Can environmental DNA solve the braided river sampling conundrum to better inform management

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Acknowledgements

- My supervisors Angus McIntosh and Amy Osborne
- Wilderlab
- The Department of Conservation
- Waterways Centre for Freshwater Management

Braided Rivers




Photos taken by Angus McIntosh

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- Mosaic of different aquatic and terrestrial habitats
- What proportion of habitats need to be sampled?
- How does each component contribute to the river-wide biodiversity?

The braided river sampling conundrum

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- Lack of knowledge: Sampling challenges – under sampled because of their complexity, size and accessibility
- Impossible to get a sample representative with conventional approaches
- Human-driven disturbances – constrains flow and simplifies the river
- We don't know the effects of this simplification on the overall floodplain biodiversity

Environmental DNA (eDNA)

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- Organisms continuously leave eDNA in the environment
- Ideal in braided river - conveyer belts of biodiversity
- Conventional methods are spatially explicit whereas eDNA can provide information at the landscape scale

Figure on the left was taken by Inge Martens at the Rakaia River, Figure in the middle was taken by Angus McIntosh and the Figure on the Right was taken by Inge Martens at the Ashburton River.

Environmental DNA…part of the solution?

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Design

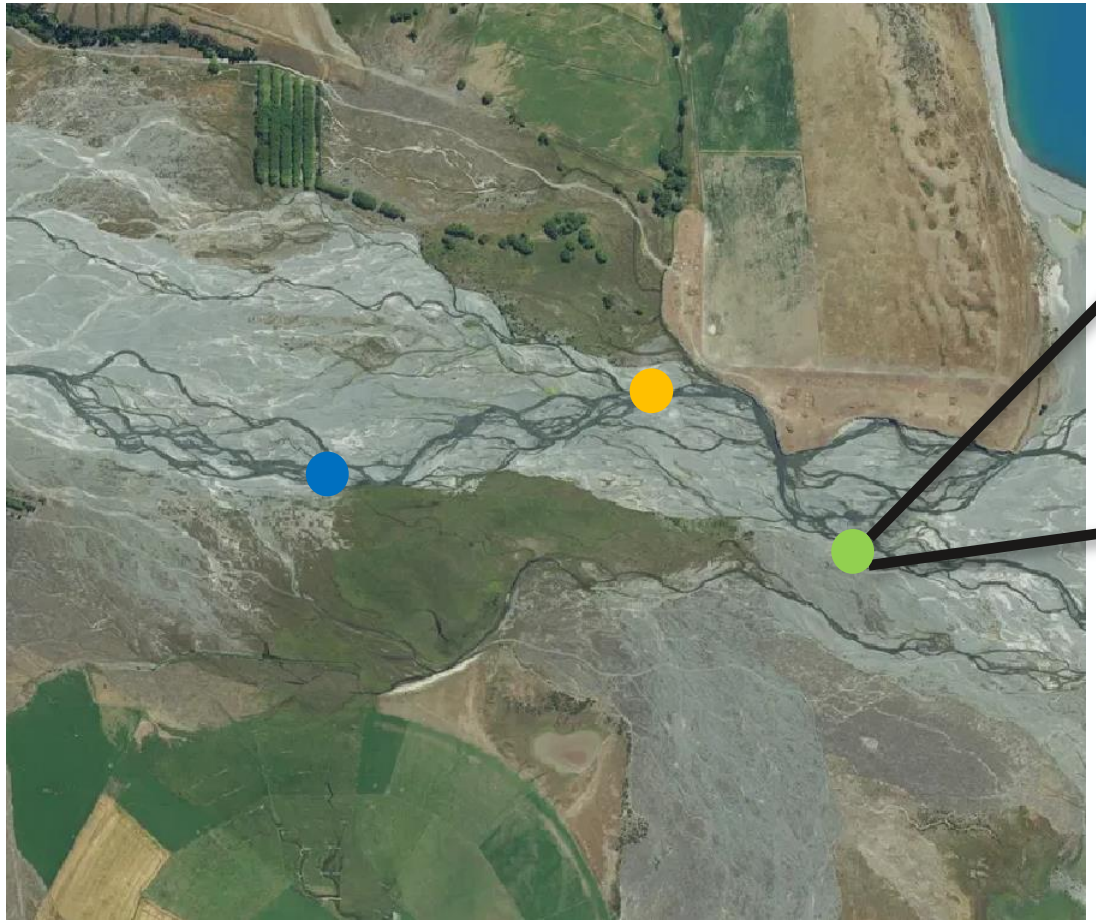

Figure on the left was produced via QGIS using LINZ aerial imaging; Photos taken by Inge Martens at the Upper Rangitata river and Cass river

Sampling method

Figure on the left: Syringe method from the Wilderlab website; Figure in the middle: Drogue method, picture taken by Inge Martens as the Cass river; Figure on the right: Mount method, picture taken by Inge Martens at the Ashburton river.

Filters out-perform syringes

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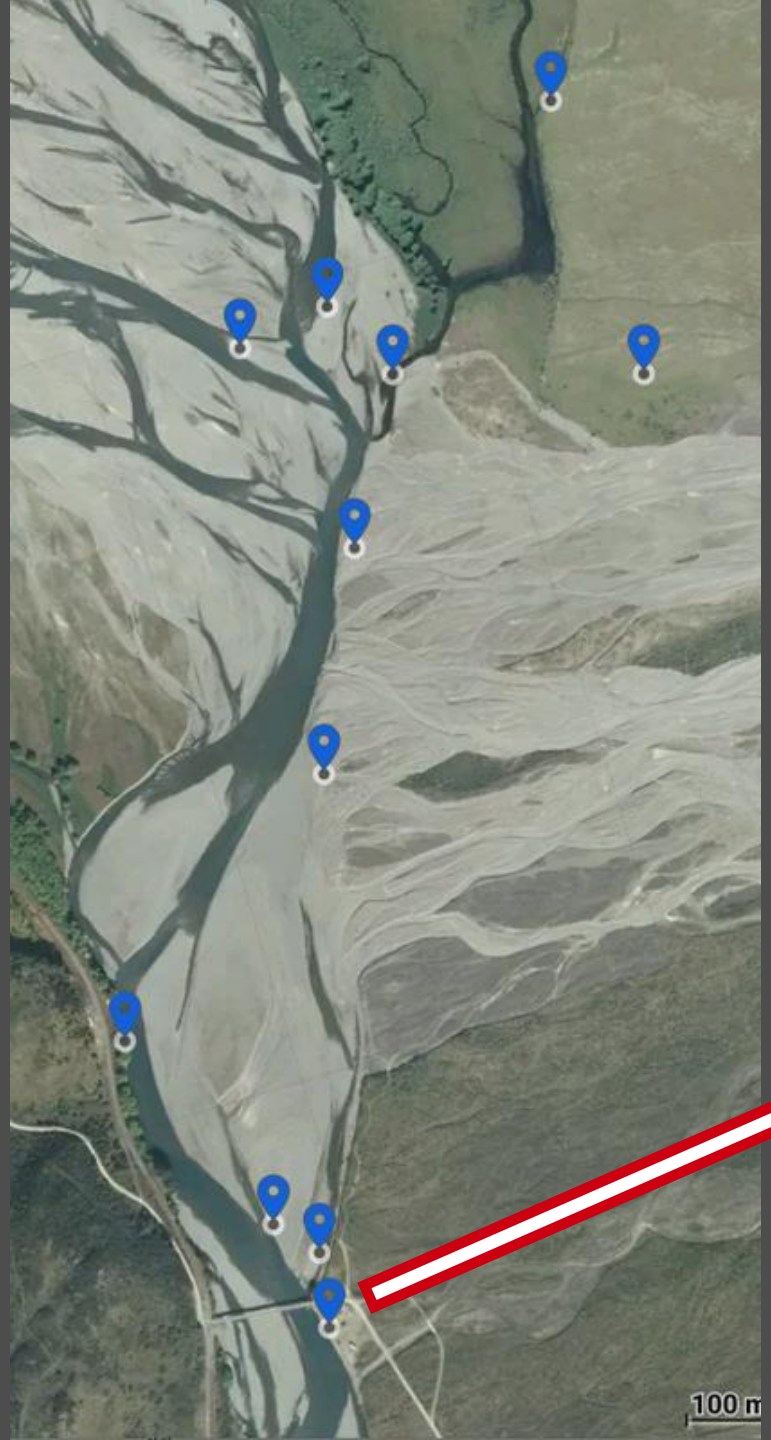
- All of the following results are preliminary
- Only Invertebrate species have been looked at so far for the filter:syringe comparison
- Longer period in the water - nocturnal species
- The syringes are potentially more location and time specific



Kick-net verse filter

- Kick-nets showed low abundance and diversity in Main Braid
- Capturing information from the lateral habitats?

eDNA site three, downstream

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Landscape scale fish information (Cass river)

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Common Name

- Upland bully
- Koaro
- Brown trout
- Alpine galaxias
- Rainbow trout
- Common bully
- Waitaki upland longjaw galaxias

- Capturing information from the lateral habitats?

Does placement matter?

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No, Preliminary data suggests not!

Are replicates important?

Yes, Preliminary data suggests it is, especially if it is a rare species!

Bigger picture

- preliminary data suggests that eDNA has the potential to add valuable information at the landscape scale
- Could be used routinely as it is cost and time efficient
- Braided rivers need to be viewed and managed holistically

Thank you