Environmental DNA Sampler

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Objective and Background

Environmental DNA (eDNA) is DNA that has been expelled from an organism into its surrounding environment. eDNA is an extremely useful tool in identifying species present within the environment being examined.

There are currently not many options for sampling eDNA from the marine environment and the few options are pricey or not readily available. There is a need for cheaper, customizable eDNA samplers.

Design Constraints

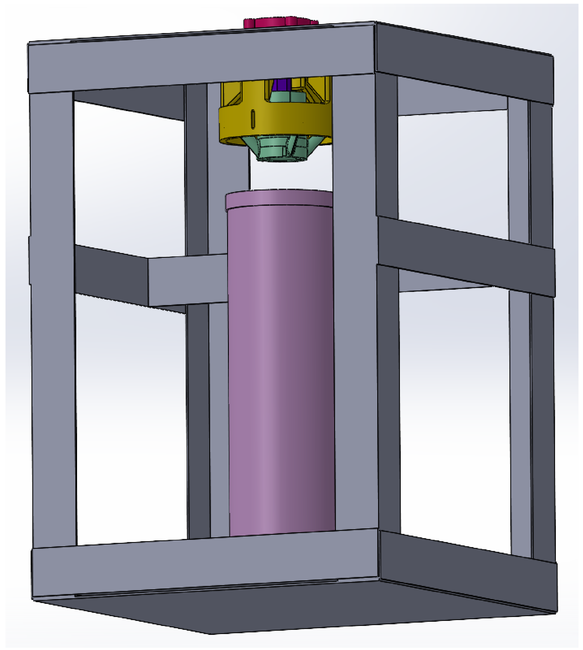
- Use as many off-the-shelf products as possible
- Customizable to a variety of research projects
- Able to be deployed in the ocean for extended periods of time

Design

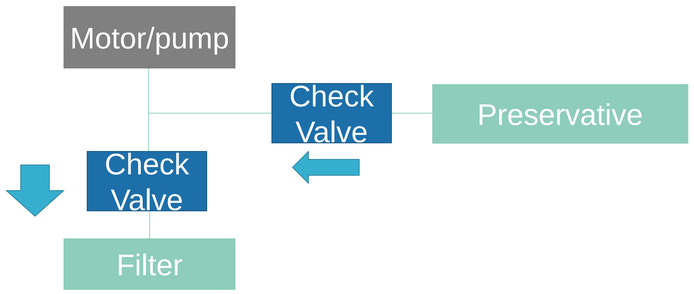
A submersible motor is connected to a peristaltic pump which will pump a consistent, set amount of seawater through a filter to collect eDNA. A preservative will then be pumped through the filter to prevent the DNA from degrading until it can be collected from the field and analyzed in a lab.

Components

1. Submersible motor and electronic speed controller
2. Peristaltic pump
3. Waterproof electronics housing
4. Planetary Gearbox
5. 3D printed motor and gearbox housing
6. Sparkfun Pro Micro Microcontroller
7. Sparkfun Real time clock
8. Sparkfun Micro SD card breakout board

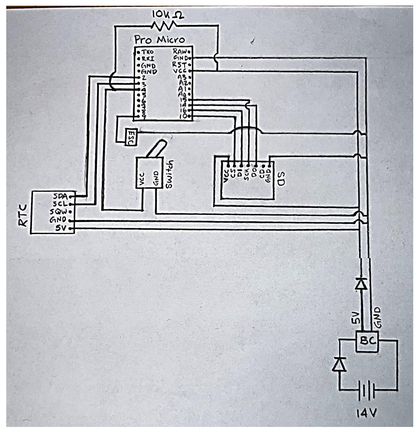


3D model of eDNA Sampler



Timeline

1. Attached the submersible motor to the peristaltic pump
2. Designed and 3D printed a housing for the pump and motor
3. Set up the electronic control system to run the motor and record flow rate data to an SD card
4. Built the filtration system and a submersible frame for deployment



Schematic of electronic control system

Troubleshooting

- Motor was unable to pump water through the smaller of two filters which led to burst tubing – solution was to add a gearbox in-between the motor and the pump
- Electronics board failed multiple times and had to be redesigned and rebuilt