

APPLICATIONS OF EDNA TECHNOLOGY FOR IMPROVED EIA AND CONSERVATION OUTCOMES



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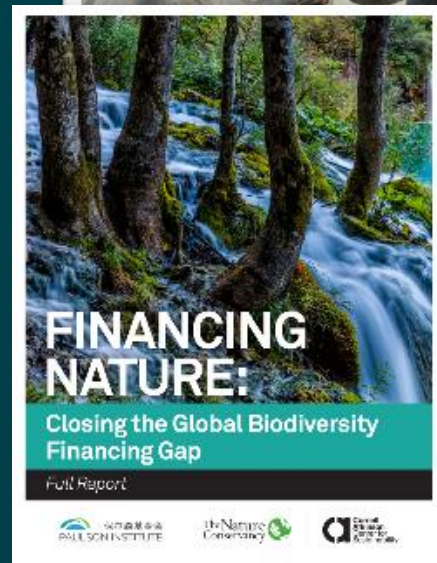
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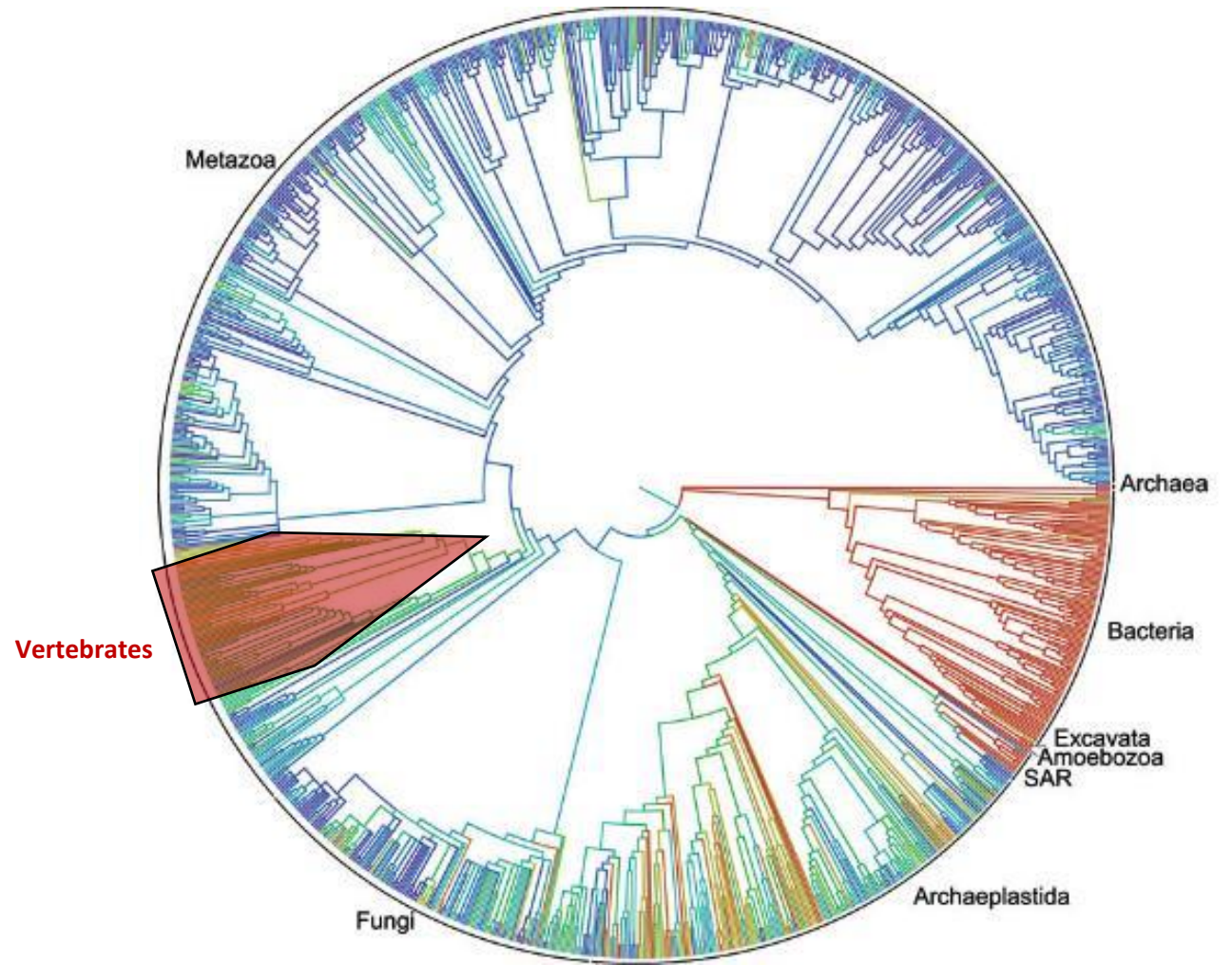
In 2021 business and finance woke up to **the need to monitor impacts** on nature



But biodiversity has a
measurement problem

Biodiversity is much more
complex than carbon

**Meaningful metrics must
simplify complexity**....not
by-pass it altogether

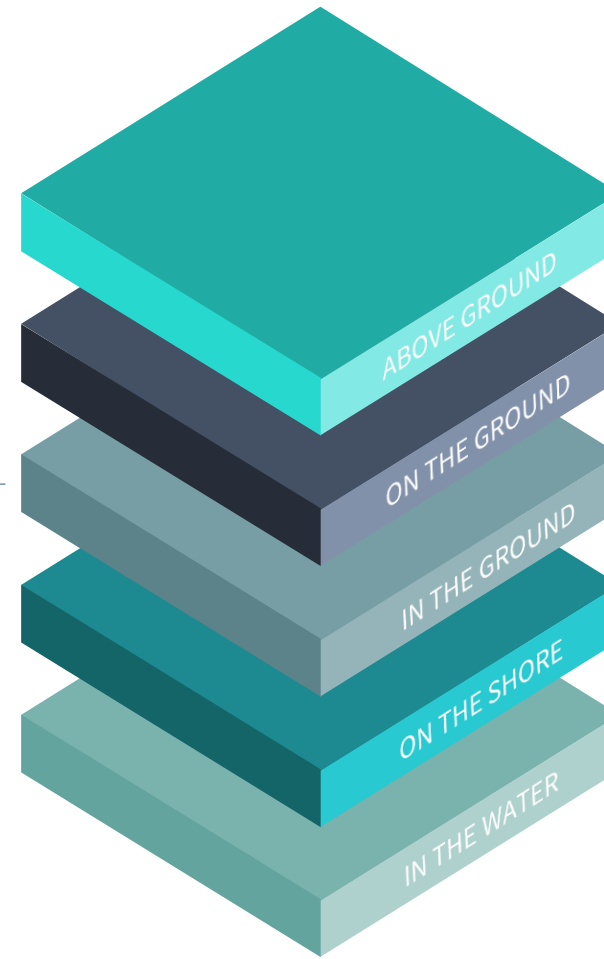


ENVIRONMENTAL DNA (eDNA)

- Animals shed cells containing DNA as they move (skin, mucous, faeces, urine) through environments
- Cells with DNA enters water courses
- This is environmental DNA (eDNA)
- eDNA in the water remains detectable for hours to few days
- The eDNA can be captured & used to survey species.



Soil fauna
Bacteria
Fungi



Insects
Vertebrates



Vertebrates
Invertebrates
Mussels
Bacteria



FILTER



ANALYSE

	Feb 19	Mar 19	Apr 19	May 19	Jun 19	Jul 19
<i>Anguilla anguilla</i> (Eel)	•	•	•	•	•	•
<i>Abramis brama</i> (Bream)	•	•	•	•	•	•
<i>Alburnus alburnus</i> (Bleak)	•	•	•	•	•	•
<i>Barbus barbus</i> (Barbel)	•	•	•	•	•	•
<i>Cyprinus carpio</i> (Carp)	•	•	•	•	•	•
<i>Gobio gobio</i> (Gudgeon)	•	•	•	•	•	•
<i>Leuciscus leuciscus</i> (Dace)	•	•	•	•	•	•
<i>Phoxinus phoxinus</i> (Minnow)	•	•	•	•	•	•
<i>Rutilus rutilus</i> (Roach)	•	•	•	•	•	•
<i>Squalius cephalus</i> (Chub)	•	•	•	•	•	•
<i>Tinca tinca</i> (Tench)	•	•	•	•	•	•
<i>Barbatula barbatula</i> (Stone loach)	•	•	•	•	•	•
<i>Esoc lucius</i> (Pike)	•	•	•	•	•	•
<i>Gasterosteus aculeatus</i> (Three-spined stickleback)	•	•	•	•	•	•
<i>Gymnocephalus cernua</i> (Ruffe)	•	•	•	•	•	•

REPORT

WHAT eDNA CAN ACCOMPLISH

Limitations can be addressed through efficient study design*

LIMITATIONS

- Not possible to count (R&D in progress)
- No age or size data
- Incomplete reference databases*
- Spatial uncertainty*
- Lack of standardization*

ADVANTAGES

- Large datasets for NPI & monitoring
- Reduced cost & HSE risks in field
- Detect cryptic & elusive species
- Works in terrestrial environs & all water
- Methods are non-invasive
- Can be used by anyone

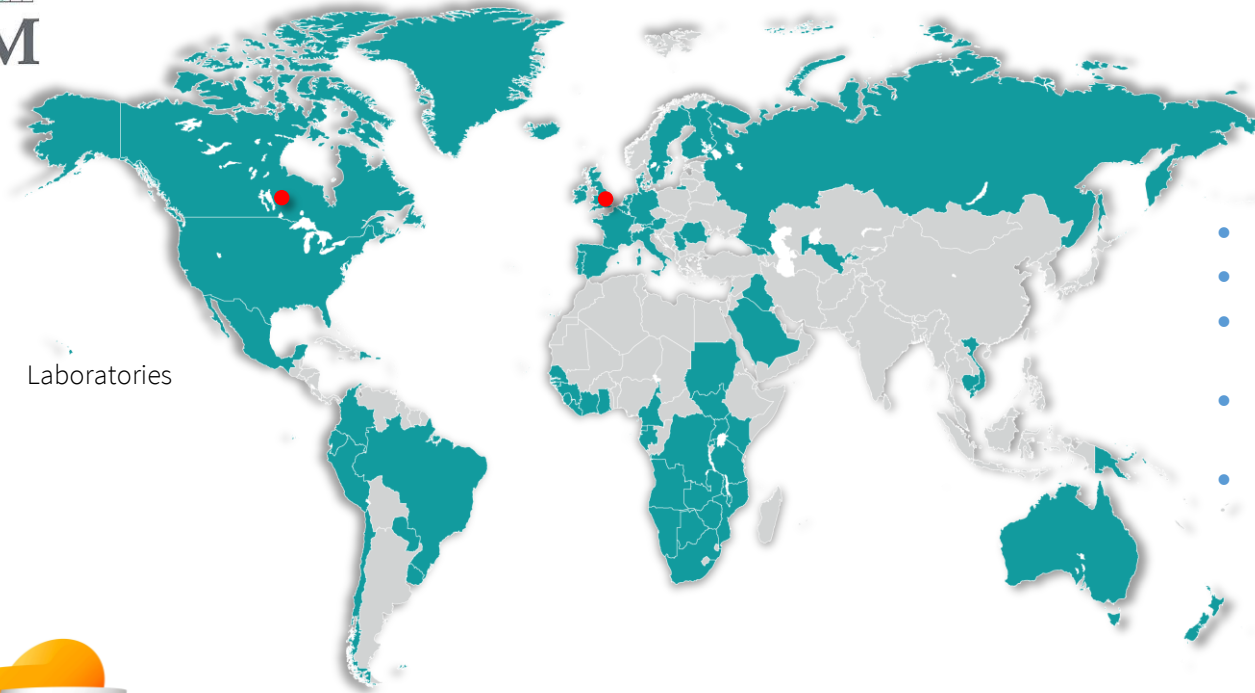
WHO WE ARE



BARRICK

Jacobs

AECOM



Laboratories

- Conservation
- Research
- Impact assessment
- Statutory monitoring
- Planning

THE BIODIVERSITY CONSULTANCY



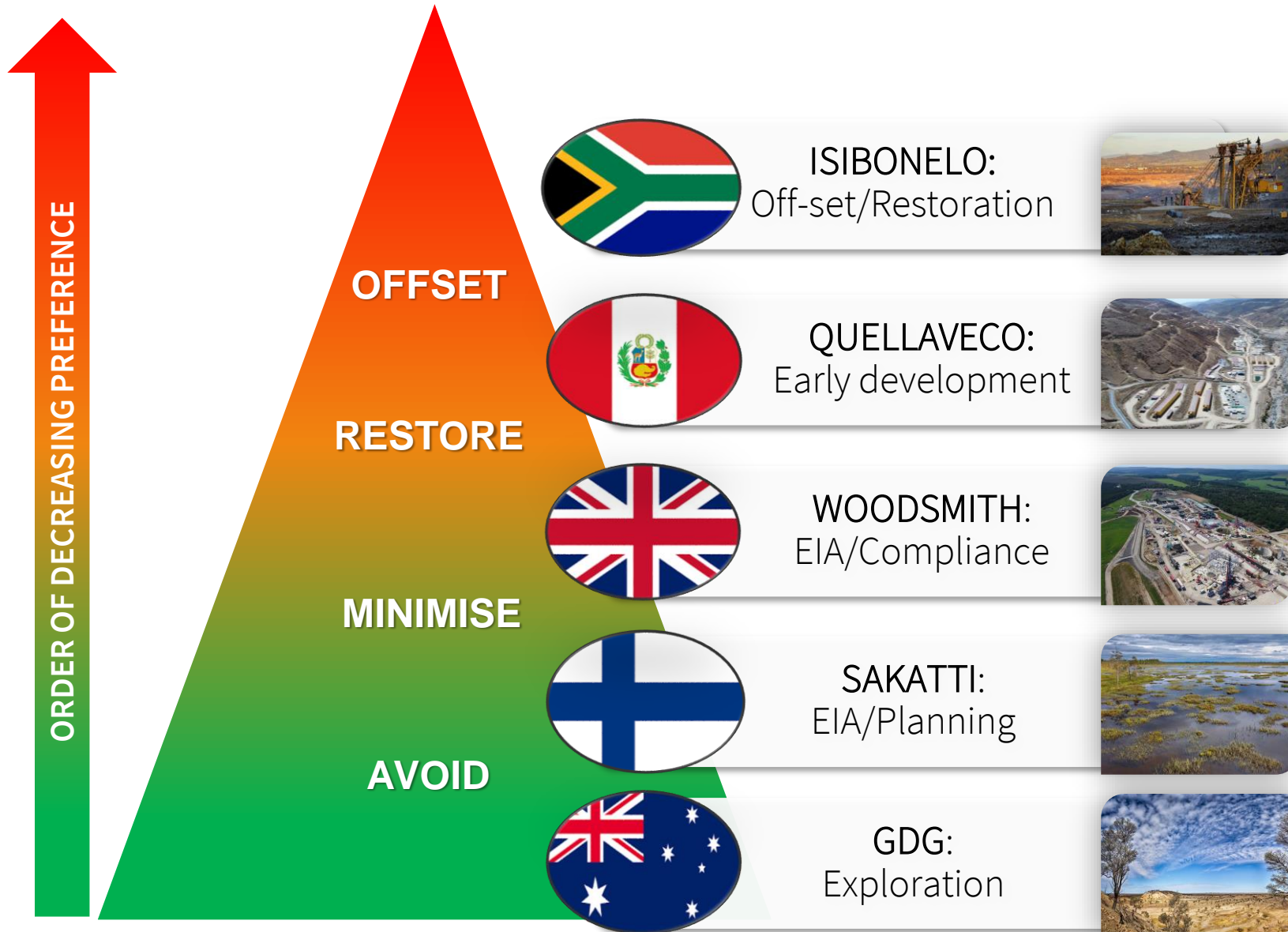
Marine Infrastructure Extractives Conservation Water / Utilities Research Agriculture Renewable Energy

~110 employees

450+ client/projects

65+ countries

eDNA INFORMS ALL STAGES OF THE MITIGATION HIERARCHY



- Early surveying to **develop baseline** for the project
- **Monitoring** to track changes in the nature and the extent of the impacts on biodiversity
- Prior to intervention **planning for restoration and offset**, measure biodiversity and then track changes to monitor progress in species and habitat recovery.

iNPI: INTELLIGENT NET POSITIVE IMPACT

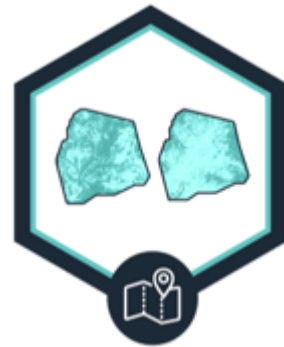
Many companies compensate for simple approaches to delivering No Net Loss and Net Positive claims by using large offset areas. We are proposing a practical but sophisticated approach that embraces the complexity of biodiversity as an asset rather than a complication.



SAMPLING

Survey design and eDNA sampling

NatureMetrics designs an optimized, cost-effective sampling plan, drawing on any existing survey work and consultant knowledge.



MAPPING

Biodiversity landscape mapping

eDNA point samples are combined with Earth Observation data to create a continuous map of biodiversity, allowing efficient comparisons across the landscape surrounding the impact area.



RANKING

Identification of biodiversity values across the landscapes

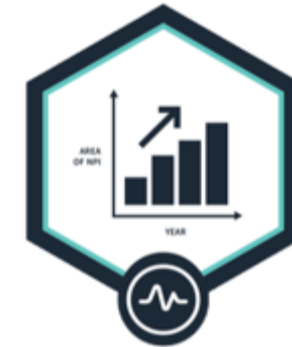
Units of the landscape are scored and ranked. Stakeholder interests and landscape features are incorporated. Following valuation targets are set for the minimum biodiversity score landscape units must reach to count towards NPI.



RESTORING

Site restoration and offset planning

The map and site rankings can be used to avoid high-biodiversity-value areas (Avoidance and Minimisation) and to plan an efficient set of restoration actions and offsets to create sufficient landscape area of increased biodiversity value to achieve NPI



MONITORING

Measurement of NPI success

Year-on-year progress is tracked. Once a unit has reached the target biodiversity value it is added to the NPI balance. When the NPI balance is greater than the area of impact, success can be reported.

'BIG DATA' FOR ECOSYSTEM HEALTH METRICS

- **Ecosystem mapping** for strategic biodiversity planning & achieving No Net Loss / Net Gain
- **Define indicators** from the wider spectrum of biodiversity as well as lower trophic levels, now accessible through eDNA
- **Track restoration** progress and implement adaptive management practices

INDUSTRY GUIDANCE



NATURE METRICS
DNA-BASED MONITORING

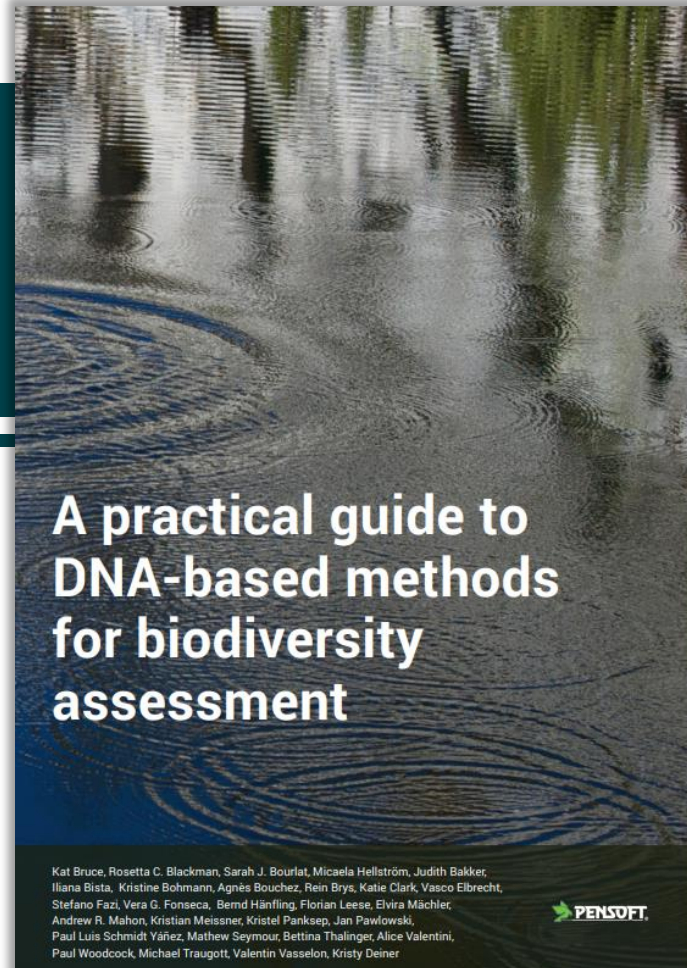
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Briefing note

Using Environmental DNA to manage biodiversity risks

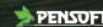
- An eDNA approach complements traditional survey methods and is particularly useful for aquatic species.
- eDNA has multiple potential applications, from understanding ecological communities at a landscape scale to confirming the presence of rare and elusive species at a project site or demonstrating the effectiveness of mitigation measures.
- Collecting eDNA samples requires no expert skills and while limitations exist, eDNA approaches can reduce the cost of data collection and provide answers to clearly defined questions and objectives.

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A practical guide to DNA-based methods for biodiversity assessment

Kat Bruce, Rosetta C. Blackman, Sarah J. Bourlat, Micaela Hellström, Judith Bakker, Iliana Bista, Kristine Bohmann, Agnès Bouchez, Rein Brys, Katie Clark, Vasco Elbrecht, Stefano Fazi, Vera G. Fonseca, Bernd Hänfling, Florian Leese, Elvira Mächler, Andrew R. Mahon, Kristian Meissner, Kristel Panksep, Jan Pawlowski, Paul Luis Schmidt Yáñez, Mathew Seymour, Bettina Thalinger, Alice Valentini, Paul Woodcock, Michael Traugott, Valentin Vasselon, Kristy Deiner



DNA-BASED BIOMONITORING RECOMMENDATIONS, OPPORTUNITIES AND PERSPECTIVES FOR THE MARINE ENVIRONMENT

WHITE PAPER

NatureMetrics, December 2020



USING EDNA TO DRIVE NATURE POSITIVE OUTCOMES

Inclusion of
eDNA in
Project ToR's



Financial
incentives



Improved
Stakeholder
engagement
using eDNA



Transparent &
Objective
Record
Keeping



Curated
Open-access
biodiversity
data

Key drivers for a data-driven approach to
biodiversity monitoring

eBioAtlas

www.ebioatlas.org



30,000 eDNA samples



Equip local stakeholders



Open Data



At-cost sample analysis



Digital Infrastructure

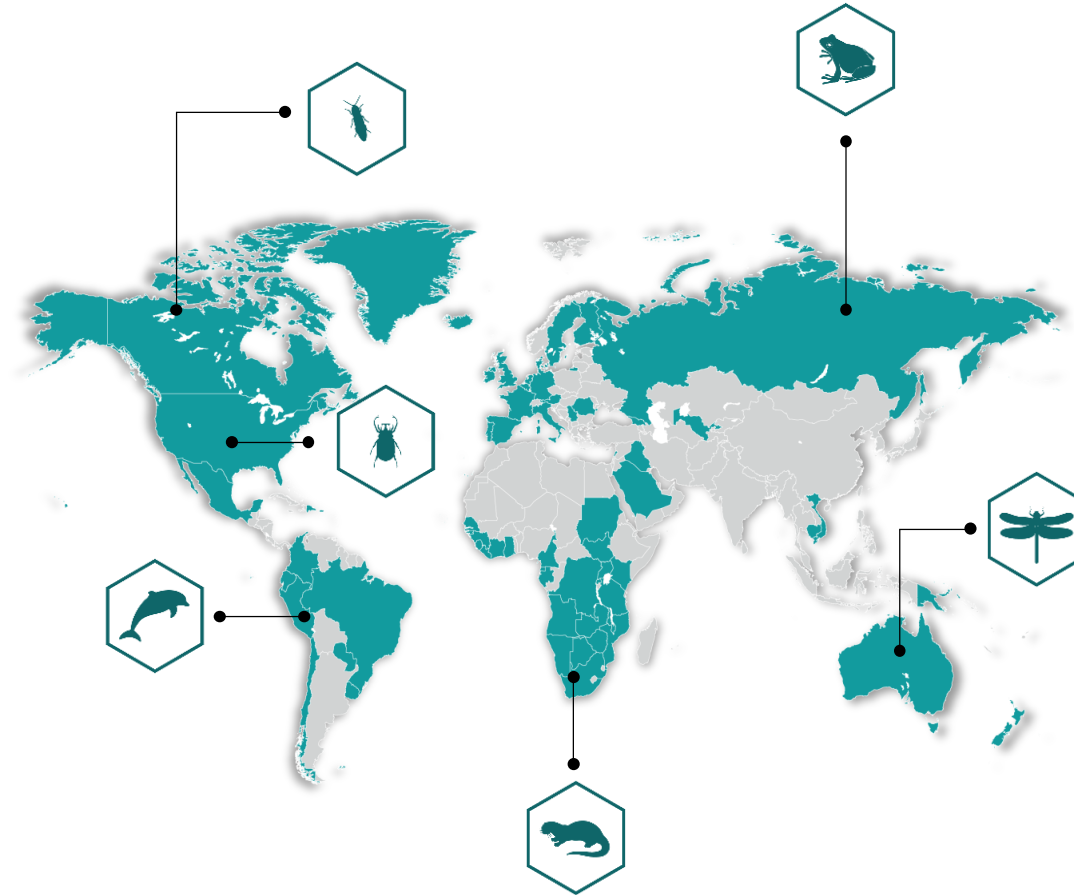


Sustainable financing

A global map of biodiversity to address global knowledge gaps and lay the foundations for setting and meeting global goals on nature & biodiversity.



NATURE METRICS
DNA-BASED MONITORING



Implementing partner



Funding partner



AngloAmerican



exodus travels

VIÑA CONCHA Y TORO
— FAMILY OF WINERIES —

Business partners

Let's continue the conversation!

Post questions and comments via chat in the IAIA22 platform.



#iaia22

Vere Ross-Gillespie

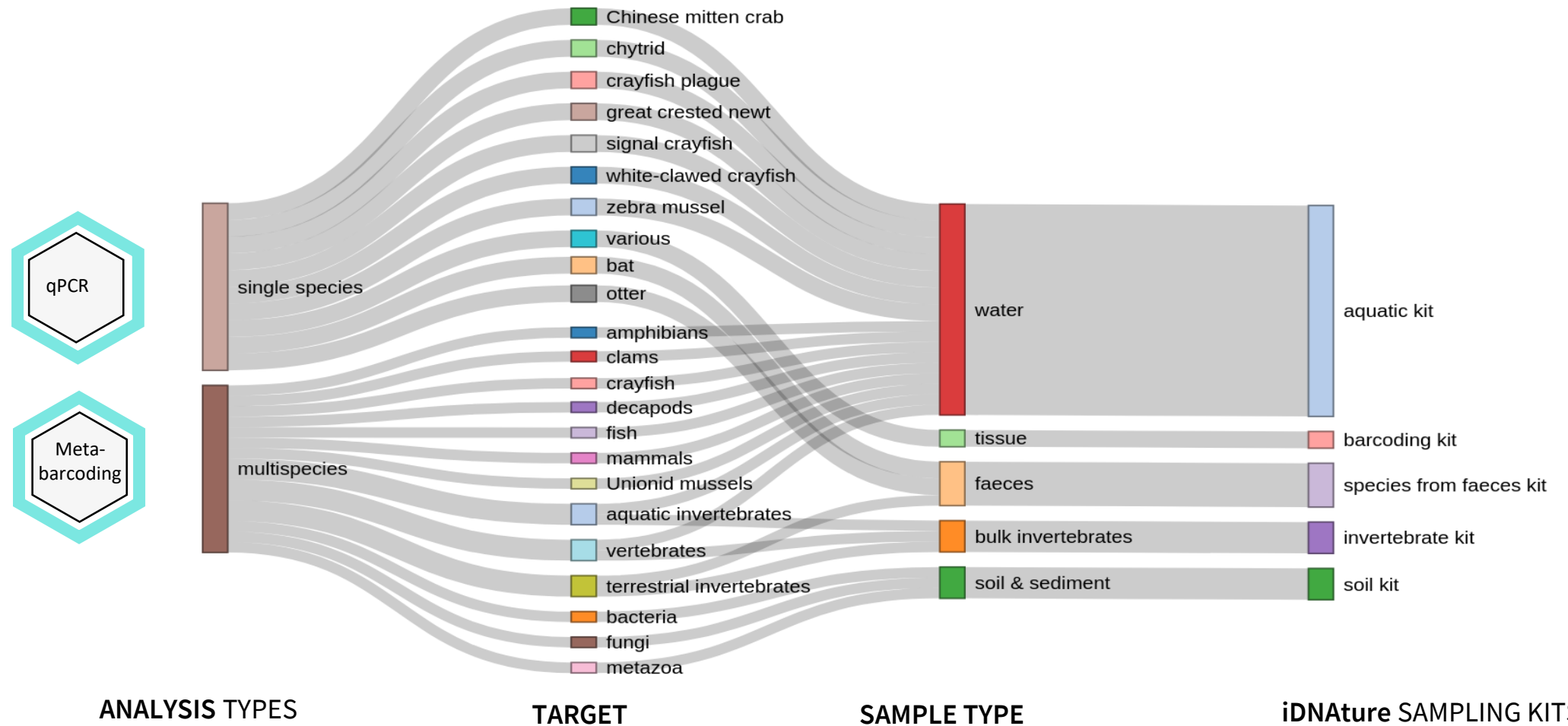
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WHAT CAN BE DETECTED?



It is possible to target a range of taxa from a single kit type and you can either choose to target a single species (qPCR) or multi-species (metabarcoding).