WE ARE NATUREMETRICS, DELIVERING

DNA-based Biodiversity Monitoring

Dr Sam Lacey,
Business Development Director

@NatureMetrics
In the last year, business, governments and finance woke up to the need to invest in the protection and restoration of nature because it underpins the global economy.
BUT nature based solutions are not always good for biodiversity.

We need a way to differentiate NBS that are good for nature, from those that are not.
Biodiversity is complex

- **Wildlife**: Hard to observe
- **Small Things**: Hard to identify
- **Biodiversity**: Drives ecosystem functions and resilience
Biodiversity has a measurement problem

Biodiversity is much more complex than carbon

Traditional biodiversity monitoring is time consuming, expensive and returns limited results

The market is relying on proxies, not measuring biodiversity outcomes

Diversity drives ecosystem function and resilience
Investors need clarity

• For the private sector to value and invest in something, they need an **objective, verifiable measure** of its **quality**

• Conservation and restoration require **outcome** metrics

• Biodiversity is a **big data** problem

• How to convert complexity into something **simple, universal** and **meaningful**?
Why is eDNA transformational?

**Comprehensive:** eDNA captures everything in one sample from microbes to megafauna

**Scalable:** Cost-effective relative to traditional approaches and enables consistency when sampling whole landscapes.

**Accessible:** Anyone in the world can collect a sample – don’t need experts

**Objective:** Standardised processes produce replicable results independent of expertise

**Verifiable:** eDNA samples can be stored for independent verification of outcomes, thus establishing the credibility of claims.
Environmental DNA (eDNA) sampling

eDNA from cells, mucus, faeces, from all taxa living in and around water is captured in a simple filter.

1. Collecting samples
2. DNA extraction
3. DNA amplification

The amplified DNA is then sequenced on a high-throughput platform.

4. DNA sequencing
5. Bioinformatics analysis
6. Identification of individual species and determination of sample diversity.

DNA is extracted from the filter in the lab and the DNA from the target groups is amplified.
At 2 river sites and 10 stream sites, the client compared aquatic eDNA with the netting process.

**Fish**
- 5 x more species than netting

**Mammals**
- 5 x more species than camera traps

**Conventional vs. eDNA**

**EIA - Peru**
Overall

27 x more species per unit sampling effort
The academic literature provides extensive evidence of how effective eDNA is compared to traditional techniques in marine, freshwater and terrestrial environments...
DNA METABARCODING

Quickly & cheaply generate species lists from complex samples containing the DNA of many species

Extract total DNA from sample

Amplify & sequence DNA of target taxonomic group

Match sequences against reference libraries to identify

- Water (eDNA)
- Vertebrates
  - Fish
  - Bacteria
- Soil
- Soil fauna
  - Bacteria
  - Fungi
- Insects
- Insects
  - Vertebrates
From proxies to holistic, objective, verifiable, biodiversity data

Simplify complexity, don’t bypass it

What gets measured, gets managed and invested in
eDNA can be used to advance biodiversity monitoring

**Enhance** – add species data to existing habitat quality measures

**Calibrate** – groundtruth biodiversity proxies

**Create** – new biodiversity metrics incorporating holistic ecosystem health and composition
R&D - Machine learning classifier

Score the soil samples between 0 and 1

0 = very similar to target, 1 = very similar to grassland