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UNCREWED VEHICLES & MARINE ROBOTICS

A NEW WAVE OF COLLABORATION

Advancing eDNA sampling through uncrewed platforms

The ever-shifting balance of our planet's ecosystems requires innovative autonomous solutions to keep pace. The challenge of monitoring underwater ecosystem biodiversity has led to the tremendous growth of environmental DNA (eDNA) sampling, which allows researchers to study a range of factors that characterize biological communities.

Two leading oceanographic technology companies have risen to the challenge, collaborating on a first-of-its-kind integration of an eDNA sampler, the Robotic Cartridge Sampling Instrument (RoCSI), with the DataXplorer™, an all-electric, solar-powered, self-righting uncrewed surface vehicle (USV).

The McLane RoCSI is a compact yet powerful eDNA sampler capable of collecting a large number of samples while preserving them onboard for future analysis. The DataXplorer USV, manufactured by Open Ocean Robotics, operates silently, with a unique self-righting capability. Combining these two powerful technologies creates a highly efficient, environmentally friendly eDNA collection platform.

UNCREWED eDNA SAMPLING

This new technology collaboration was put to the test in September 2024 during a two-week deployment in Shinnecock Bay, New York. Designated as a global "Hope Spot" in 2022, Shinnecock Bay is the site of a yearlong expedition focusing on eDNA collection, led by scientists from Stony Brook University and the University of Waterloo. The project team includes citizens from the Shinnecock Indian Nation.

Thanks to Stony Brook University's Shinnecock Bay Restoration Program (ShiRP), the health of the bay's ecosystems has improved remarkably. However, up until the September expedition, biodiversity monitoring efforts relied on low-tech eDNA sampling methods.

OPERATIONAL SYNERGIES

Dr. Ellen Pikitch, Endowed Professor of Ocean Conservation Science at Stony Brook University explained her rationale for selecting the two technology companies involved in this phase of the expedition: "We selected RoCSI because of its industry-leading high sample capacity, on-board sample preservation, and compact size and the DataXplorer because of its silent, solar-powered operation and self-righting capabilities." Pikitch added: "Each of the technologies had proven track records, and integrated together they formed an environmentally responsible means of conducting biodiversity surveys."

McLane CEO Dr. Yuki Honjo stated: "We're excited about the RoCSI and DataXplorer integration and were honored to contribute to an official flag expedition of The Explorers Club in Shinnecock Bay. With over a decade of developing eDNA samplers, McLane Labs is committed to the future of these types of platform integrations with our eDNA samplers."

Dr. Fritz Stahr, CTO of Open Ocean Robotics, added: "This integration was a great example of bringing two key technical innovations together to improve the observational capabilities of an experienced oceanographic team. We appreciated everyone's collaboration, particularly McLane's, to get the full system integrated in time for Stony Brook's annual September sampling in Shinnecock Bay, and we're honored to be part of an Explorers Club Flag expedition in this recovering ocean environment. We hope to do more such eDNA sampling work with a RoCSI on a DataXplorer in the future."

THE IMPORTANCE OF eDNA ANALYSIS

These developments coincide with the June 2024 National Science and Technology Council (NTSC) announcement of the *US National Aquatic Environmental eDNA Strategy*. The strategy emphasizes the importance of eDNA analysis in monitoring



➤ McLane RoCSI eDNA sampler with 24 sample cartridge filter holders integrated with DataXplorer USV. (Credit: Open Ocean Robotics)

biological diversity, food production and water safety. At the heart of this strategy, the integration of autonomous platforms capable of remote eDNA sampling is highlighted.

As the demand for efficient, non-invasive eDNA monitoring solutions increases, these technology integrations will play an increasingly critical role in protecting fragile marine ecosystems and advancing the means to detect broad spectrums of marine life.

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