About "eDNA"

for our IsampleON volunteers, from FOCA (October 2023)

Environmental DNA (eDNA), is a groundbreaking technology that has the potential to revolutionize how we monitor the presence and movement of various species in our environment. **It's like a genetic detective tool for the natural world.** It could dramatically improve and expand our ability to monitor our aquatic systems.

If you are trying to figure out if a rare or invasive species is lurking in a lake, instead of laborious surveys of a waterbody, eDNA can allow us to more cost-effectively collect tiny fragments of genetic material that organisms leave behind in their environment – things like skin cells, saliva, or waste. **This genetic material is like a biological fingerprint unique to each species.**

By collecting water samples and analyzing the eDNA within, scientists can detect the DNA signatures of the species that have been in the area recently. This can be a game-changer because it's often faster, less invasive, and more sensitive than traditional methods.

However, there's a catch: to make eDNA work effectively, you need to have a good reference library of genetic data for the species you're searching for. Think of it like trying to identify a criminal using a database of fingerprints; you need a large catalogue or collection to match against. Also, it is not foolproof, and depending on the design of your sampling program, eDNA may still not be able to 100% ascertain the presence or absence of a species in a waterbody. eDNA also cannot tell you about abundance, or whether a positive identification came from a viable (living) plant or animal sample.

What it can do is point our attention in a direction for further investigation. Our hope is that this technology will eventually become a working tool that will help direct resources with greater efficiency. So, while eDNA is a promising tool for monitoring and tracking species, it has its limitations, and its success depends on having a strong foundation of genetic information to make accurate identifications. Without that, it's like trying to solve a mystery without all the clues.

When used to identify different *animals* (a more common use of eDNA technology, for instance, to identify and differentiate between wolf species in an area, or in food

surveillance, to verify the type of fish being sold) it is possible to compare well-established baseline DNA examples with collected samples with great accuracy.

In the case of identifying *plants*, the picture is not nearly so clear. **There are currently very few reference samples of Ontario-specific aquatic plants (native or otherwise).** The fact that plants will easily hybridize further complicates matters, making the genetic identification of one particular species problematic without having a strong understanding of overall community composition.

In our most recent iteration of the **IsampleON program** (Invasive Species Awareness and Monitoring Program for Lakes Education in Ontario), we set out to try and identify several worrisome plants, namely European Water Chestnut and Water Soldier. These species are both present in Ontario, and we feel it is important to know where they are, in order to inform management options.

Using the samples collected through the program in 2023 by our volunteers across the province, we are building the evidence that will get us to a system that enables us to reliably sample for the presence or absence of target aquatic plant species. Our work to date will also help us to more definitively define future sampling design, including the timing, frequency, and location of sampling required for the optimal results.

The samples we have in-hand from our many 2023 ISampleON volunteers will be crucial in refining the accuracy of eDNA testing and moving us toward fully realizing the potential of eDNA sampling, and will establish some critical baselines for future programs.

Thank you for participating in the program this year!

Learn more on FOCA's IsampleON program webpage: **https://foca.on.ca/isampleon/**