This is meant as a journal / documentation / plan activities.
- Review communications in Slack.

Timeline of Program

- Friday, June 16th: Submit mentoring Plan to me.
- Tuesday, June 20th: First Day of Program
- Wednesday, June 21st: First LSAMP Professional Development Session
- Week of July 10th: I will check in with the students
- Wednesday, August 2nd (estimate): If students need to have the LSAMP program get their posters printed they will need to submit a draft. LSAMP will create a group order through Health Sciences Printing Services
- Sunday, August 13th: Abstracts will be due
- Wednesday, August 16th: Undergraduate Research Symposium where students will present their research posters
- Wednesday, August 16th: End of Program Celebration