Novel Unmanned Environmental DNA Collection Technique

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Environmental DNA (eDNA) detection is utilized to non-invasively detect logistically difficult to identify organisms. Genetic material shed into the environment is concentrated from samples and analyzed for target species presence. Monitoring techniques which require human interaction may pose unnecessary risk, particularly when the targeted habitat is critically endangered. Here, I demonstrate an innovative device for environmental DNA collection that circumvents previous limitations. Water was sampled at varying volumes (30ml, 20ml, 10ml) in nearshore Space Coast marine environments, was processed through silica solid phase extraction, and analyzed for DNA volume and concentration using Spectrophotometric techniques. Data demonstrated a positive linear relationship between water volume and DNA yield. mtDNA (LTCM1, HDCM1) assay primers and a novel probe were developed for the endangered Chelonia mydas (green sea turtle) as an augmentation to surveying efforts for the species and was implemented to test for the presence of the chelonid in water samples utilizing PCR fluorometry. Detection occurrence was highest at sites of historical chelonid prevalence (93.33%). The data obtained supports the validation of this device as an adaptable, low cost, open-source tool for surveyors. The modular design of the device allows for portability and implementation in a variety of transport and unmanned control circumstances. Stealthy Unmanned Surface Vessel and Aerial Vehicles were developed as well as an array of command Control linked orientations to utilize jointly with the device for biometric sensor fusion. eDNA derived detection may augment visual surveying in the future to provide more robust visualization of species mapping for researchers.

Awards Won:
National Oceanic and Atmospheric Administration - NOAA: First Award of $1500.00