

Exploring the use of a DNA method in citizen science river monitoring

October 23

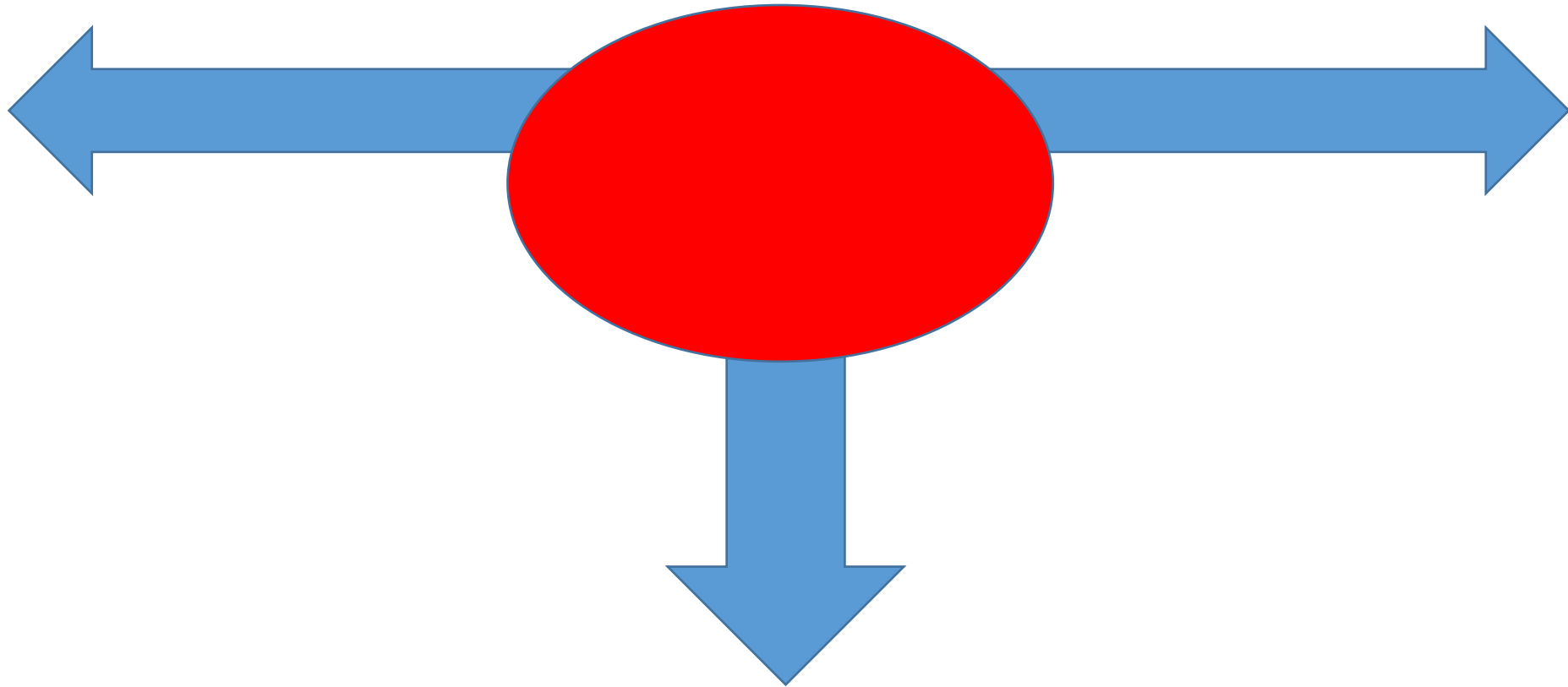
Willie Duncan, Becky Lewis- Riverfly Partnership, Roger Owen- Smart Rivers, Colin Bean- Nature Scot, Alistair Duguid- SEPA, Bernd Haenfling- UHI, Jennifer Dodd- Napier University, Craig Macadam- Bug Life, John Clayton- Smart Rivers, Lauren Harley- Wild Fish & Esk volunteers in particular Peter, Neil & Steve!

Outline

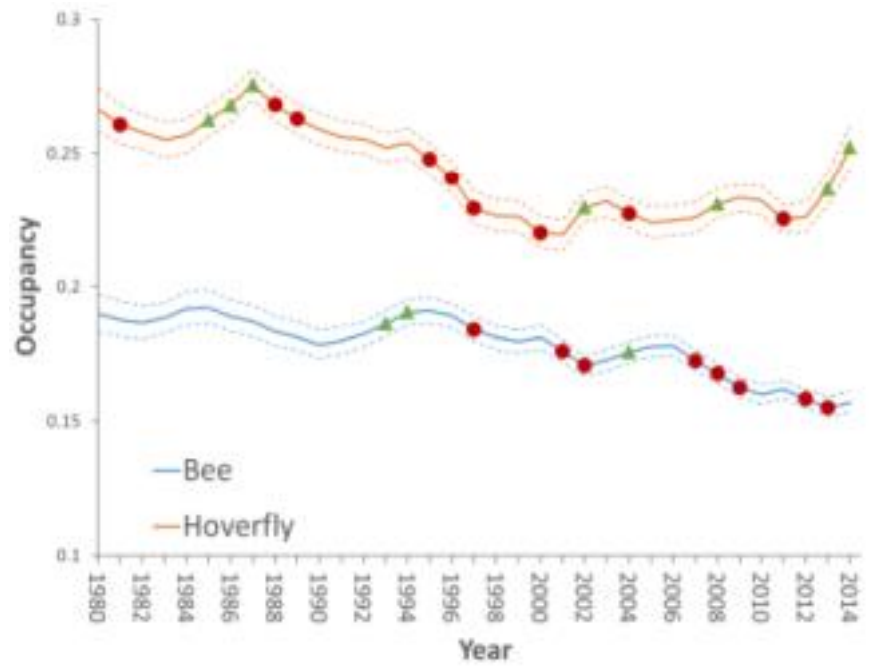
- Citizen science and DNA multiplier effects.
- The Canadian experience in STREAM.
- The 2 Esks Project- Scotland



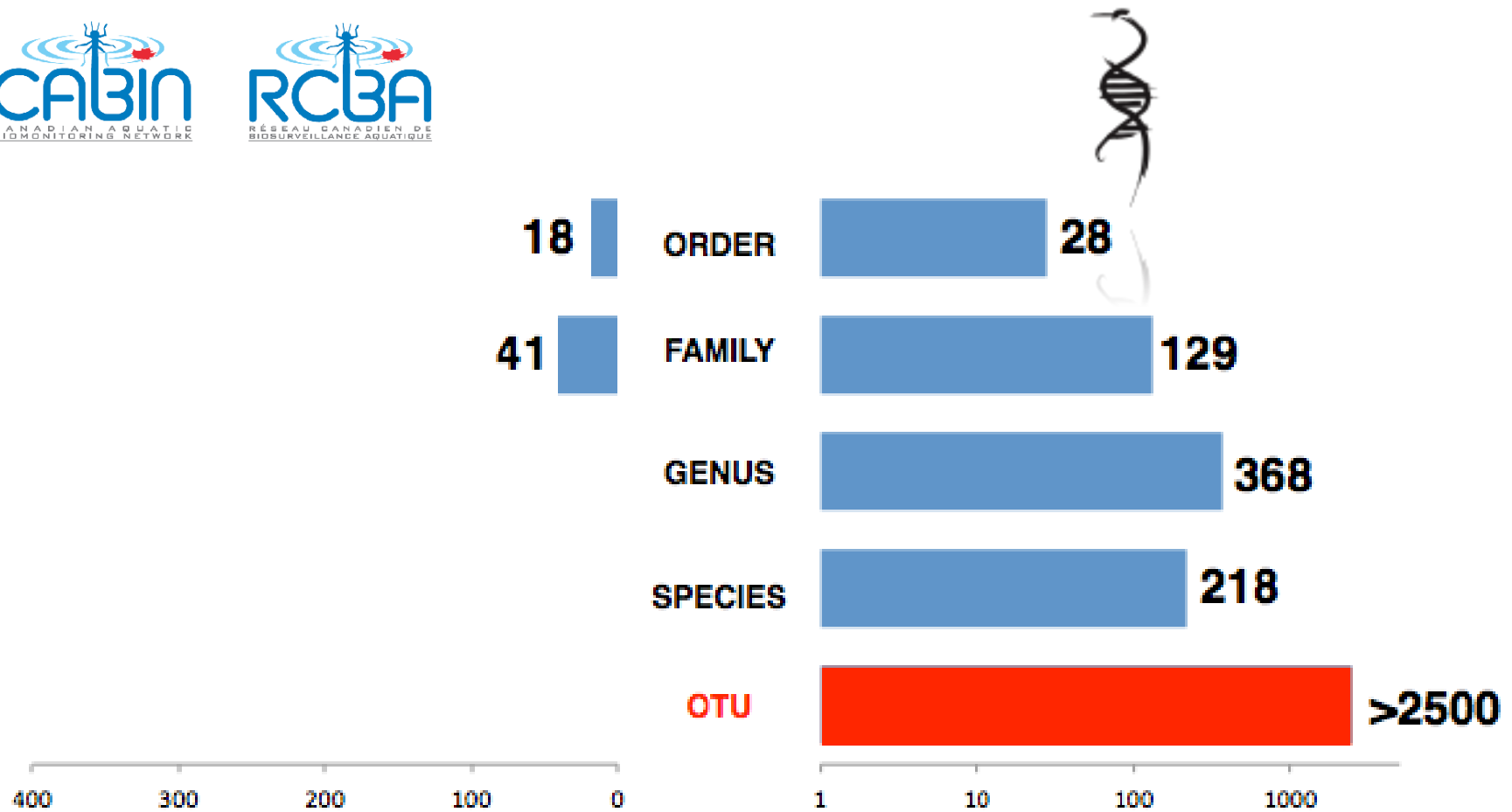
Citizen Science and DNA Multiplier



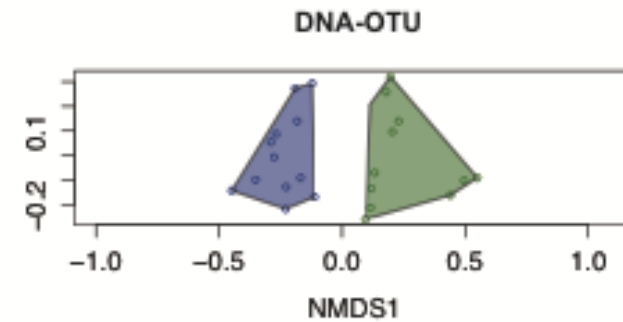
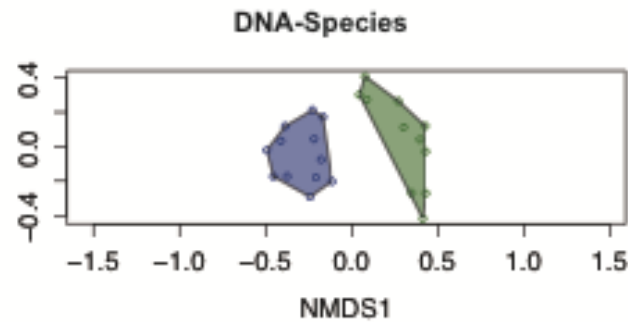
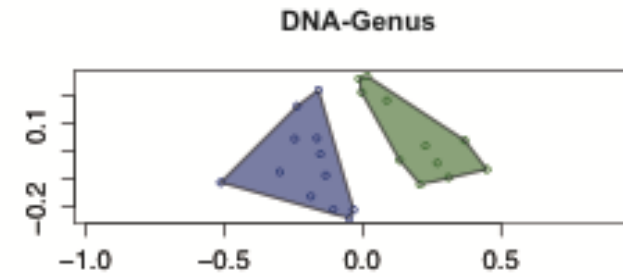
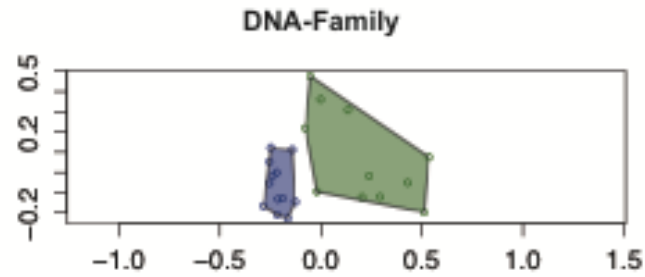
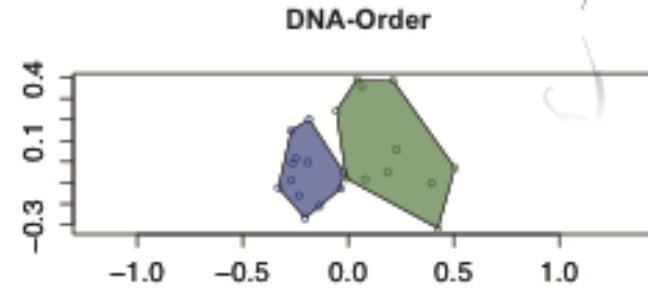
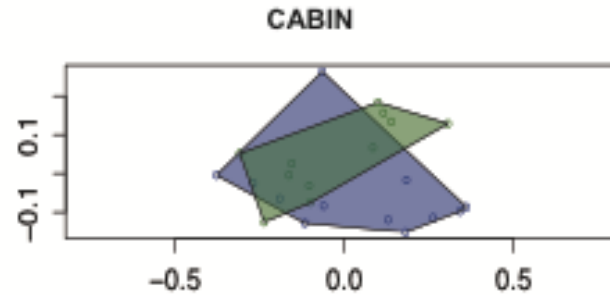
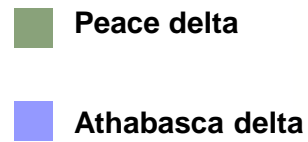
The Spatial & Temporal Reach of Citizen Science



Gamma diversity: Morphology versus DNA

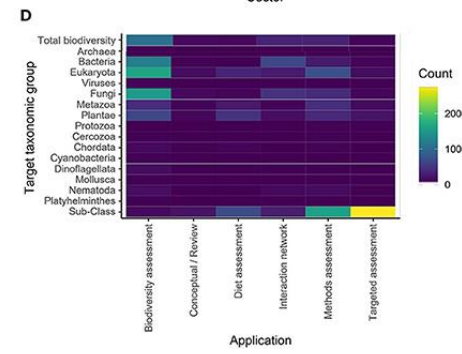
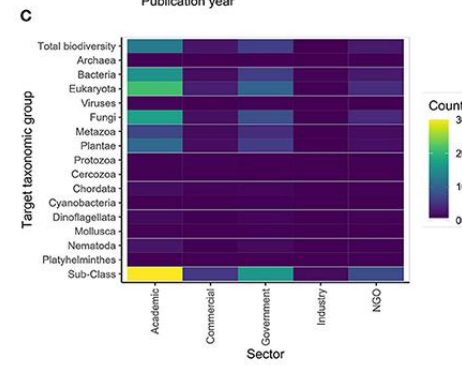
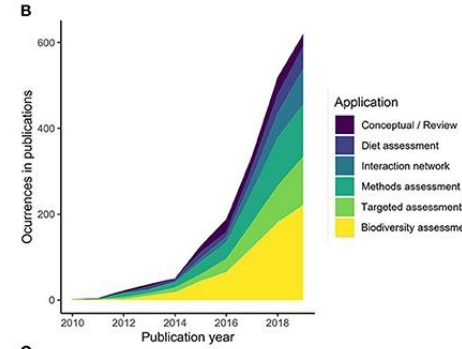
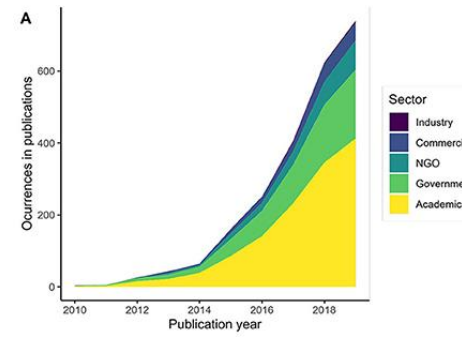


Distinguishing local faunas



Global Molecular Ecology Studies

Compson et al 2020 Front. Ecol.
Evol.



Canadian Experience

<https://stream-dna.com/>



- Partnership- Living Lakes Canada, Environment & Climate Change Canada, University of Guelph and Community Groups
- Standard analysis and community group engagement allows local issues/questions to be framed
- Operated since 2018, analysed 1200 samples
- Bulk samples gathered using standardised CABIN methodology.
- Samples are gene sequenced and results are compared DNA/RNA barcode libraries
- Information is integrated into existing reporting
- Genome Canada- Province Network

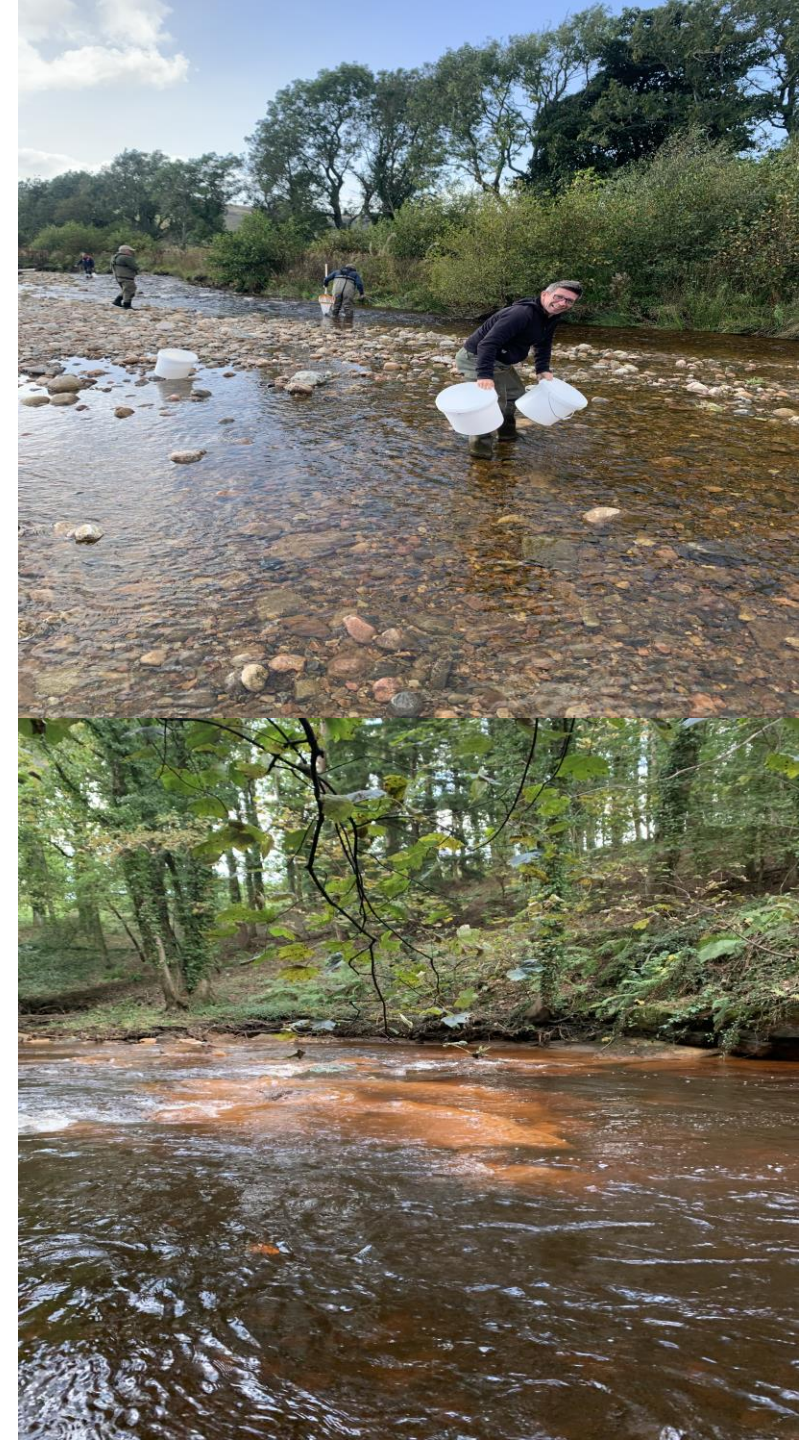
The 2 Esks Pilot Project- Objectives

- Comparing performance of DNA analysis against field & lab analysis methods, Riverfly- ARMI, Riverfly- Extended, Smart Rivers, and SEPA's mixed taxon level analysis.
- Identifying what additional metrics the DNA results can be applied to.
- Understanding the cost effectiveness of a DNA method compared to existing citizen science based methods.
- Understanding the issues associated with delivering a DNA based monitoring method through a volunteer network.
- Explore what a complementary sampling programme could look like.
- Explore what additional engagement and educational opportunities arise from including DNA methods in a citizen science monitoring programme.



Potential Future Objectives

- A wider DNA surveillance network- a pan Scotland/UK network.
- Augmenting current UK EPA bankside and lab methods with molecular methods.
- Achieve efficiencies in existing monitoring programmes, e.g reduce the current temporal frequency.
- Improve information on the distribution of species of conservation interest.
- Support current biosecurity surveillance targeted at INNS.
- Provide surveillance on human, plant and animal pathogens.
- Track climate impacts on biodiversity.
- Support the development of broader biodiversity condition metrics and more specific pressure diagnostic metrics.



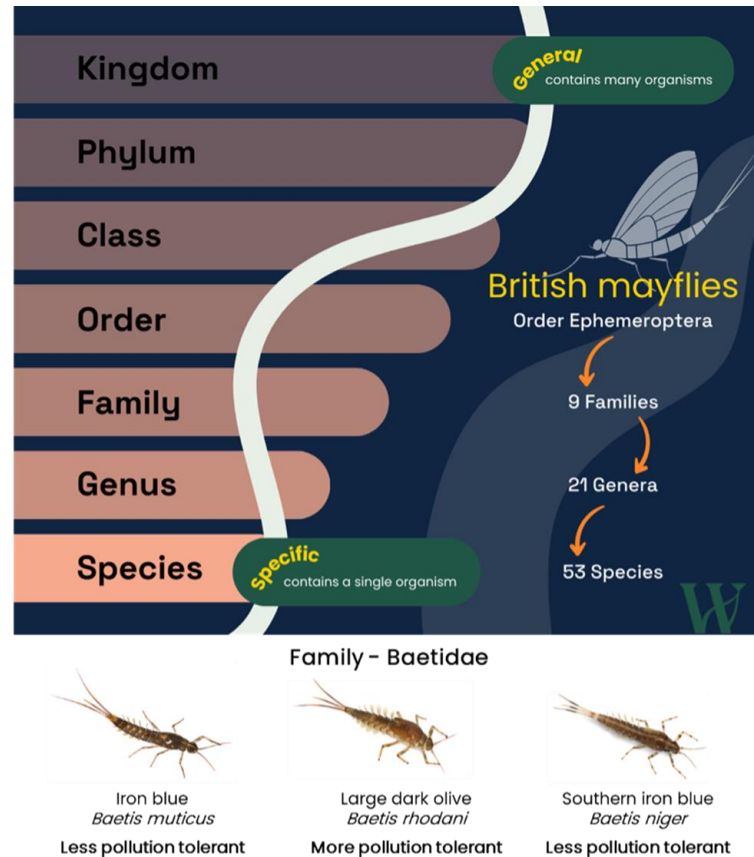
What's being delivered?

- 2 Esks
- 2 seasons
- 5 sites
- Macroinvert replicate samples 2 or 3
- Comparing
 - Riverfly (8 and 33 taxa methods)
 - Smart Rivers
 - SEPA analysis
 - DNA/Metabarcoding



Lessons Learned to Date/Issues to Think About

- Species vs family identification
- Impact of material entrainment on DNA analysis
- Preservative selection.
- Standardisation- how far can you go



Many Thanks to all of the Team!

