

MONMOUTH UNIVERSITY, URBAN COAST INSTITUTE/
ROCKEFELLER UNIVERSITY, PROGRAM FOR THE HUMAN ENVIRONMENT
MARINE RESEARCH AND POLICY INITIATIVE
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Topic: NYC and NJ Aquatic Vertebrate eDNA Project

Background:

Recent work demonstrates that the presence of many aquatic vertebrates (fish, amphibians, reptiles, and mammals) in waterways can be reliably detected by analyzing water samples for the presence of species-specific DNA fragments. The half-life of aquatic eDNA is estimated to be a few days, so positive results indicate recent or current species presence. Although most of the work to date has occurred in static freshwater lake and pond systems, this methodology has also been successfully applied in streams and rivers.

In recent experiments, aquatic eDNA testing reliably detected a variety of nearshore marine fish, with results equally sensitive as traditional methods. In marine settings, the sensitivity of eDNA will be dependent upon several factors, including species density, tides and other currents. Despite these variables, one offshore study detected dolphin and pilot whale DNA in nearly 10% of samples.

Discussion:

This emerging technology with potentially wide application may add to or supplant traditional monitoring methods, many of which can be time consuming, expensive and in some cases, destructive. The NYC-Coastal NJ area provides the perfect setting to test the sensitivity of the eDNA methodology in more complex freshwater systems as well as in marine waters, and to detect, identify and raise awareness of the marine fish and mammals in the study area.

Preliminary proof-of-concept eDNA pilot studies can be performed by testing waters where species are known, such as at the New York Aquarium and NY and NJ fishing piers. Testing can then be expanded to sites where eDNA detection can be correlated with other knowledge of species presence or absence, such as in waters where other fish studies are underway. Students of varying levels and disciplines will be involved in all phases of the project, including the identification of appropriate study locations, the design of sampling plans, sample collection, DNA extraction and sequencing, bioinformatics, data compilation and interpretation, and photo/video-documentation and communication of project progress and results. Potential high-interest targets include endangered species (e.g., Atlantic sturgeon), invasive species (e.g., Northern snakehead), and species with locally increasing populations, including charismatic megafauna such as Humpback whales.

MURU Roles and Actions:

Under the supervision of Dr. Mark Stoeckle, Senior Research Associate at RU, a series of eDNA water sampling experiments will be planned and executed in and around NYC and Coastal NJ waters. Project teams will be populated with graduate and post-doctoral students from RU and undergraduate students and masters' candidates from MU, as well as select High School students. Sampling will be student-executed using MU vessels and eDNA analysis will take place at both MU and RU facilities. MURU will work together to identify ongoing research projects being conducted by their respective institutions and by other entities in the study area where eDNA detection can be correlated with definitive knowledge of species presence or absence.