



## **Citizen engagement and open science.**

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# Citizen engagement and open science

eDNA Expeditions is a citizen science initiative that empowers and engages local communities to sample their World Heritage marine sites with cutting-edge eDNA methods. Across the globe, site managers will lead the work with local citizens taking water samples, filtering and fixing the DNA. Samples will be processed and sequenced in a central laboratory.

A central part of the project is to move eDNA sampling and sequencing towards a more standardized approach and secure open access for the resulting data. While many researchers today undertake eDNA sampling, little of the resulting information can be compared or

combined because of the different ways in which eDNA is sampled and analysed. By sharing our methods as well as our data, UNESCO hopes to refine protocols for marine citizen-science sampling and benefit the global research community.

Data collected will be openly available and shared on UNESCO's Ocean Biodiversity Information System (OBIS) according to the FAIR (Findable, Accessible, Interoperable, Repeatable) principles. A dedicated online platform will allow researchers, managers as well as every citizen on Earth to access the data and jointly step up protection of the ocean for future generations.



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The eDNA initiative is a joint initiative between the UNESCO Intergovernmental Oceanographic Commission and the World Heritage Centre.

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# Environmental DNA expeditions in UNESCO World Heritage Marine Sites

Engaging citizen-scientists for biodiversity conservation of UNESCO sites

# The challenge

The ocean covers over 70% of the Earth's surface. As climate change impacts underwater life, conservation efforts are increasingly hampered by how little we know about its effects on species richness and distribution. Comprehensive baseline information, data and analysis of species diversity and migration patterns are essential to determine what local decisions need to be taken today to secure conservation will be effective over the next decades.

This need is felt most pressingly at the 50 flagship marine protected areas on the UNESCO World Heritage List which the global community has committed to protect for future generations. These sites host over 20% of the world's blue carbon ecosystems and are a refuge for the majority of the world's vulnerable and endangered species. Their exceptional biodiversity and inimitable ecosystems would be an irreversible loss to humanity. Yet, over 75% of these sites are threatened by climate change.



# Why environmental DNA?

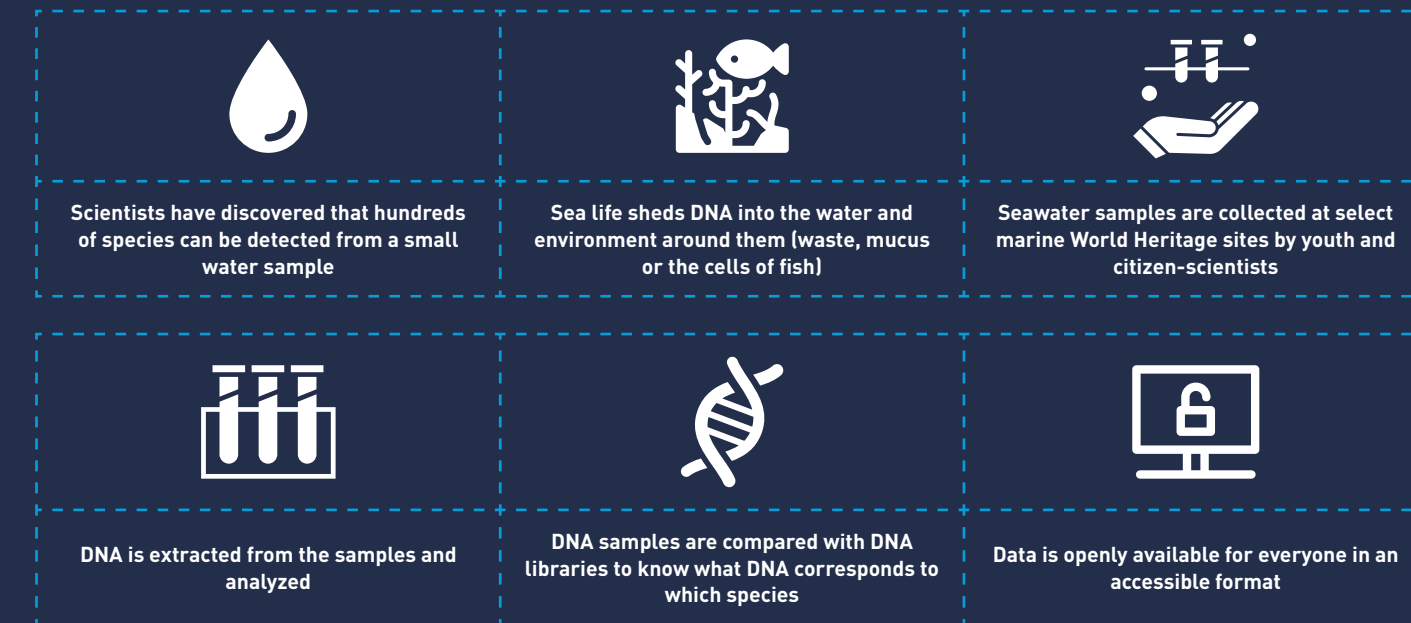
Environmental DNA (eDNA) sampling has the potential to revolutionize knowledge on ecosystems and species biodiversity, and to inspire the next generation of ocean researchers. Ocean species shed DNA into the water around them. The genetic material from waste, mucus or cells in a simple water sample can determine the species richness in a given area, without the need to actually extract organisms from their environment.

The DNA is extracted from the samples and amplified before being sequenced to identify which species' DNA is in the water. The method allows us to identify hundreds of species in a few litres of ocean water. eDNA is a noninvasive, cost effective research method that allows any citizen on Earth to engage in collecting the science we need for the ocean we want.

The eDNA expeditions sampling will concentrate on fish species, but turtles, sharks and other organisms that are part of marine World Heritage sites' Outstanding Universal Value will also be analyzed.

# A global sampling campaign

eDNA samples will be taken in selected UNESCO World Heritage marine sites over the course of two years, starting in the second half of 2022\*. This sampling will give a one-off biodiversity snapshot. Combined with ocean warming data, it will then be determined how climate change is affecting the world's most exceptional marine biodiversity and inform the conservation measures needed today to protect it for future generations.



- Sampling Phase 1
- Sampling Phase 2
- Sampling Phase 3

\* The final list of sites where sampling will take place is to be determined.

