eBioAtlas

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Using the power of eDNA to fill global biodiversity knowledge gaps and deliver impact in conservation.

IUCN & NatureMetrics Ltd

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OVERVIEW

NatureMetrics and IUCN are seeking $15M to establish a global biodiversity map, harnessing the power of environmental DNA (eDNA) to provide species data from water samples collected by local stakeholders and citizen scientists around the world.

eDNA is transformative technology that enables biodiversity data to be gathered by anyone anywhere in the world, simply by filtering water with a simple kit. An individual sample contains DNA from all levels of organisms (microbes to megafauna) and from terrestrial as well as aquatic species. Surveys conducted over a matter of days can provide data that would take decades to gather using conventional field methods.

Employing a globally standardised sampling and analysis protocol, the project will provide the baseline data urgently required to underpin effective biodiversity conservation, environmental management, and ecological impact assessment, especially in the regions most at risk from climate change and the ecosystems experiencing the fastest rate of biodiversity decline.

To maximise impact, the database will be freely available to non-commercial users and will be designed to interface with the IUCN Red List, and other national and global environmental databases.

Those who stand to benefit from this initiative include: i) conservation bodies; ii) investors aiming to minimize the impact of funded projects, iii) donors wanting to maximize biodiversity benefits of their investments, iv) businesses looking to avoid or minimize site-based biodiversity impacts, and v) governments needing to track progress on international commitments to protecting and restoring biodiversity and develop baselines for natural capital accounting.

Stakeholder buy-in will be facilitated at any geographic location and scale, enabling contribution of samples from governments, businesses, conservation organisations and local community initiatives worldwide, including both ongoing and newly-initiated project. This will yield increased data resolution in the most important locations and lead to a sustainable long-term financing model.

The initial taxonomic focus will be fish, vertebrates and mammals, and barcoding campaigns will be conducted alongside the environmental sampling to enable accurate species identification. Unidentified species data will be employed as input to biodiversity metrics for system monitoring, such as for restoration work, until DNA barcoding enables later identification. Left-over DNA from each sample will be archived in the world's largest eDNA biobank, which can be used to survey other groups of organisms in the future, with the potential to develop a new generation of indicators for ecosystem health assessment.

There is an opportunity to address a combined biodiversity and public health agenda, since water samples can be screened for the presence of particular pathogens or zoonotic disease vectors at the same time as being analysed for biodiversity assessment.

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BACKGROUND

Biodiversity is the bedrock for human civilization, and it is declining faster than at any point in history (IPBES, 2019). This is especially true for freshwater and marine species, as evidenced by the Living Planet Index and IUCN Red List.

Global Aquatic Habitats

- Freshwater habitats are disproportionately important for biodiversity. They cover 1% of the earth's surface but hold 10% of known animals and around 30% of vertebrates.

- Freshwater and marine habitats are among the most threatened around the globe, being subject to a multitude of threats including habitat modification, fragmentation, overfishing, pollution, and invasive species.

- Freshwater fish have the highest extinction rate of all vertebrates, and they are relied upon for nutrients by over 200 million people

- More than 1,200 marine species are threatened with extinction, and 12% of the world's population rely on fisheries and aquaculture.

- Are experiencing a far greater rate of biodiversity loss than marine and terrestrial habitats.

While urgent action is required to reverse the decline, efforts are hampered at every level by a lack of data by which to measure progress and target actions.

We need reliable data on the distribution and status of species in order to inform decision-making and address the competing needs of development and conservation, for accurate reporting, avoidance and mitigation of industrial impacts on biodiversity, and to predict the responses of species to climate variables.

New biodiversity data will inform efforts to help bend the curve of biodiversity loss globally. The "curve" refers to the steady erosion of populations documented across the planet, such as the 68% decline in population sizes of species tracked by the Living Planet Index, and the increasing numbers of species at risk of global extinction as determined by the IUCN Red List of Threatened Species[TM].

PROJECT GOALS
eBioAtlas will deliver

01 The world's most comprehensive knowledge base on global biodiversity. This will contribute directly towards:

- Identifying priority areas for biodiversity conservation and restoration, and informing strategic planning of development and conservation activities.

- Expanding and updating biodiversity data to support monitoring and management of biodiversity in protected areas including Key Biodiversity Areas, Alliance for Zero Extinction sites, National Parks and Reserves, Marine Protected Areas, UNESCO World Heritage Sites, UNESCO Biosphere Reserves, Ramsar sites, & Natura2000 sites.

- National Biodiversity Action Plans for governments around the world.

- Sustainable management of the world's fisheries.

- Tracking ecosystem condition as part of the UN Decade of Restoration, and evaluating restoration progress through tracking changes in species assemblage structure.

- Filling knowledge gaps in species distributions to inform knowledge products such as the IUCN Red List.

- Enhancing DNA reference libraries for protected species.

- Biodiversity baselines for industrial environmental impact assessments (EIAs) and the establishment of Science-based Targets for Nature.

- Development of new biodiversity metrics for evaluating business performance and informing the Species Threat Abatement and Recovery (STAR) Metric for advising private sector developments on maximizing biodiversity benefits.

- Distribution mapping and early detection of alien invasive species.

- Evaluating the importance of wetlands, estuaries, river catchments, mangroves, coral reefs or seagrass habitats.

- Enhancement of Global Swimways monitoring (the world's most important migration routes for fishes) by identifying routes down to tributary level.

- Monitoring progress towards international goals e.g. Sustainable Development Goals, post-2020 Global Biodiversity Framework, the UN Decade on Ecosystem Restoration (2021-2030), and regional targets such as those within the European Biodiversity Strategy for 2030.

02 A global community of local stakeholders equipped to carry out long term monitoring of biodiversity. Training will be delivered via implementing partners such as international NGOs with strong regional and local networks. It will include national NGOs, local community groups, citizen scientists, schools, and local / national government personnel.

03 A digital repository for global eDNA data. This will be centrally curated and regularly updated to improve species naming as genetic reference databases grow. It will be designed to integrate with other global environmental databases, including the IUCN Red List of Threatened Species and GBIF.

The database will provide a digital platform for access to eDNA data provided through directly by NatureMetrics and also third parties with validated and standardised data that will build eBioAtlas into a global repository for biodiversity.

04 A long-term sustainable financing mechanism via corporate stakeholders in the environment, supporting jobs and technical capabilities worldwide. Businesses will pay to sponsor the long-term monitoring of particular areas, which may be of relevance to their operations or supply chain. Commercial users will pay for access to data with the funds invested into the eBioAtlas. Through storytelling and immersive technology, business leaders and their employees will be connected with the nature that they support and rely on.

05 DNA reference libraries to enable accurate naming of species detected in eDNA samples. We will work with on-the-ground partners to source and sequence DNA from identified species and collaborate where possible with programmes such as the Earth BioGenome project, and with national institutions such as natural history museums around the world.

ABOUT eDNA

- Environmental DNA (eDNA) can be used to survey biodiversity in both freshwater and marine environments. In freshwater, the DNA of terrestrial species can be detected in addition to aquatic ones.

- Animals leave traces of DNA in the water; these are captured on a filter and sequenced to identify the species present (a process called 'metabarcoding').

- eDNA democratises acquisition of biodiversity data by making sampling easy enough for non-specialists to collect high-quality samples. This opens the door for a standardised citizen science approach to be applied globally.

- eDNA can revolutionise global capacity to obtain on-the-ground biodiversity data and address knowledge gaps on species distributions in poorly-documented and hard to access places including freshwater and coastal habitats.

- eDNA metabarcoding has been extensively validated for fish surveys and consistently outperforms conventional survey methods (netting, electrofishing) wherever side-by-side comparisons have been carried out. It also provides at least as much data as conventional survey methods for terrestrial mammals and amphibians, as well as valuable records of birds and reptiles.

- DNA reference libraries remain incomplete in many parts of the world but can be built up alongside a large-scale eDNA sampling campaign, creating valuable national resources and institutional capacity building within each country. As reference databases grow, species names can be retrospectively assigned to previously unidentified sequences in the metabarcoding datasets, thereby confirming species presence in a library of previously collected samples.

- Even in the absence of good reference databases, a wealth of ecological information is obtained from eDNA data, including diversity metrics, connectivity assessments and tracking of community change. Unidentified species are named at higher taxonomic levels (family or genus).

- DNA left over from the initial analysis can be stored and the same samples used later to generate data on additional taxonomic groups e.g. invertebrate groups or specific human pathogens.

FILTER · **FILTER** · **PRESERVE** · **SEND**

MOBILE APP FOR FILED DATA
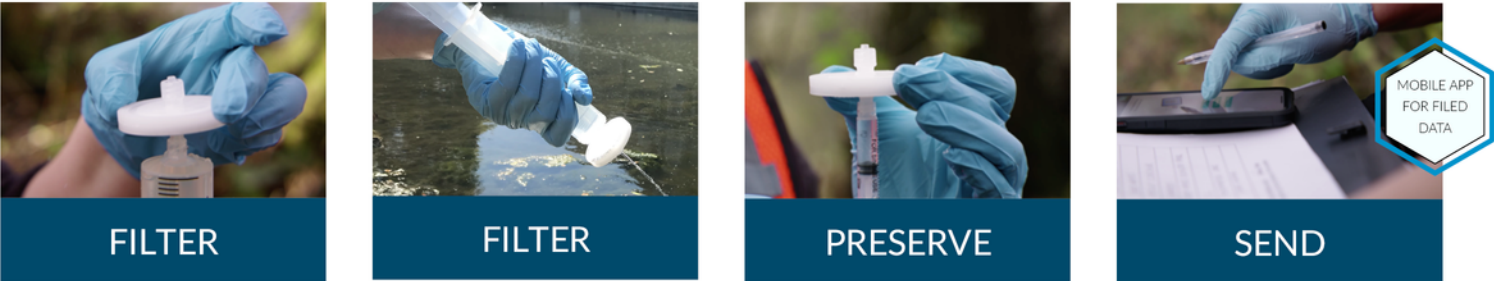
Testing the quality of data collected by citizen scientists

	Unwrapped					Wrapped				
	Emily	Jonny	Rozzy	Maia	Edwin	Mike	Tom	Jane	Kat	Kat2
European eel										
Spined loach										
Common bream										
Gudgeon										
Dace/Orfe										
Bitterling										
Roach										
Chub										
Tench										
Stone loach										
Northern pike										
Ruffe										
Perch/Zander										
European bullhead										
Mallard/Common shelduck										
Duck species										
Dove species										
Common moorhen										
Grey heron										
Water vole										
Cow										
Dog										
Human										

Highlighted samples collected by expert for comparison

Figure 1: Citizen scientists of all ages can collect high quality eDNA samples with minimal training

CASE STUDY

NatureMetrics and WWF Peru used eDNA to create a biodiversity baseline of the Northern Peruvian Amazon, covering over 1000 km of waterway. During a single journey along each river section, the WWF Peru team collected 160 half-litre water samples, which they filtered and preserved using the NatureMetrics eDNA sampling kits.

Analysis of the 160 water samples provided data on over 600 species of vertebrates, including:

◆ Over 300 fish species, including

👉 Species that are commercially important for fisheries or the aquarium trade.

👉 Migratory species that travel upriver to breed in the seasonally flooded forests.

👉 Many species that are poorly known, data deficient, and rarely (if ever) monitored enabling species distribution maps to be developed to better understand conservation.

◆ Over 150 mammal species, including

👉 Aquatic species such as river dolphins and otters

👉 Large and small terrestrial species, including charismatic megafauna like jaguar, giant anteater and tapir along with many species of rodents and opossums.

👉 Tree-living species including almost all species of monkey known from the area, plus nocturnal tree-living species like night monkeys and kinkajou.

◆ Over 70 species of amphibian

◆ Over 60 species of birds

As well as mapping the distributions of the individual species we were able to show how community composition changed according to different types of river habitats. We could also analyse for hydrological connectivity, identifying natural barriers to upstream migration of fish.
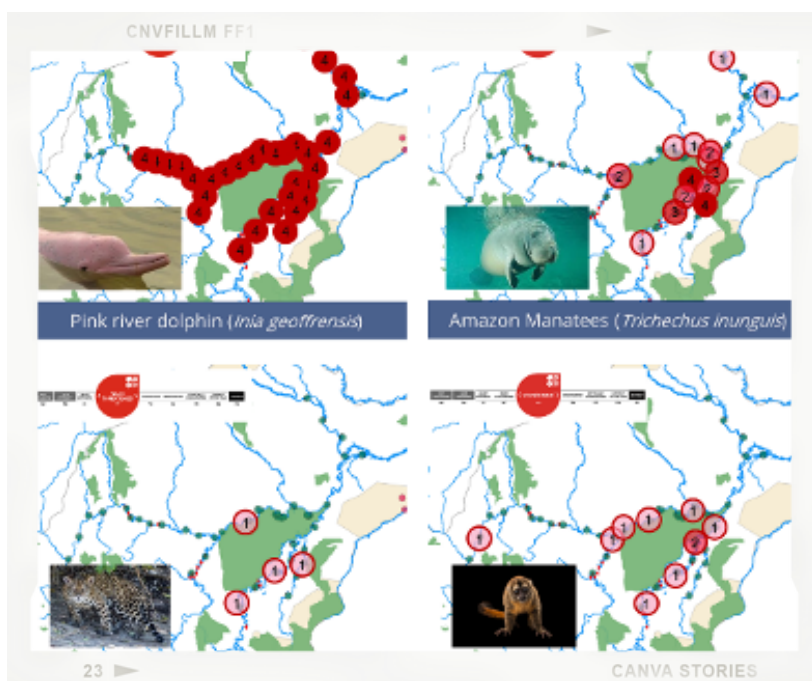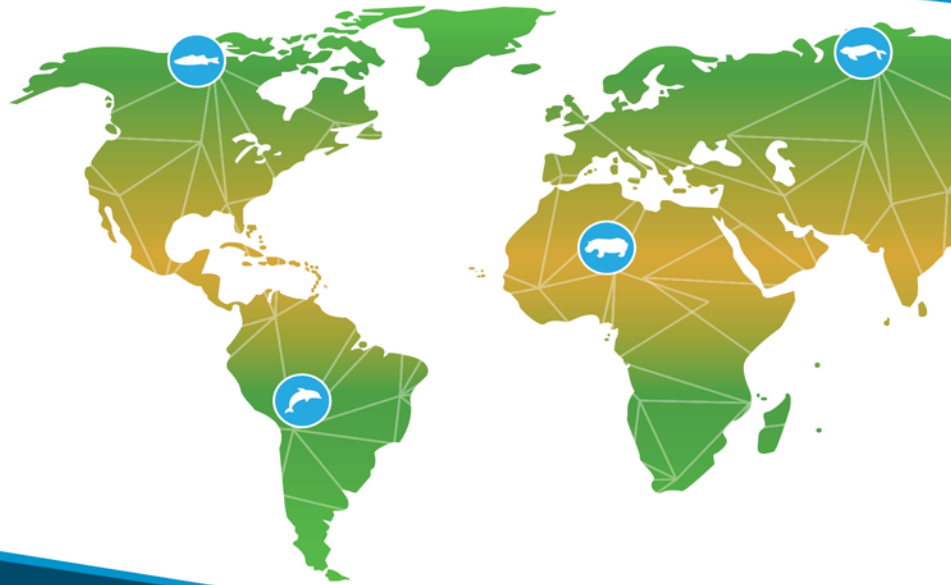
Indicative project cost: approx. $70,000.

Figure 2: Distribution maps of four Amazonian mammal species in the Northern Peruvian Amazon based on eDNA metabarcoding

HOW WILL WE USE eDNA TO AUGMENT GLOBAL BIODIVERSITY DATABASES?

We will implement a global campaign to capture eDNA samples from freshwater and marine habitats, mobilising local stakeholders to collect samples that will be analysed following a standardised protocol. The initial focus will be vertebrate biodiversity (fish, amphibians, birds, mammals & reptiles).

Sampling will be coordinated via a network of implementing partners, principally made up of international conservation NGOs. These organisations have an established presence in many areas of the world that are biodiversity conservation priorities, and in each area they are well-networked with local stakeholder groups who can be trained and engaged in sampling. As far as possible we will align our sampling with existing monitoring or conservation activities being carried out by these partners so avoiding the cost of mobilising full field teams. The implementation partners also have strong links with national governments and can assist in securing sampling permits, overcoming other potential logistical or regulatory obstacles, and facilitate links to the relevant decision making bodies who will potentially utilize this biodiversity information.

The NatureMetrics eDNA sampling kits are designed for use by non-specialists. They are robust to the risk of contamination from external DNA sources and do not require any power source, being based on manual syringe filtration. The preservative solution used to stabilise the DNA in the filter does not require cold storage, meaning that samples are stable at ambient temperature for several months even in tropical environments. We have demonstrated that samples collected by non-expert local stakeholders yield comparable data to those collected by eDNA experts.

Where export permits and Nagoya Protocol allow, samples may be shipped back to the NatureMetrics laboratory in the UK or Canada for analysis. However, we will also look to establish laboratory capacity in certain regions, training staff in these labs to carry out the NatureMetrics protocols so that samples can be (at least partially) analysed in-country where it makes sense to do so. We have successfully achieved this in Cote d'Ivoire are working with a university, and intend to create a network of skilled molecular scientists around the world and support skilled jobs in low-income countries.

Initially, all samples will be analysed for vertebrate biodiversity. Computational processing of sequence data will take place centrally using the NatureMetrics specialist bioinformatics pipelines to match sequences against available reference libraries to assign taxonomic names. Species will be named at the lowest possible taxonomic level depending on the availability of reference sequences.

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In parallel to the coordinated eDNA sampling campaign, the project will also distribute kits for collecting DNA from identified species to build up DNA reference databases around the world. This can be carried out in collaboration with national museums, fisheries agencies and taxonomy experts.

As the reference libraries grow, our ability to name species improves. All existing data will be periodically reanalysed to add any species names that have been added to the reference library since the previous update.

Analysis of the vertebrate communities uses up only a small proportion of the total DNA extracted from each sample. Therefore, the left-over DNA will be archived for long-term storage, creating the world's largest biobank of georeferenced and time-stamped eDNA samples. These can be made available for further use, including:

- Large-scale surveys of other groups of organisms. This could include aquatic invertebrates, diatoms or bacteria, which could form a reference baseline for the development of novel globally applicable indices of ecosystem health. Such indices could be optimised by ecoregion, addressing the problem of trying to apply indices developed in temperate regions to tropical ecosystems for which they were not designed.

- Assessment of particular groups or species or of local or regional importance to one or more stakeholder.

- Surplus DNA could be used to create risk-maps for human diseases caused by freshwater-associated pathogens. For example, in the case of Schistosomiasis, the eDNA could be screened both for the parasite itself and for the snail that serves as its intermediate host.

- Data derived from the eDNA samples can be used to ground-truth and calibrate earth observation data to improve the link between remote sensing observations and on-the-ground measurements of biodiversity.

eBioAtlas Summary Theory of Change

Biodiversity loss slows through improved management, mitigation and conservation activities	Reduced poverty and strengthened rural economies, with more sustainable livelihoods and opportunities for women	Better quality ecosystems provide climate resilience	More sustainable industries & increased green economy
Improved data availability and capacity for ongoing surveillance enables adaptive management, systematic conservation planning, and early detection of threats. Data-driven metrics can be used to set meaningful targets and outcome-based measures for businesses so they can be held to account for negative impacts and incentivised to protect and augment biodiversity.	Improved data availability facilitates sustainable management of fisheries, which support lives and livelihoods. Training in eDNA sampling provided to local stakeholders (including women) will create new employment opportunities, in addition to technical science jobs in regional labs. Engaging local stakeholders in biodiversity assessment yields solutions that are better aligned with local needs, better understood by local stakeholders & are more likely to integrate local knowledge.	Data underpins a new generation of ecosystem health metrics, helping to drive effective ecosystem restoration. New metrics create mechanisms for connecting financial flows to ecosystem quality, which acts as a powerful incentive for investment in restoration Long-term monitoring of restored ecosystems can be conducted with the participation of local stakeholders.	New metrics enable target-setting for businesses and more effective implementation of the mitigation hierarchy. Businesses and governments can be held through enforceable standards. New metrics feed into ESG ratings and nature financial disclosure, enabling more sustainable investment and acting as powerful incentives. Connecting financial flows (e.g. via green bonds & natural capital accounting) to ecosystem health creates new markets for biodiversity and drives investment in the green economy. New jobs will be created in habitat restoration, maintenance and monitoring

Relevance to the UN Sustainable Development Goals (SDGs)

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SUSTAINABLE DEVELOPMENT GOALS

| 1 NO POVERTY | 2 ZERO HUNGER | 3 GOOD HEALTH AND WELL-BEING | 5 GENDER EQUALITY | 6 CLEAN WATER AND SANITATION |
| 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 14 LIFE BELOW WATER | 15 LIFE ON LAND | 17 PARTNERSHIPS FOR THE GOALS |

Biodiversity is a major component of SDG 14 (Life below Water) and SDG 15 (Life on Land), and it is relevant to almost all. Moreover, the biodiversity loss is ranked as the third highest risk to human and global economic well-being (World Economic Forum 2022). According to a recent study, the value of the global ocean-based economic sectors is estimated between USD 3-6 trillion/year with the ecosystem services provided by rivers and inland wetlands equate to approximately USD $5,000/ha/year and USD $25,000/ha/year, respectively.

In addition, freshwater ecosystems remain globally undervalued and have suffered an 83% decline in monitored populations since 1970 whilst only 12% of the ocean is considered to be wilderness (WWF LRP, 2018). Importantly these metrics are based on vertebrates which constitute a small fraction of species diversity. This is further compounded by a) the extensive but understudied species diversity in many tropical regions, b) which also face increasing anthropogenic pressures and c) where there are direct socio-economic dependencies on these resources for livelihoods and nutrition.

Specific relevance of biodiversity to SDGs includes:

◆ SDG 2 Zero hunger

Fish account for the equivalence of total annual animal protein for 3 billion people globally and especially in low-income nations. Understanding the composition of these fish communities, trends over time, connectivity within the landscape and early detection of invasive species/ threats to freshwater fish is critical.

◆ SDG 3 Good health & wellbeing

Samples collected for eBioAtlas could be for the presence of waterborne pathogens or their vectors, with the potential to create risk-maps for human diseases associated with freshwater habitats. Using Schistosomiasis as an example, samples can be screened for the parasite itself and the snail that acts as its intermediate host.

SDG 5 Gender equality

Fish provide protein for the equivalent of 3 billion people and support over 300 million jobs. In freshwater fisheries, 55% of these roles are undertaken by women. This project can support co-management of subsistence fisheries through partnerships between women, conservation authorities, researchers and local government. Whilst women account for around half of the workforce in fisheries and aquaculture, they often earn less than men due to a combination of unpaid work and involvement in lower-return work. In addition, they are constrained by societal and gender norms, as well as restricted access to resources and key assets such as capital, land, technology and equipment. Including women in the development of new scientific techniques, particularly in the lower-middle income countries where they are often excluded from such areas, will help and contribute towards female empowerment and changing societal norms.

SDG 6 Clean water & sanitation

Understanding the biodiversity of freshwater-related ecosystems underpins our ability to protect and restore them. Large-scale baselines of invertebrate biodiversity enable a new generation of bioindicators of pollution which will support the improvement of water quality. Training local communities to take samples and monitor water quality, will strengthen their participation in sustainable water management.

SGD 9 Industry, innovation & infrastructure

Baseline data for assessing business impacts on biodiversity & evaluating conservation outcomes towards post-2020 biodiversity targets, feeding into existing metrics and enabling the development of new ones.

SDG 12 Responsible consumption & production

Data derived from this project can feed directly into catchment-wide management plans and support co-management of protected areas and subsistence fisheries or aquaculture to monitor and minimise risks to natural habitats.

SDG 14 Life below Water

Oceans also provide jobs for more than 3 billion people who depend on marine biodiversity for their livelihood. Our knowledge of marine biodiversity is highly localised and limited restricting our ability to truly conserve commercial and endangered species. eDNA gives the opportunity to fill these gaps quickly.

SDG 15 Life on Land

Includes freshwater and terrestrial biodiversity. This project provides data relevant to SDG 15 on an unprecedented scale and in a globally standardised format. In addition to strictly freshwater species, the analysis of eDNA samples also provides significant amounts of data on terrestrial vertebrate species.

SDG 17 Partnerships for the goals

Partnerships and co-management of habitats such as catchment-wide approaches which include businesses, conservation authorities, researchers and local communities are critical to achieving success. The project provides a broad-spectrum platform to engage and partner with all relevant stakeholders. "Big data" are generated at unprecedented scales to assist global conservation research & management. Business can contribute through CSI, ESG and CSR initiatives towards a feedback loop which benefits them. It also greatly empowers local communities to be part of the solution through co-learning and placing the sampling tool directly in their hands.

eBioAtlas Funding

We are seeking an initial funding injection of $18.5M (USD) to get the programme up and running. We will be seeking donor funds from corporate or private philanthropy to finance public goods. This initial funding will allow us to:

- Fund the collection and analysis of the first 30,000 eDNA samples arranged via the network of implementing partners.

- Provide sampling coverage of wide geographical areas combined with higher-resolution sampling in selected regions of conservation significance.

- Train over 1,000 local stakeholders across Africa, Asia and Latin America to collect eDNA samples. Regional strategies will seek to ensure participation by gender* and minority socio-economic groups.

- Make the data derived from the samples from eBioAtlas funding freely available for research and conservation

- Establish a dedicated project team with expertise in international logistics, stakeholder engagement, project management, biodiversity conservation, citizen science and fundraising.

- Build the digital interfaces to link the eBioAtlas dataset with other biodiversity / environment databases.

- Establish a network of partners and collaborators with on-the-ground capabilities throughout the world and expertise in delivering conservation projects with multi-stakeholder involvement.

- Through the network, run training courses on eDNA sampling in multiple locations in Africa, Asia and Latin America, creating a global community of samplers who can pass on the training to others locally (train the trainers).

- Develop and implement a strategy for developing laboratory capacity in different regions to increase both scale (for the project) and skills (for the regions).

- Address logistical and regulatory challenges associated with collecting and exporting samples, working with national governments to secure the necessary agreements and permits, and investigating opportunities to tie in with national biodiversity action plans wherever possible.

The eBioAtlas Fund will be held, managed and distributed by IUCN. The Fund will pay NatureMetrics the costs of sample analysis at an agreed rate that represents full cost of analysis (including overheads but no profit margin) and will cover other project costs as specified in the project budget.

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eBioSite Data

While eBioAtlas Funding will deliver a large-scale framework of biodiversity data, the programme will also be designed to incorporate higher-resolution data obtained from independently-funded eDNA monitoring of particular sites. This is envisaged as monitoring carried out by organisations during the normal course of their operations, where they indicate a desire for data to be added to the eBioAtlas. Data added via this route will be known as eBioSite data. eBioSite funding will be agreed on a case-by-case basis but the general principle will be that commercial organisations will pay for analyses at commercial rates with a standard discounted rate for non-profit organisations. Payment may be made directly to either NatureMetrics or IUCN.

For such projects, advantages of integration with eBioAtlas include:

- Delivery against organisational transparency targets in relation to impact on biodiversity. A biodiversity transparency stamp may be used to incentivise companies to participate.

- Long-term databasing and accessibility of data, which maximises its legacy and impact.

- Access to the visualisation and analysis tools available within eBioAtlas.

- Ability to view and analyse the project data in the context of the broader data available in the eBioAtlas, which will be directly comparable.

- For some projects, access to reduced pricing for sample analysis if data is integrated into eBioAtlas.

- For private sector projects, access to data and tools that facilitate biodiversity risk assessment for current and planned operations, moving beyond assessment of "pressure" (e.g. water quality) to assessment of "state" (status of key species).

Long-term Sustainable Finance Model

The finer the resolution of biodiversity data, the broader and more accurate the applications that can be derived from it. Furthermore, ongoing biodiversity monitoring must be sufficiently regular to assess the continued presence of protected species and detection of new ones in order to support the management of threatened species and protected areas. Such regular reassessment is critical for the, updating, maintenance and expansion of the IUCN Red List and KBAs, which have both

been adopted as biodiversity indicators for the UN Sustainable Development Goals and other important international reporting mechanisms. eDNA provides an effective and efficient way to deliver these ongoing reassessments, while engaging and empowering local stakeholders. For these reasons it is important that eBioAtlas incorporates a long-term sustainable finance model beyond the initial funding raised to support finer resolution and regular ongoing reassessment.

Ongoing funding will come from a combination of:

- Continued eBioSite funding from organisations conducting monitoring at particular sites.

- Corporate sponsorship opportunities at local and regional levels, whereby businesses fund the ongoing monitoring of particular areas that may be linked to their impacts or dependencies on biodiversity.

- A proportion of the fees charged to commercial users for access to eBioAtlas data. The amount will be calculated as the proportion of eBioAtlas data derived from eBioAtlas Funding at time of access (based on the number of samples).

- A proportion of commercial revenues derived from the sale of value-added aggregate metrics developed by NatureMetrics.

We will remain committed to ensuring that the data generated in this project is freely available to non-commercial users for the purposes of biodiversity research and conservation.

About NatureMetrics

NatureMetrics is a world leader in the use of DNA-based tools for biodiversity assessment. We have long believed in the potential of eDNA to address global data gaps for biodiversity, and have also recognised that realising this potential will inevitably involve a large, co-ordinated effort involving multiple stakeholders and citizen scientists, spanning many different countries, environments, languages and with different levels of access to resources. To facilitate such a project, we have been building the tools that would be required in the field, in the lab and online. We are now in a position to offer:

- Unrivalled expertise in the practical application of eDNA to environmental monitoring challenges.

- Custom-designed eDNA sampling kits optimised for use by non-experts in remote locations. These require no pumping equipment, power source or refrigeration and have been tested by diverse user groups (including citizen scientists) in freshwater and marine environments all over the world.

- Easy-to-use swab kits to collect DNA samples from identified specimens in order to build reference libraries.

- A mobile app for recording field data associated with eDNA samples (field data and photos). This works offline and field surveyors can receive results from their samples directly via the app. Results can be displayed and explored on interactive maps. The app is currently in beta testing and can be translated into multiple languages.

- Optimised and validated laboratory workflows for assessment of vertebrate, invertebrate and microbial communities from eDNA samples.

- Experience of working with partner laboratories in other countries, providing training and support to replicate our workflows in a standardised way.

- Standardised computational pipelines for bioinformatic processing of sequence data derived from eDNA samples. These are optimised for use in highly diverse environments where reference databases are incomplete, providing accurate identifications at the lowest taxonomic level that can be confidently ascribed to each taxon.

- A deep commitment to biodiversity conservation and a track-record of collaboration both across sectors and within the eDNA community.

NatureMetrics is a private company seeking to build a world-leading DNA based biomonitoring business while also delivering positive impacts for biodiversity conservation.
We aim to ensure that our commercial interest in the project is totally transparent to support potential donors in their decision making. Benefits to NatureMetrics include:

- Financial security during a phase of business expansion through the opportunity to process a large volume of samples for this project.

- Mainstreaming of our core technology for biodiversity assessment worldwide and increased commercial market opportunities arising from large-scale demonstrations of the technology in different regions of the world.

- Consolidating our position as global leaders in this new industry.

- Establishing a strong network of partners and collaborators around the world.

- Global operational capabilities and partnerships established through eBio Atlas will facilitate the delivery of commercial services globally.

- NatureMetrics will be joint owners of the eBioAtlas data and can use the data for internal R&D purposes or to sell the data (or analysis based on the data) to commercial clients.

WE ARE COMMITTED TO

☞ Offering below-commercial rates for sample analysis. We will cover our costs but will not seek to make a direct profit from analysis of eBioAtlas samples.

☞ Ensuring that the eBioAtlas data remains freely-accessible for the purposes of biodiversity research and conservation.

☞ Ensuring that income generated directly by the eBioAtlas resources are directed back to fund further eBioAtlas sampling.

ABOUT IUCN

IUCN's Mission is to: "Influence, encourage and assist societies to conserve the integrity and diversity of nature and ensure that any use of natural resources is equitable and ecologically sustainable". IUCN is a membership Union uniquely composed of both government and civil society organisations. It provides public, private and non-governmental organisations with knowledge and tools that enable human progress, economic development and nature conservation to take place together.

The ability to convene diverse stakeholders and provide the latest science, objective recommendations and on-the-ground expertise drives IUCN's mission of informing and empowering conservation efforts worldwide. We provide a neutral forum in which a diverse array of parties can work together to forge and implement solutions to environmental challenges.

Our dedicated Centre for Science and Data is focused on the compilation and provision of data on biodiversity for decision making globally. The Centre works closely with the IUCN Species Survival Commission's more than 9,000 experts to build knowledge on the distributions and conservation status of species and threats to them, and to provide advice, develop policies and guidelines and facilitate conservation planning. Through this work, we catalyse conservation action and enable IUCN to influence policy and assist societies in biodiversity conservation. Our freshwater and marine specialists are engaging with partners to support data generation to support Red List assessments.

More Specifically IUCN Offers

- The most extensive database on species distributions created as part of the first global assessment of the conservation status (according to the IUCN Red List Categories and Criteria) for all known described species of freshwater fishes, mammals, water birds, amphibians and reptiles as well as certain groups of invertebrates (odonates, decapods and molluscs). This database will serve to help guide selection of priority areas for eDNA sampling globally and cross-validate results.

- A global network of experts on freshwater, terrestrial and marine species to consult with and to help collect eDNA samples.

- IUCN has offices in more than 50 countries and runs projects all around the world through which eDNA sampling might be conducted. We have Member organisations and State Members in more than 160 countries and a network of over 18,000 voluntary scientists and experts spanning the globe.

- Experience as the current leaders on the identification and delineation of Key Biodiversity Areas (KBAs), as sites essential for the global persistence of biodiversity for freshwater ecosystems. eDNA outputs will be used to inform selection and monitoring of these sites.

- Strong analytical skills for application of species spatial data to conservation planning.

- Numerous contacts with environment decision makers across the world.

- Advisory role on application of eDNA outputs and their derivatives to inform SDGs, other MEAs global targets / indicators, and developing metrics, such as STAR.

- Experience in management of large, complex, global projects.

Roles and Responsibilities

IUCN will provide the strategic oversight and direction of the project to ensure that it delivers in line with agreed objectives that will support global freshwater biodiversity goals, whilst adhering to the highest standards of governance. This includes:

- Overall administration together with management of the eBioAtlas Fund

- Working with national governments and other stakeholders to facilitate and maximise the uptake of project outputs to inform conservation planning and action.

- Mobilisation of eBioAtlas data to inform and improve IUCN knowledge products - such as the IUCN Red List of Threatened Species, Key Biodiversity Areas (KBAs) and Global Swimways – and support targeted action.

- Development of a system to identify species and important conservation sites where new eDNA sampling data triggers the need for reassessment for e.g. the Red List, KBAs.

- Supporting sampling implementation through IUCN regional offices, IUCN granting initiatives (e.g. SOS), and field-based activities with implementing partners

- Identifying and managing potential private sector collaborations through existing IUCN Business and Biodiversity Programme partnerships

NatureMetrics will manage the global sampling program whilst ensuring adherence to standardised protocols. This will include

- Provision and distribution of sampling kits

- Training stakeholders on the sampling process

- Support for import/export of the kits and samples

- Analysis of samples in the laboratory

- Storage, curation & bioinformatic processing of data in a secure database

- Responsibility for project quality control, including in regional labs where established.

- Publication of species records to GBIF and development of APIs to interface with other data information platforms as agreed

- Development of private sector collaborations to provide eBioSite data through the NatureMetrics commercial client base

- Development of local/regional corporate sponsorship programs

- Identification of academic research projects with the potential to contribute to the eBioAtlas

IUCN & NatureMetrics will take joint responsibility for initial fundraising and the development of a sampling strategy to support the collection and analysis of 30,000 samples from the world's most important river basins and coastal areas, including management of implementation partners. Together they will ensure timely reporting and communication of progress to all project partners and project donors, and communication and promotion of the results to potential data users. Upon completion of the initial donor funded

eBioAtlas programme, they will produce a key scientific output demonstrating the benefits of the eBioAtlas initiative to conservation in freshwater, terrestrial and marine ecosystems.

Implementation partners will identify local projects and stakeholders to assist with sampling. They will ensure compliance with local regulations (e.g. sampling permits) and assist in training local stakeholders. They will also take responsibility for communication of the results to local stakeholders.

eBioAtlas

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