



eDNA applications from Pit-to-Port: Implementing biodiversity monitoring along the value chain

Warwick Mostert (Principal Biodiversity - Anglo American)

Dr Vere Ross-Gillespie (Mining Sector Lead - NatureMetrics)



Companies are being held back by conventional monitoring



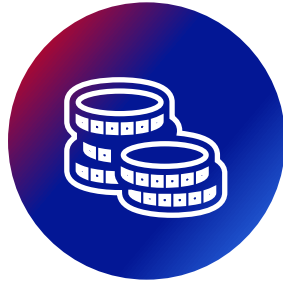
Time-consuming
& safety risks



Inconsistent
& inaccurate



Incomplete



Expensive &
unscalable

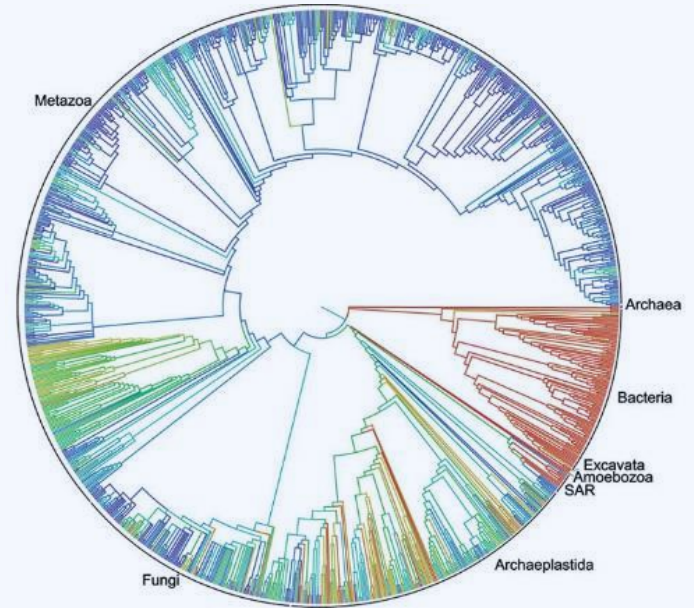


Why? Measuring nature is really hard



Climate

Nature



A solution is environmental DNA (eDNA)

Traces of DNA that organisms leave behind in the environment



How to sample eDNA



01 Collect



02 Filter



03 Preserve



04 Send



Why use eDNA

eDNA has transformed biodiversity monitoring. The most accurate and scalable solution for site-level biodiversity insights.



Find hard to detect species

Discover rare, elusive and cryptic species - even if you can't see them.



Collect more data with fewer samples

Identify hundreds of species from a simple sample. (And take a sample in just 10 minutes).



Increase accuracy and consistency

Overcome errors associated with visual identification and generate repeatable results.

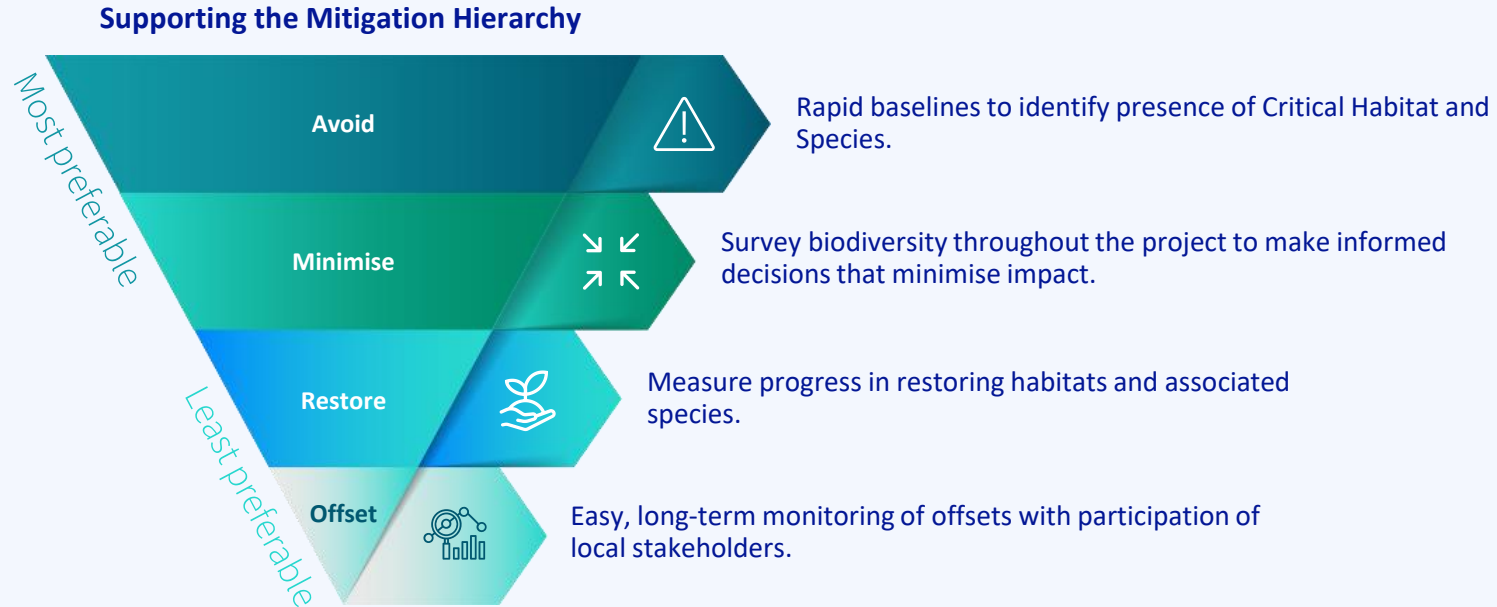


Improve Health and Safety

Reduce health and safety concerns by minimising the time staff spend in the field.

First steps: Informing the Mitigation Hierarchy

eDNA is applicable at all stages



Cross sector & supply chain monitoring



Marine



Infrastructure



Extractives



Conservation



Water /
Utilities



Research

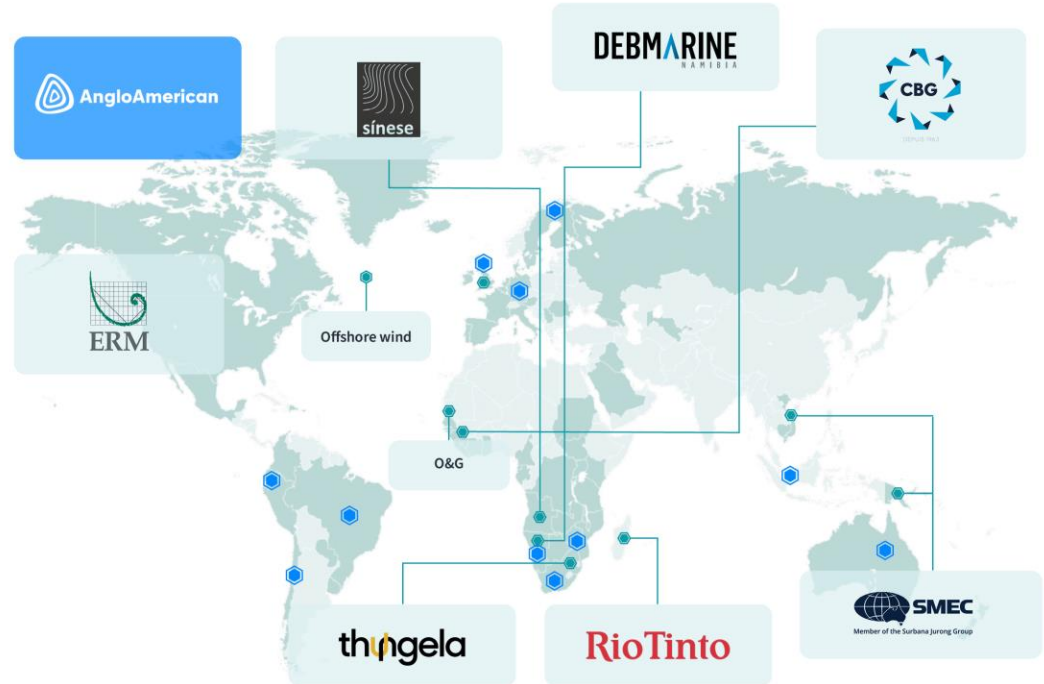


Agriculture



Renewable
Energy

- Building a community of practice together
- Working with supply chain customers, suppliers and educating regulators / authorities
- Share learnings



Simple sampling kits

Simple sampling kits enable stakeholders to sample waters or sediments, offshore or on land at different scales

On-site HSE teams, Port authorities, Consultants, Shipping crews



Pit-to-port case study



Anglo American Marketing & Shipping, Sishen & Kolomela
Saldanha Bay, South Africa & Singapore
Saldanha Bay Water Quality Forum Trust (SBWQFT)
Autumn 2022 continuing in 2025
Vertebrate, sediment, eukaryote eDNA

Pit-to-port case study

Why?

- Understand Biodiversity interactions of product from pit-to-port, monitoring across logistics and supply chains and business units
- Inventory and monitoring of:
 - seasonal wetlands, rivers and biodiversity
 - invasive and non-native species (INNS)
 - other marine fauna in ports and harbours
 - ballast water along major shipping lanes
- Inform management decisions for site operations (e.g. for expansion areas)
- Help define ecological indicators for monitoring and measurement of nature positive contributions and net positive impact on biodiversity over time
- Facilitate partnerships with port authorities and stakeholder groups, contributing to local ongoing monitoring and regional scientific knowledge



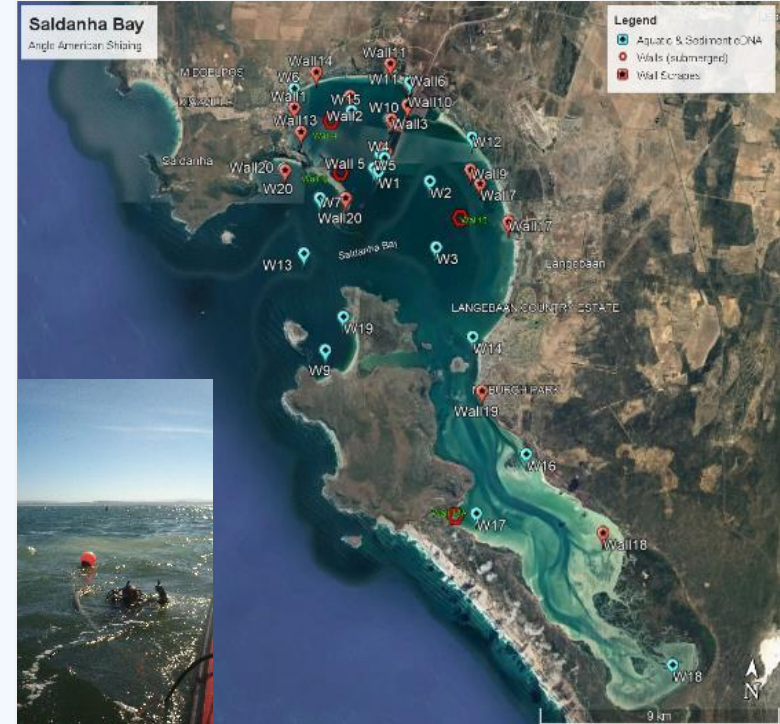
Pit-to-port case study

DNA Based methods

- Alignment of water and sediment samples with Saldanha Bay Water Quality Forum Trust (SBWQFT) monitoring points & metadata
- Extra DNA biobanked for future analyses

Sampling

- 1 Season (2022)
- Sediment eDNA samples (x20)
- Aquatic eDNA Maxi samples (x20) – Vampire pump
- Wall scrapes (x20)
- Ballast water aquatic eDNA (x4)
- Barcoding samples (x200)
- Negative field controls (x4)



Pit-to-port case study

Data (3414 species detected)

- Numerous fish – correlation with conventional sampling & several additional fish species detections
- 6 vulnerable species detected (4 fish, 1 shark and 1 bird)
- Elasmobranch (Shark) & Holocephali detected
- Bacteria & Eukaryotes detected for sediment and wallscrapes enabling statistical analyses with metadata (e.g. water quality)
- eDNA assays confirmed several invasive species
- Ballast water yielded potential harmful species & suggests UV is not installed/working and biotic communities may have established in ballast tanks

Stakeholders & reporting



- New partnerships & monitoring to continue in 2025
- Improved & transparent reporting for the SBWQFT state of bay reporting including addition of data to Global Biodiversity Information Facility (GBIF) (in progress)
- First study of Ballast Water using eDNA in SA
- Barcoding of species - augmenting global databases & regional knowledge

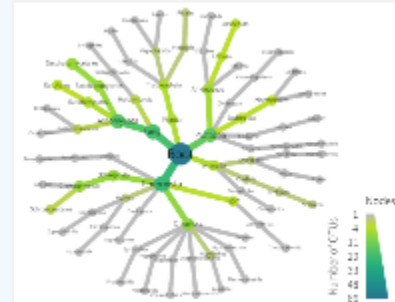


Figure 1. A dendrogram showing the number of OTUs across 10 samples from the order Sauri. The color scale indicates the number of OTUs, ranging from 0 to 100. The dendrogram shows a hierarchical clustering of samples, with a color scale on the right indicating the number of OTUs.

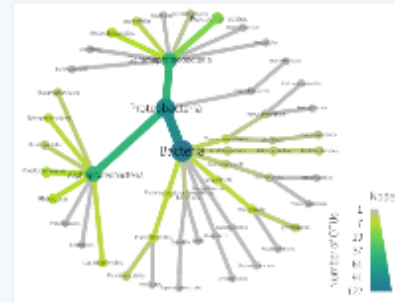


Figure 2. A dendrogram showing the number of OTUs across 10 samples from the order Sauri. The color scale indicates the number of OTUs, ranging from 0 to 100. The dendrogram shows a hierarchical clustering of samples, with a color scale on the right indicating the number of OTUs.



Thank You

Please reach out with queries

Warwick Mostert

Principal Biodiversity

Warwick.mostert@angloamerican.com

Dr Vere Ross-Gillespie

Mining Sector Lead

vere.ross-gillespie@naturemetrics.co.uk