Use of environmental DNA to detect invasive terrestrial mammals on coastal islands

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Native flora and fauna on coastal islands face serious threats from invasive mammalian pest species yet knowledge about the presence of such species on islands in Nova Scotia is lacking. We used a commercial eDNA water sampler and metabarcoding lab services to generate rapid biological inventories of pest mammals present on remote coastal islands. We collected eDNA from 30 waterbodies on three coastal islands in southwest Nova Scotia, including small pools, dug wells, brackish coastal barachois ponds, and shallow, emergent, tannin-rich streams. Results of eDNA barcoding was compared to photos from trail cameras mounted near the targeted water bodies. Using mammal-specific metabarcoding markers, we detected 25 mammalian taxa with nine resolved to species level. Invasive and problematic species detected included mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), snowshoe hare (*Lepus americanus*), and red squirrel (*Tamiasciurus hudsonicus*). Fifteen non-mammalian taxa were also detected, including painted turtle (*Chrysemys picta*) and several species of fish. Five of the nine mammal species were recorded on camera trap images taken from corresponding water collection sites, with mouse notably absent from the camera trap images. The number of taxa detected per sample was not correlated with water origin or the volume of water filtered (0.04-1.99 L), nor to environmental correlates such as pH, temperature, and total dissolved solids. Our results indicate that other environmental factors, such as precipitation, can affect the numbers of taxa detected from a sample; Norway rat and red squirrel were detected only after sampling several sites a second time after heavy rainfall.

Keywords: eDNA, trail cameras, invasive species, pest, coastal island conservation