Senior Design Proposal

Title

PUCKfish: Enabling sustainable **fish**ing with **P**rimarily-**U**nderwater data **C**ollection **K**its

*Note: this is an **interdisciplinary project** seeking engineers from both the ECE and MechE departments.*

Problem Description

There are less than 400 North American Right Whales remaining in the ocean today. Unfortunately, 34 of these endangered creatures have died of unnatural causes since 2017, and lobster trap entanglement and fishing vessel collision are the leading causes of these deaths. Our company, Fathom Fishing, is looking for your help in developing the PUCKfish, an underwater sensor device, with the goal of eventually ridding the sea of entanglement-prone lobster-fishing lines and allowing fisherman to make fewer, more-efficient trips to their traps.

The PUCKfish data collection kit consists of a base station (to be mounted on fishing vessels) and several small sensing devices (to be mounted on or near individual lobster traps). In the long term, these devices will allow fishermen to wirelessly locate and hoist their traps up from the ocean floor without needing to leave location-marking buoy lines floating where they can harm whales and other sea life. The first revision of the PUCKfish, however, will simply collect temperature, depth, dissolved oxygen, and other measurements of the water surrounding a deployed lobster trap. As soon as a fisherman pulls the trap above the surface, the PUCKfish will wirelessly upload the collected data to the onboard base station. Fishermen can then use this data to determine the locations and water conditions in which they'll catch the biggest haul, reducing the number of trips needed to reach their legal sustainable catch limit, and marine biologists can use this data to track sea life conservation efforts.

Expected Deliverables

- 3 PUCKfish underwater sensing devices
- 1 PUCKfish base station
- Accompanying documentation

Constraints

- Each PUCKfish underwater sensing device must…
  - have a total landed unit cost of less than $150 (for prototypes)
    - ideally, each unit should be designed in such a way that it can be manufactured at scale for less than $50/unit
  - operate fully-submerged in saltwater at depths up to 1100ft
    - meaning it must withstand hydrostatic pressures over 30 atmospheres
  - contain sensors for detecting temperature, depth (hydrostatic pressure), salinity (conductivity), dissolved oxygen, and ambient water current speed and direction
  - collect sensor data at least once per hour for up to 10 days on a single charge
  - automatically detect when it has been submerged or has surfaced
  - wirelessly transmit up to 1 megabyte of data at a minimum rate of 50 kilobits/second to a base station up to 50ft away
  - support a drop-in recharging solution
- The PUCKfish onboard base station must…
  - be powered by the marine batteries onboard most fishing vessels, which range from 11V to 14V
  - withstand prolonged exposure to marine weather conditions, including heavy rain and frequent splashes of saltwater
  - receive data from devices up to 50ft away (see above)
  - store received data on removable media (e.g., SD card)
  - store received data in a common machine-readable format (e.g., CSV)

Contacts & what you can expect

Fathom Fishing

Anthony Byrne, abyrne19@bu.edu

Andy Whitman, andy@fathom.fishing

- Regular on-campus, in-person client meetings available upon request.
- Opportunities for marine field testing (i.e., free boat rides) in locations like the Charles River available.
- Requests for monetary support will be considered on a case-by-case basis.

IP Issues

Any intellectual property (including patents and patentable inventions) produced by this project will be transferred to Fathom Fishing at project completion or at the end of the Spring 2022 semester.