

# Cell Phone Based Underwater Acoustic Autonomous Data Logging System

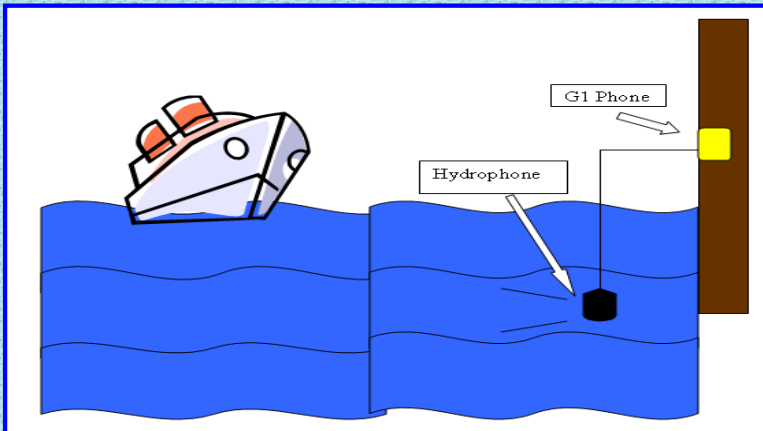
Sponsored by: The Nature Conservancy

## PROJECT MEMBERS

SPONSORS: The Nature Conservancy and The Near Lab

ADVISORS: Dr. Martin Siderius and Dr. Barry Ma

TEAM MEMBERS: Amra Ljucevic, Emily Smith and Stephen Zhuo



## ABSTRACT

Coral reefs are one of the most diverse ecosystems on planet Earth. However, an estimated 90% of coral reefs in the Pacific ocean have never been assessed, and with global warming, pollution and disease threatening the health of the coral reefs already assessed, it is imperative that researchers design tools and collect data in an attempt to understand these ecosystems before it is too late.

The objective, of this Portland State University Senior Capstone Project, is to design a tool that will aid the Nature Conservancy's researchers in collecting data in an aqueous environment. This tool must meet a few guidelines given by the Nature Conservancy. First, the device must record, save, and wirelessly send the recorded audio data. Second, the device must also have a long recording life, which requires a large sized battery and memory space. Third, it would be desirable if the device had a recording time and a GPS locating feature, so that the researcher knows where and when the recording occurred. The objective of the Nature Conservancy's researchers is to find the relationship between the underwater acoustic sounds activity, and the impact it has on the overall health of the coral reef. It is important to collect as much data as possible, everything from the sounds of boats and snorkelers, to the sound of fish and the coral itself. The study of coral reefs is an exciting, young, and growing field of research. It is crucial for researchers to build a large knowledge base about this manner, so that coral reefs can be preserved, and enjoyed by generations come.

This is the G1 Phone the team choose to work with.



This is the hydrophone used. It is the only part of the device completely submerged into the water.



Here Stephen and Emily are shown setting up the device for testing along the Willamette River.

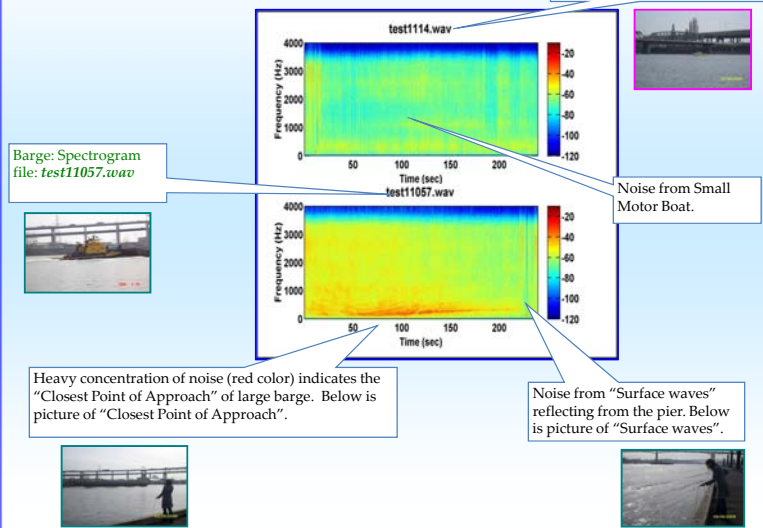


This is the waterproof casing that will hold the G1 phone above the waters surface. The reason the phone must remain above the surface is so that it can transmit data wirelessly.



## DEVICE TESTING

This box shows how the devices recording was tested by the team. The team recorded underwater audio at the Willamette River and analyzed the recorded sound in the lab using Matlab Spectrograms.

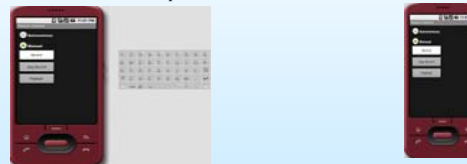


## ANDROID IN THE ECLIPSE ENVIROMENT

The Engineering Team wrote 5 methods. Below is an example of the Recording Method written.

```
recorder.setAudioSource(MediaRecorder.AudioSource.MIC);
recorder.setOutputFormat(MediaRecorder.OutputFormat.THREE_GPP);
recorder.setAudioEncoder(MediaRecorder.AudioEncoder.AMR_NB);
recorder.setOutputFile(filename);
recorder.prepare();
recorder.start();
```

This written Recording Method Code was then tested in the open Android environment, before being tested on the G1 Phone that the team selected to use for this project. Below is a screen shot of the Android Eclipse Environment.



This shows the user interface for a manual recording. Code was written for manual and Autonomous giving the user a choice in how they want to set up their recording.

This is the solar panel that can give power to the G1 phone. This technology helps extend the device's battery life.

