

# Sampling Freshwater Fishes In Dangerous Waters

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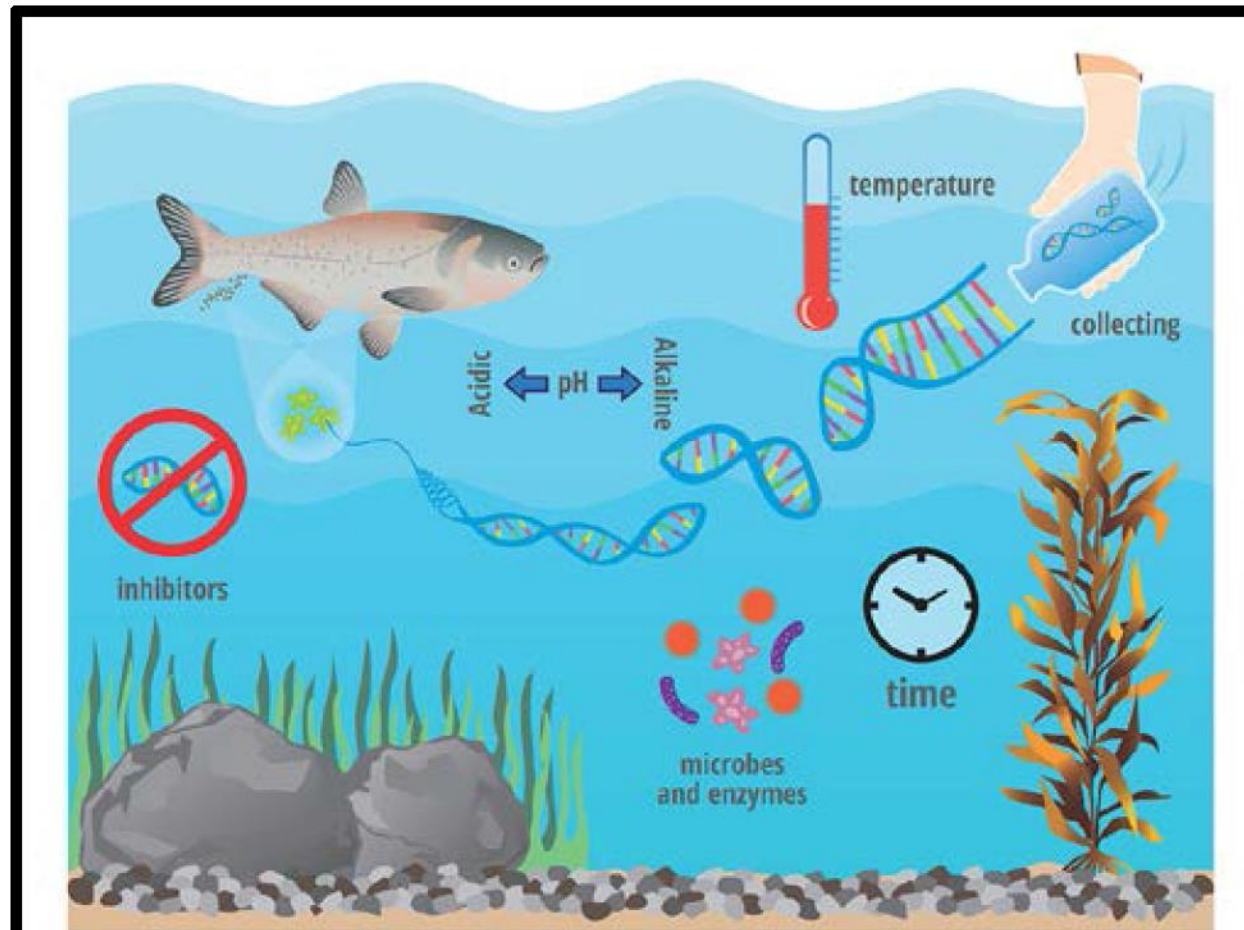
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Savannah Science Network Meeting, Skukuza 2025

# Introduction

- \* Freshwater fishes sampled for a variety of reasons, e.g. biodiversity surveys, fisheries assessments indicators of aquatic ecosystem health.
- \* Conventional sampling uses active (e.g. seine nets, electrofishing) or passive (e.g. traps) gears deployed by wading into the waterbody or from a boat.
- \* Challenging in waterbodies with physical (e.g. fast-flowing waters, sunken trees) and biological (e.g. aquatic megafauna) hazards.

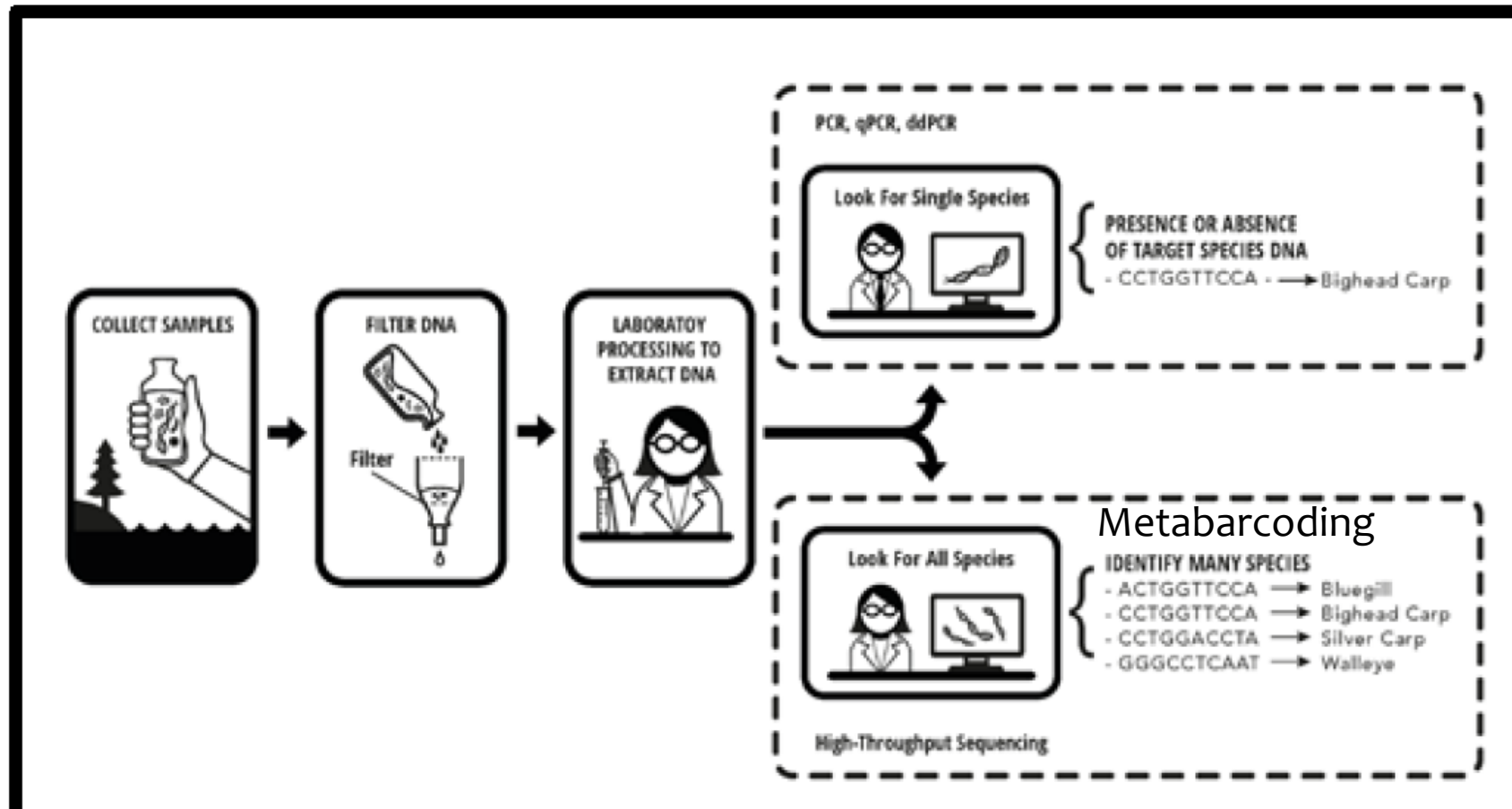
# Environmental DNA (eDNA)



**GEN-FISH**

Genomic Network for Fish  
Identification, Stress and Health

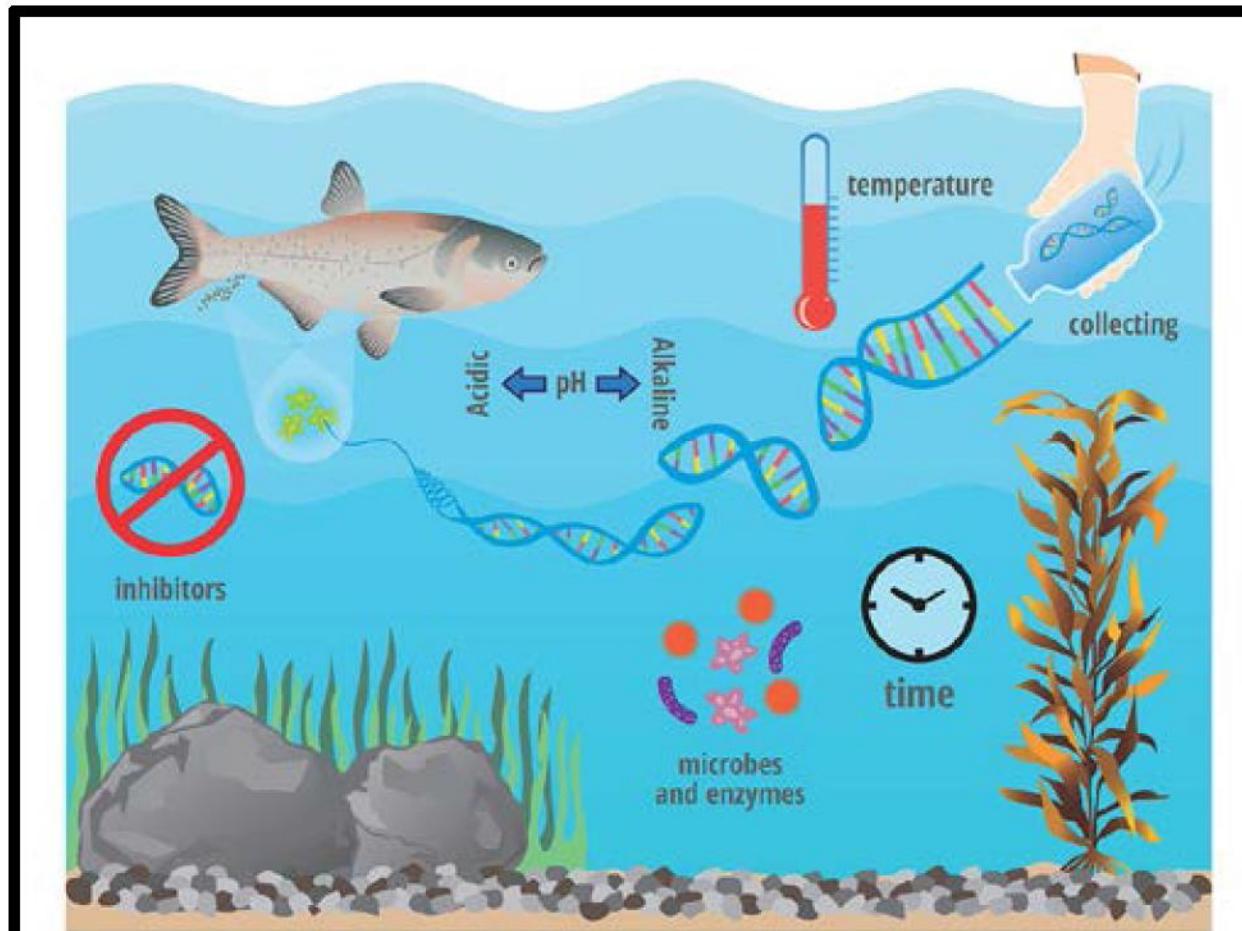
# Environmental DNA (eDNA)



**Figure 1:** Process for collecting and analyzing eDNA.



# Environmental DNA (eDNA)



**Figure 2:** Many factors can influence eDNA degradation in the environment.



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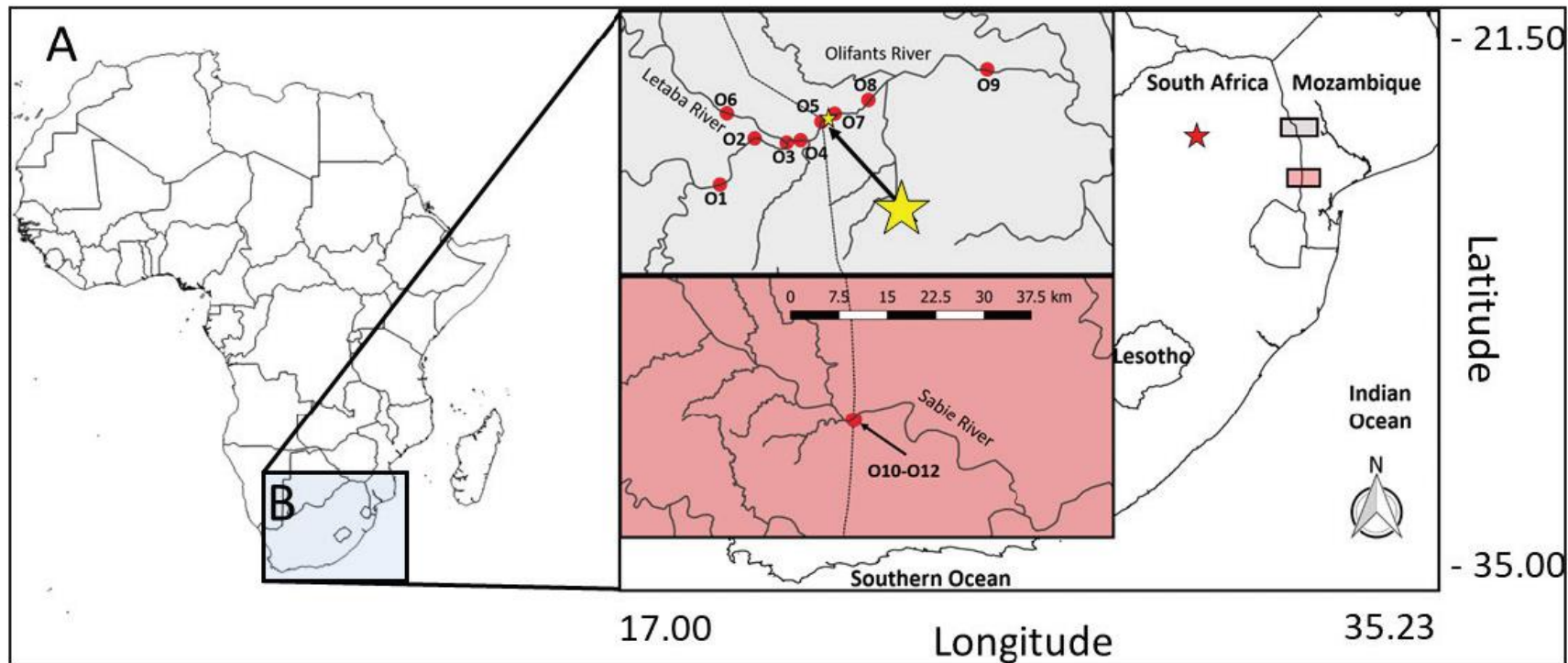
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*Advancing research on alien species and biological invasions*

## **Monitoring the silver carp invasion in Africa: a case study using environmental DNA (eDNA) in dangerous watersheds**

Steven Crookes<sup>1,2</sup>, Tej Heer<sup>3</sup>, Rowshyra A. Castañeda<sup>4,5</sup>, Nicholas E. Mandrak<sup>3,4,5</sup>, Daniel D. Heath<sup>1</sup>, Olaf L.F. Weyl<sup>5,6</sup>, Hugh J. MacIsaac<sup>1</sup>, Llewellyn C. Foxcroft<sup>7,8</sup>

# eDNA



**Figure 1.** Map of sampling locations for silver carp eDNA within the continent of Africa (**A**). All sampled sites within southeast Africa (**B**) are shown as red circles. The two areas sampled are the Olifants system (Olifants and Letaba Rivers, grey inset) and the Komati (Sabie River, red inset). Also shown is the site of introduction and escape of silver carp in South Africa (red star) and the location of the Massingir dam, Mozambique (yellow star). Dotted line delimits the South Africa – Mozambique border.

# eDNA

## Potential Limitations

- \* Inhibition in warm, turbid, contaminated waters
- \* Lack of human, laboratory, and financial resources
- \* Lack of reference sequence databases for African species, particularly endemics

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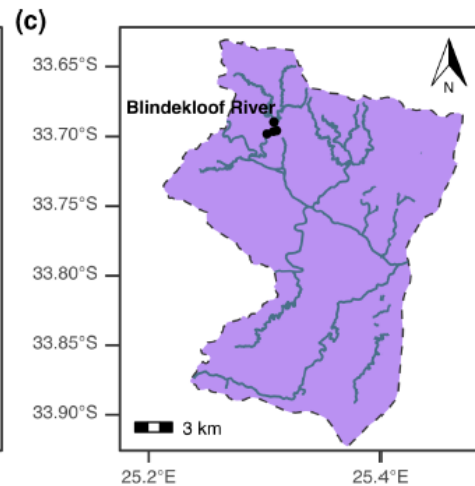
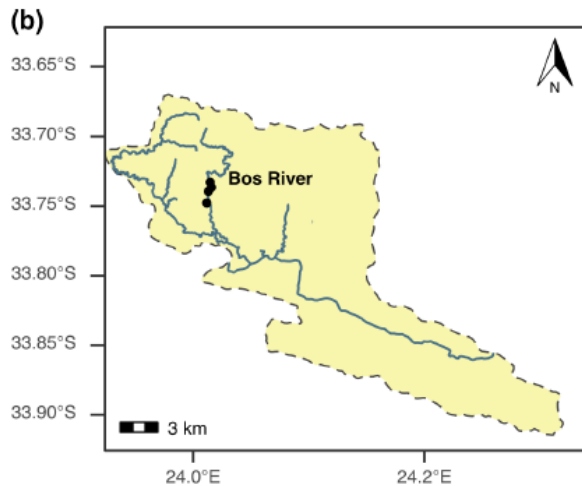
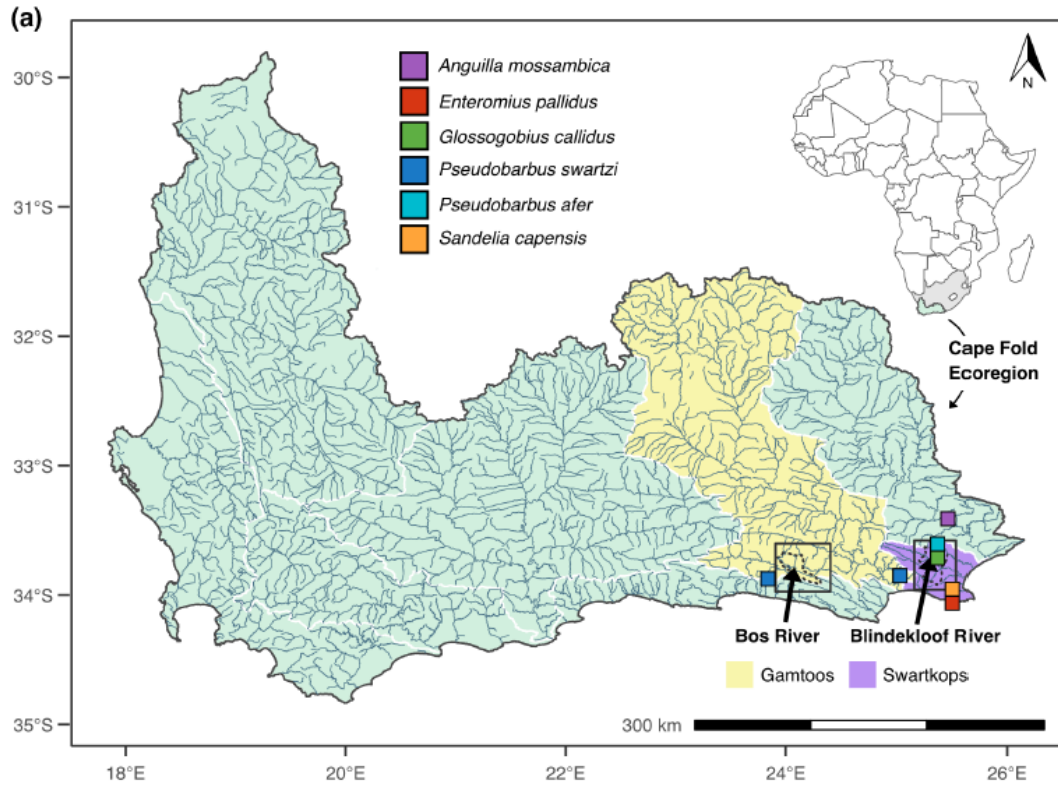
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ORIGINAL ARTICLE

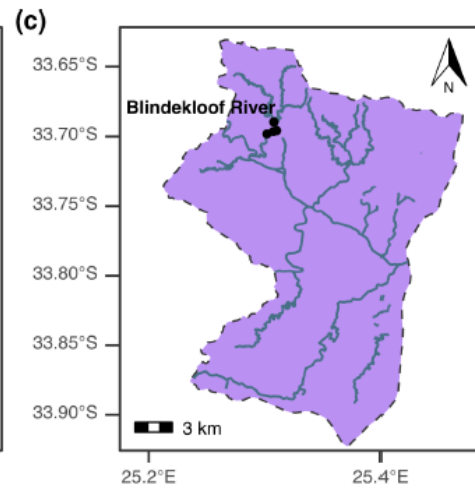
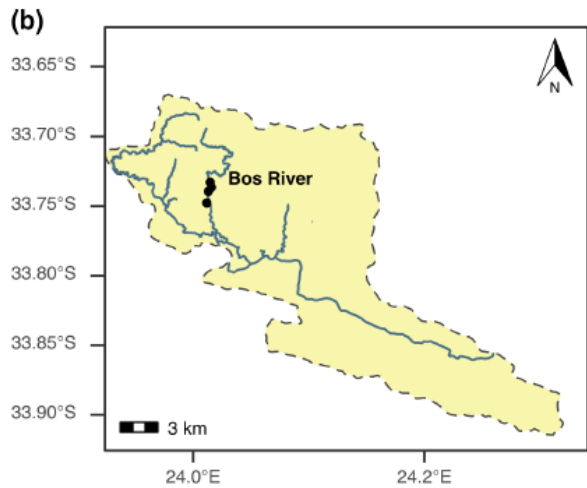
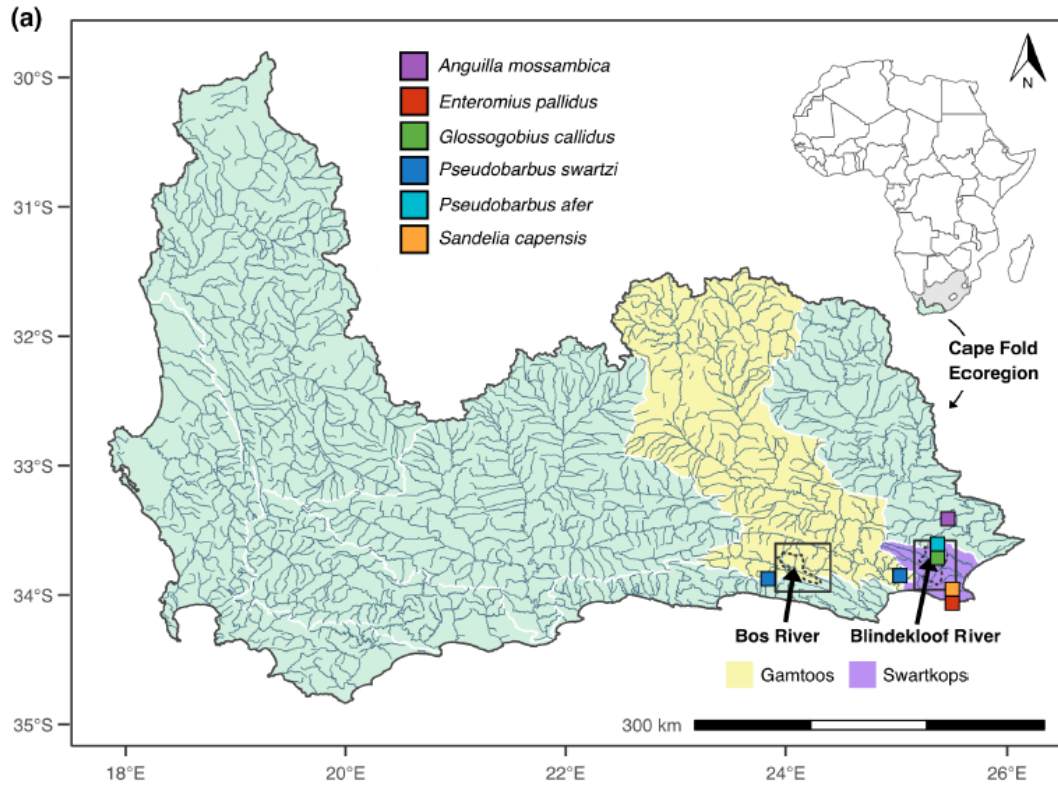
Freshwater Biology | WILEY

# Environmental DNA metabarcoding in the Cape Fold aquatic ecoregion: Opportunities and challenges for eDNA uptake in an endemism hotspot

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Nathan R. Lovejoy<sup>1,2</sup> | Olaf L. F. Weyl<sup>3,†</sup> | Nicholas E. Mandrak<sup>1,2,3</sup> 



- \* Only 1% of eDNA metabarcoding reads classified to fish species without using existing reference sequence databases. 3 species.
- \* Once regional reference sequences were added, nine species detected and >99% reads classified. 9 species.



- \* Strong positive relationship ( $\Phi = 0.75$ ) was observed between the patterns of detections using eDNA and visual approaches.
- \* Relative read frequency and abundance observed in visual surveys significantly correlated ( $R^2 = 0.85-0.88, p < 0.001$ ).





Q. How to sample eDNA (and fishes) from smaller, more remote pools with dangerous megafauna?

- \* Drones are increasingly used in conservation.
- \* Collect water samples and deploy and retrieve GoPro cameras and lightweight minnow traps using a drone.



# Pilot Studies

Conservation research typically uses drones to study animals, but effects of drones on animals less studied

1. Toronto Zoo – determine behaviour of hippos and crocodiles in response to hippos, simulating field study (spring 2025)
2. Canada/SA – conduct preliminary field studies (cameras/trap; water-sample study already completed) (summer/fall 2025)
3. Kruger NP – implement primary study (2026)

# Pilot Studies – South Africa

## When to Do?

- \* Wet season
  - \* Water, but too flashy, unpredictable?
  - \* Where did eDNA come from?
  - \* Inhibitors – higher temperature, turbidity, contaminants
- \* Dry season
  - \* Too little water for traps?
  - \* Dangerous animals concentrated
- \* End of wet season when pools becoming isolated?

# Questions?

