Oyster Biosensors: Measuring Farmed Oyster Health and Related Water Quality

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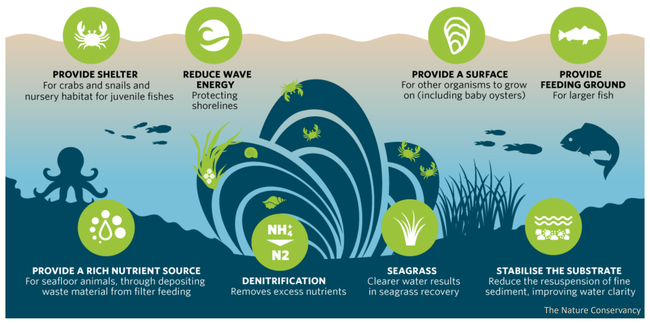
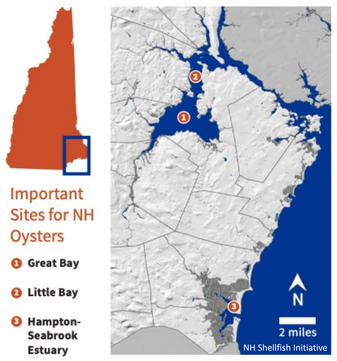
Introduction

Why are oysters important?

Environmental Impacts:



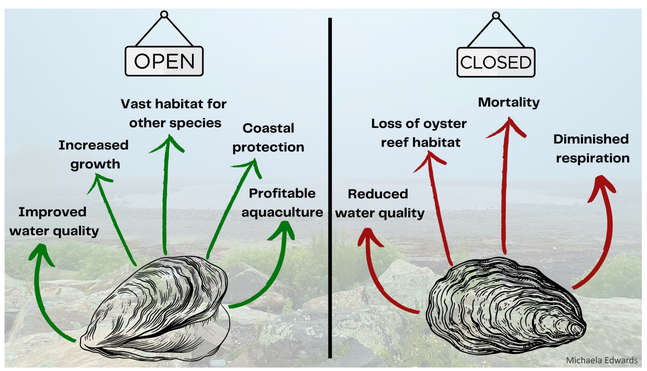
Economic Impacts:



- 14 oyster farms exist in Great Bay, Little Bay, and Seabrook-Hampton estuary
- The economic benefit of oyster aquaculture in NH is $4.6 million as of 2020
- From 2013-2020 there has been a 774% increase in NH oyster harvest value

Goals of this Project

- Create a user-friendly sensor system capable of measuring farmed oyster gaping behavior and basic water quality parameters
- Better understand oyster behavior in response to their environment and help improve oyster aquaculture techniques



Why measure gaping behavior?

Oysters open to filter feed and close due to stressful conditions including the following:

- High or low temperatures
- High or low salinity
- Low dissolved oxygen
- Low phytoplankton levels
- Predator presence

System Design and Testing

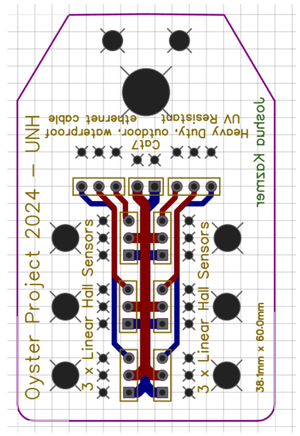


Figure 1. PCB Wiring of Ethernet Split

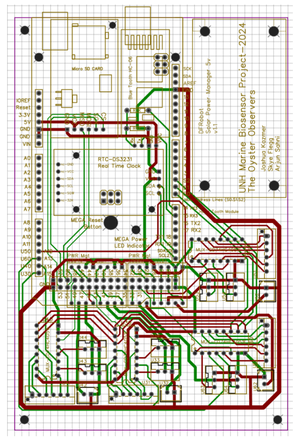


Figure 2. PCB Wiring of Main Circuit

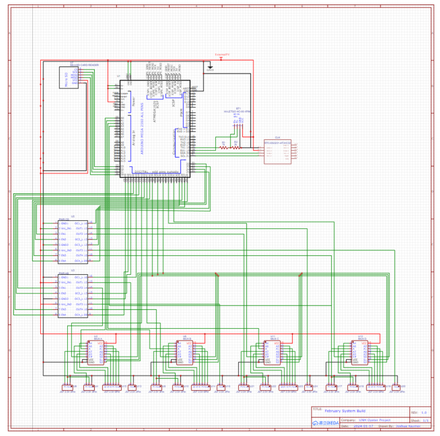


Figure 3. Electrical schematic

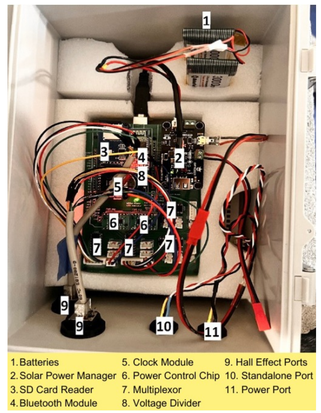


Figure 4. Labeled components of system

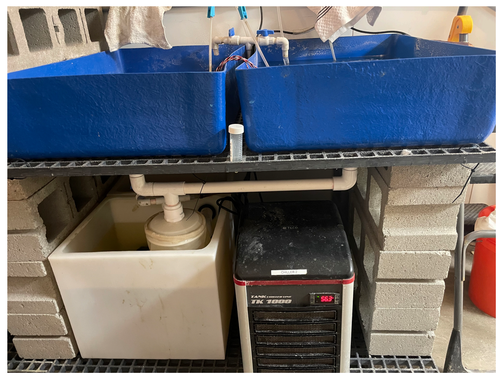


Figure 5. Kendall Hall experimental set up in flow through tank with bag filter, water pump, water chiller, and aerators

Figure 6. Above view of flow-through set up with full sensor system

Results

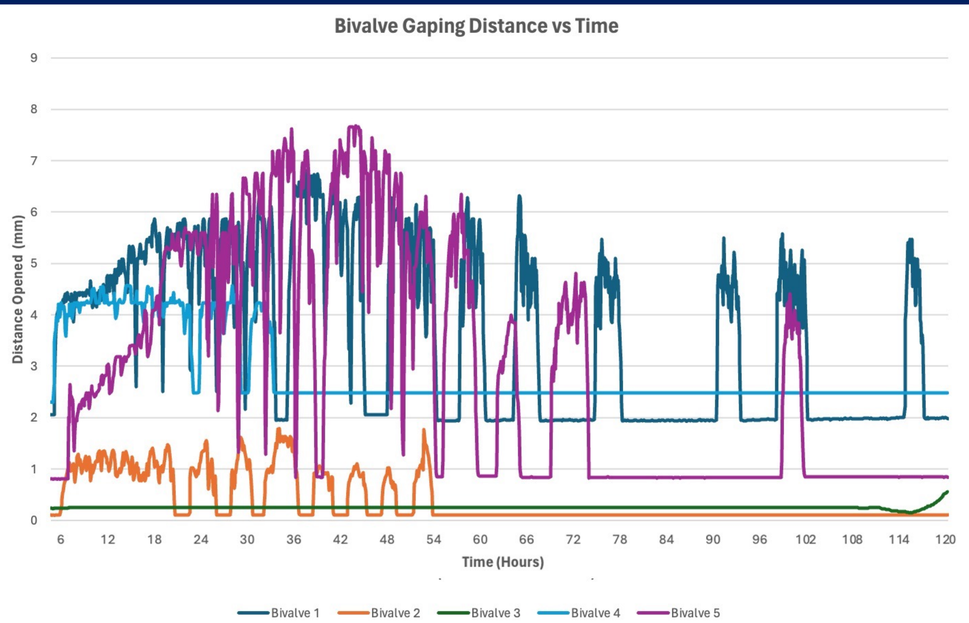
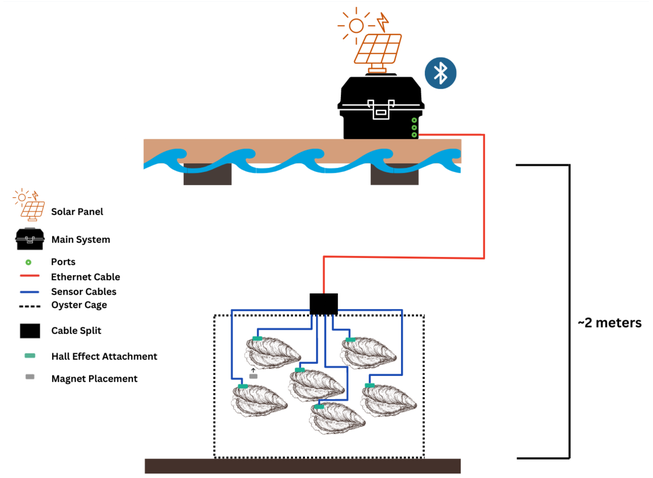


Figure 6. Testing data collected from lab set up in Kendall Hall depicting the opening and closing of six oysters

Field System



Major System Features

- Bluetooth capability
- Solar power capability
- Water quality sensor attachments
- Distance readings on gaping behavior

Discussion

Completed Testing

- Lab testing in Kendall hall confirmed water proofing is suitable for multiple days
- Data was collected continuously by the system and uploaded to the SD card

Next Steps

- Complete waterproof testing
- Feed oysters shellfish food in lab and document changes
- Test water quality sensors
- Deploy at Fox Point oyster farm for field testing
- Continue to improve sensor attachment for easier field use
- Set up a computer program that translates raw data

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References

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