Sarasota Bay Listening Network

A collaborative program involving Loggerhead Instruments, the Sarasota Dolphin Research Program, New College of Florida, and Citizen Scientists

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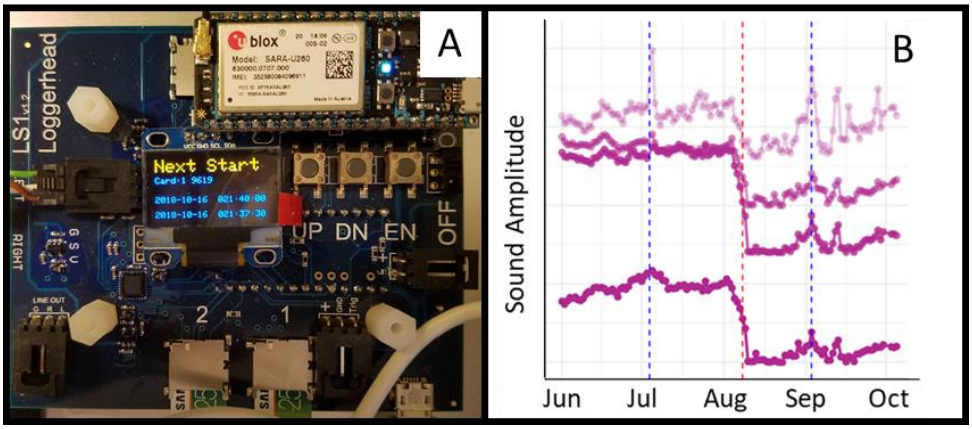
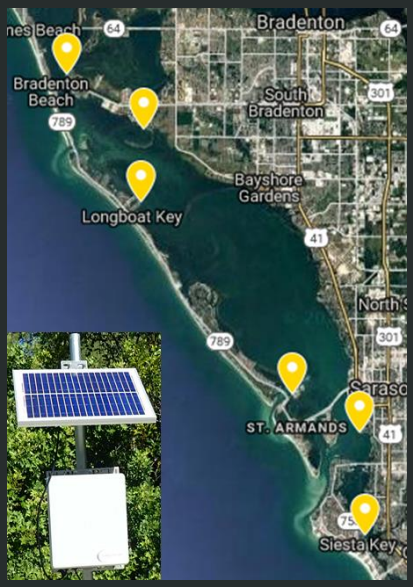
The Sarasota Bay Listening Network is a collaboration between biologists, engineers, educators, and citizens to explore the acoustic environment of Sarasota Bay. We aim to 1) better understand the biology of Sarasota Bay's marine life and how it responses to disturbances, such as red tide and boat noise, 2) communicate our findings to the public and in scientific forums, and 3) provide research opportunities for students.



A) Current acoustic-monitoring station circuit board. They were designed and assembled at Loggerhead Instruments Inc. in Sarasota, FL. B) Sound amplitude of four frequency bands at the Longboat Key station. Data shown here are from nighttime when human-produced noise is minimal allowing us to gauge changes in biological sound production. The red line marks when red tide entered the bay.

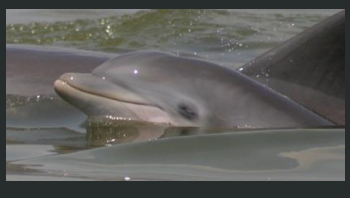
Dr. David Mann (Loggerhead Instruments, Inc.), the creator of the acoustic-monitoring stations, is continually looking into ways to improve the system and data flow. A new circuit board is under development that will offer more processing power to accommodate on-board data processing and remote control of stations.

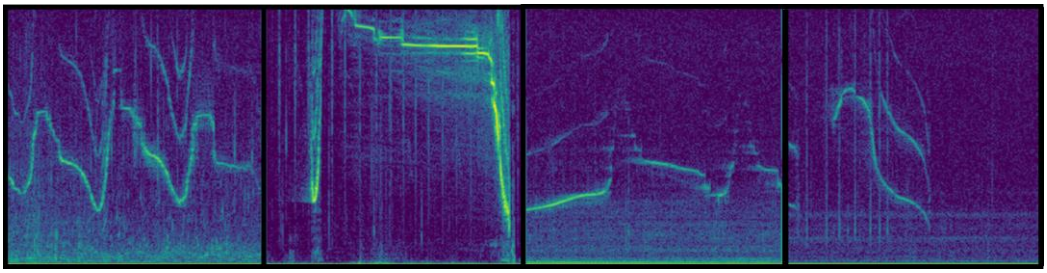
Station recordings from before and during the 2018-19 red tide harmful algal bloom event are being analyzed for a manuscript for a scientific journal. Sound levels drastically dropped when red tide arrived in the bay as marine organisms died. Acoustic data will be examined relative to data from ongoing fish abundance surveys by the Sarasota Dolphin Research Program, which documented a decline of 81% for dolphin prey fish. These findings will help us use the listening network to monitor the biological effects of future red tide events on a finer time scale.



Our listening network of six stations will soon expand to ten stations in fall!

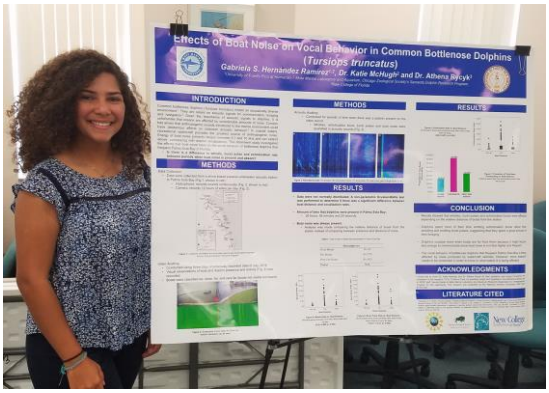
Dr. David Mann (Loggerhead Instruments, Inc.) shows a New College of Florida student (Tommy Finnan) how to apply solder to an acoustic-monitoring station circuit board using a solder paste screen stencil.





Spectrograms of four dolphin whistles extracted from recordings at the Palma Sola Bay mouth station using the developed machine learning algorithm.

Among several objectives, we want to use the network to potentially track the movements of individual dolphins by listening for their individually distinctive signature whistles at different stations. Austin Anderson, a data science graduate student from New College of Florida, has created a highly effective machine learning algorithm to extract dolphin whistles from acoustic recordings. At one station alone (Palma Sola Bay mouth) he found 14,000 whistles in a month and a half! His algorithm was trained on a set of dolphin whistles extracted from the network's raw acoustic recordings by Dr. Athena Rycyk and a group of students from New College of Florida.



Gabriela Hernandez Ramirez, from Puerto Rico, presents her Mote-REU (Research Experiences for Undergraduates) research.

Under the mentorship of Drs. Katie McHugh and Athena Rycyk, Gabriela analyzed sound and video data from the Palma Sola Bay mouth station and found a decrease in vocal activity of bottlenose dolphins when boats were very close.

Network History

In an effort to better understand dolphin behavior and their acoustic environment in Sarasota Bay, the Sarasota Dolphin Research Program has worked with Loggerhead Instruments and Mote Marine Laboratory to develop and deploy a system to listen to and record the sounds made by dolphins, fish, and human activities such as boating, at sites around the bay. The listening network consists of a series of shore stations with single hardwired hydrophones. The system is able to record dolphin echolocation clicks, whistles, including individually specific signature whistles, and social sounds, as well as fish choruses and sounds of individual fish, many of which form the prey base for the dolphins. Recorded boat engine noise provide a basis for assessing exposure of dolphins to human activities. This provides a remotely monitored window into the animals' lives. With the addition of New College of Florida into the network, we are improving our ability to process and quantify sounds, thus enhancing the utility of the system for many kinds of research. In 2017, the system went from a single station at Mote Marine Laboratory, to an actual network, involving citizen scientists, with the installation of a station behind a home on Longboat Key. We expect to have 10 stations operating soon, from Palma Sola Bay to the Philippi Creek mouth.

We greatly appreciate the support of Mote Scientific Foundation, Disney Conservation Fund, and several donors towards establishing, maintaining, and enhancing this network.

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Sarasota Bay Listening Network Board Members: Drs. Katie McHugh, David Mann, Athena Rycyk, Reny Tyson Moore, and Randy Wells