

New approaches to monitoring Canadian at-risk species and aquatic biodiversity using environmental DNA

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In the last decade environmental DNA (eDNA) has emerged as a powerful tool for surveying species of conservation concern, cryptic or rare species, or whole assemblages of species, particularly in aquatic environments. Our lab has embraced eDNA tools, both species-specific quantitative PCR and DNA metabarcoding approaches, to address a series of challenges in herpetofauna conservation and aquatic ecosystem monitoring. We have used eDNA to locate underwater hibernacula for northern map turtles, critical habitat for the continued persistence of this at-risk species. We are using eDNA qPCR to map the occurrences of turtle species to better understand the factors that shape their northern geographic range limits. We are working on using eDNA to map the contact zone for two chorus frog mitochondrial lineages in Ontario, working with Environment Canada to make decisions on conservation priorities for this species. We are using eDNA qPCR to characterize the abundance and distribution of toxin producing cyanobacterial algal blooms that can affect human and wildlife health. Finally, we are developing a 'tree of life' eDNA metabarcoding protocol for long term monitoring of aquatic biodiversity (plants, vertebrates, invertebrates, micro-organisms) in the upper reaches of the St. Lawrence River and eastern Lake Ontario. We will speak briefly on each of these projects and discuss insights we have gained and challenges that we have faced thus far.