

Report Details:

Timeframe: 11/5/2025 - 11/11/2025

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 hardware, software, and design. The main script was containerized and optimized for smoother performance. The lid design was finalized after consulting with the 3D printing makerspace, with plans to use a Bambu printer and possibly laser-cut the frame for better results.

On the software side, new backend methods were added to handle data ranges, along with integration tests and updates to the GitLab pipeline. The Arduino system now sends all sensor readings in one post request, making communication more efficient. A prototype for the data graphing feature was built, and frontend testing was set up to automatically track coverage.

Hardware work focused on improving stability and reducing noise in the circuit. Extended sensor tests were run to check consistency in water data readings. Research was also conducted on fish and plant options for the tank, along with water treatment methods to ensure the safety of the ecosystem.

Past Week Accomplishments

- **Aden:** Finished containerizing the script. Also, I finished debloating the model.
- **Marina:** Finished the lid design and consulted the 3D printing makerspace about printing feasibility. The consultant recommended using the Bambu 3D printer to print the enclosure and suggested considering laser cutting the lid frame due to its size.
- **Carson:** Added more methods on the backend to support selecting specific ranges of data, and added respective integration tests to go along with them. Adjusted the GitLab pipeline to only run when commits are pushed to the main branch. I was able to add HTTP support to the arduinos sensor reading code, and make a DTO object to receive all sensor readings in a single post request. This includes every sensor besides images, as they are too big and must be streamed over the network.

- **Max:** I set up the Arduino for an extended test in a cup of water, where it sent data from the sensors to the server.
- **Danny:** Last week, I focused on improving the hardware design to make it more stable and reduce signal noise. This involved reviewing the circuit layout, identifying potential sources of interference, and testing different grounding and filtering strategies. I also conducted several test sessions to compare sensor output consistency before and after the adjustments, ensuring cleaner and more reliable readings.
- **Ryan:** Researched fish and plant species for when we fill the tank. Some popular fish, like bettas, are territorial and would not work well if we want a large fish population in the tank. There are a few options that are easy to take care of and are natural schooling fish. I also researched water treatment techniques; the most important part is neutralizing the chlorine that is found in tap water.
- **Griffin:** Implemented a prototype of the graphing feature to display the various data types and monitor trends in the data. Added software testing through React Testing Library and Vitest to test React components and generate mock data and mock server calls. Additionally, configured the frontend testing to run on the pipeline and generate coverage reports to better gauge total line coverage.

Pending Issues

- N/A

Individual Contributions

<u>NAME</u>	<u>Individual Contributions</u> (Quick list of contributions. This should be short.)	<u>Hours this week</u>	<u>HOURS cumulative</u>
Aden	● Finished Containerizing Script ● Finished Debloating Model	7	44
Marina	● Finished the lid ● Makerspace 3D printing consultation	7	44
Carson	● Consolidated Arduino data transmission to one post with a DTO. ● More methods in controllers to allow for more precise data selection ● Integration tests for the above methods that I added ● Adjust gitlab pipeline to fix issues with changes being tested before being merged into main ● Added HTTP support to the Arduino sensor code	8	53
Max	Extended test of the Arduino	6	46

Danny	● Circuit design for stability over time	7	47
Ryan	● Researched fish and plant species ● Researched water treatment techniques, chlorine neutralizing products	6	43
Griffin	● Implemented the graphing function to display data ● Added test coverage reports and expanded test coverage	10	49

Comments and Extended Discussion

- N/A

Plans for Upcoming Week

- **Aden:** Start researching fine-tuning methods and background subtraction methods. Additionally, create an API endpoint that will store the pictures and fish count in the database.
- **Marina:** Do the training required to use the 3D printer, and clarify materials and timelines.
- **Carson:** Add up all costs so we can order more to get the project moving, look into auth for users/ security testing, move all paths to internal IP except the Arduino post so it can not be targeted from outside networks
- **Max:** Get the rest of the items ordered so we can finish setting everything up.
- **Danny:** Begin integrated testing with all sensors running in the fish tank for a while. Maybe get the fish
- **Ryan:** Begin looking at end-to-end integration testing to ensure we have no issues transferring data from the sensors to the backend and frontend.
- **Griffin:** Expand on testing, implement a separate graph page to display graphics. Work with the AI image software to add images to the dashboard.

Summary of Weekly Advisor Meeting

N/A