

Report Details:

Timeframe: 10/29/2025 - 11/4/2025

Group number: 21 (*sdmay26-21*)

Project Title: A Smart Aquatic Ecosystem

Client &/Advisor: Md Maruf Ahamed

Team Members/Role:

Griffin Urban — Frontend Developer

Daniel Pender — Hardware

Aden Koziol — AI Population Tracking

Ryan Holden — Backend/Frontend Developer

Marina Mannan — Embedded Systems Engineer

Carson Irving — Backend/Frontend/AI

Max Purvis — Hardware

Weekly Summary

This week, the team made steady progress across all major components of the project, with a heavy focus on testing, with our lightning talk on testing coming up next week. Both frontend and backend are implementing unit testing, implementation testing, and automatically testing on deployment using a GitLab runner. Additionally, we have coverage reports for testing generated for the frontend. We also focused on testing and calibrating sensors for the tank to ensure minimal errors when reading and that all components are working properly. Alongside this, we have made some additional improvements to the frontend, including React toasts when using HTTP requests and websockets. Overall, the team made great progress towards a fully working prototype.

Past Week Accomplishments

- **Aden:** Continued working on containerizing the AI Population Tracking model and scripts. Also, continued to work on debloating the model and other things so that it will be more lightweight.
- **Marina:** Continued refining the lid design for the tank housing. Met with Max to review the hardware setup and discuss integration points. Based on the sensor layout, we decided to add an opening to route all sensor probes into the tank cleanly. The design is nearly finalized and will be ready for 3D printing soon.
- **Carson:** I was able to make GitLab runners for both the frontend and backend and install them on the server. The backend runner will run my tests, build, and deploy the new application. The frontend runner will build and deploy the react app to be hosted with nginx. I was also able to implement the basic websocket functionality on the frontend so it can be used for notifications in the future, as well I added a React notification library to have something that looked a little better than alerts.
- **Max:** I finished the Arduino sketch for taking measurements with all 4 sensors. I compiled a list of, hopefully, everything we still need to buy to calibrate and set up all the hardware. I began working on combining the camera code with the sensor code. I also met with Marina

to show her the circuit and discuss possible housing for the circuitry and lid for the tank. I also gathered the maximum current draws for each component, although I still need to actually take measurements.

- **Danny:** This week I worked on testing and calibrating the four main sensors — temperature, pH, dissolved oxygen, and turbidity. I verified that each sensor gives stable readings when connected to the Arduino and checked that the voltage outputs match expected ranges. Most of my time went into troubleshooting noise in the pH and turbidity sensors, which required adjusting the wiring layout and adding filtering capacitors.
- **Ryan:** I added repeating HTTP requests to the frontend to constantly fetch the most recent sensor values from the database and display them on the webpage.
- **Griffin:** This week, I worked on implementing testing into the frontend components of our dashboard. I was able to create a framework for creating tests using Vitest, which also allowed me to generate coverage reports for testing. This will be very useful for our lightning talk next week. Additionally, I added the frontend testing to the “test” phase of the pipeline to automate testing of the frontend when changes are made.

Pending Issues

- N/A

Individual Contributions

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Aden	● containerizing AI Population Tracking ● debloated scripts and models	6	37
Marina	● refined the fish tank lid design in Fusion 360 ● discussed the placement of sensors	6	37
Carson	● Gitlab runners for frontend and backend with build/deploy ● Added React notification library ● Implemented basic WebSocket functionality for the frontend ● Installed nginx and configured it to host the React app on the server ● Configured backend GitLab runner to test, build, and deploy	8	45
Max	● Finished sensor code ● Gathered materials to buy ● Discussed housing and lid architecture	7	40
Danny	● Calibration on a few of the sensors ● Troubleshooting noise for the sensors	6	40
Ryan	● Constantly display the most recent sensor values on the webpage	6	37
Griffin	● Created Frontend Testing automation ● Integrated testing with the CI/CD pipeline ● Created a framework for implementing new tests for frontend testing ● Added coverage report creation for frontend testing	9	39

Comments and Extended Discussion

- N/A

Plans for Upcoming Week

- **Aden:** Finish containerizing the AI Population Tracking models and scripts, and put them on the server. Also continue debloating the models and scripts to make it more lightweight.
- **Marina:** Finalize measurements and update the lid design based on the hardware review. Prepare the design files for 3D printing and contact the 3D printing lab about material options and print time. Begin planning the sensor mounting and cable-routing layout inside the enclosure.
- **Carson:** Work with Arduino to get data pushed to the server for all data types. Get an itemized bill and total money spent for all parts ordered and send it to Maruf for approval. Research which camera lens will be best for maximizing FOV while keeping the image usable. Look into image manipulation to make it better for training the AI, and how distortion will affect training. Add helper methods for the backend to make it easier to gather data for graphs. Move HTTP communication to the internal IP on VM; no reason to have API open to the internet other than Arduino.
- **Max:** Get all items ordered so we can finish calibrating and setting up the pH and dissolved oxygen sensors, and finish the fish feeder. Finish combining the camera code and circuitry with the sensor code and circuitry so we can send images and measurements to the server.
- **Danny:** This upcoming week, I plan to keep working on calibrating the pH and turbidity sensors to improve accuracy. I'll start by comparing the pH readings against standard buffer solutions to find any consistent offset, then adjust the calibration values in code. For the turbidity sensor, I'll test it with different water clarity levels to map voltage outputs to realistic NTU values.
- **Ryan:** Create more tests for frontend and backend code to simulate as many different use cases as possible for either one.
- **Griffin:** Create more tests to increase code coverage for the frontend, and implement the graph branch into the main branch. Additionally, rework the frontend dashboard visuals to be more appealing.

Summary of Weekly Advisor Meeting

At our meeting, we discussed gathering some of our money from next semester early so we can continue working this semester. This is because most of our costs are up front, so we do not anticipate needing our entire budget next semester. We need to make an itemized list and send it to Maruf so he can approve our budget. We also displayed some of our progress with the frontend and set a goal to have data transmitted to the backend and displayed on the frontend before Thanksgiving break.