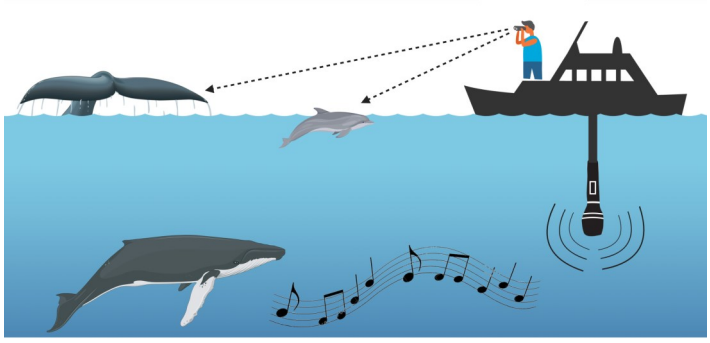
# Purpose-Built eDNA Assays for Whale Detection

*Case Study*

**OBJECTIVE:** Facilitate marine mammal monitoring efforts in the North Atlantic by developing a versatile, sensitive eDNA assay to detect and identify local cetacean diversity.

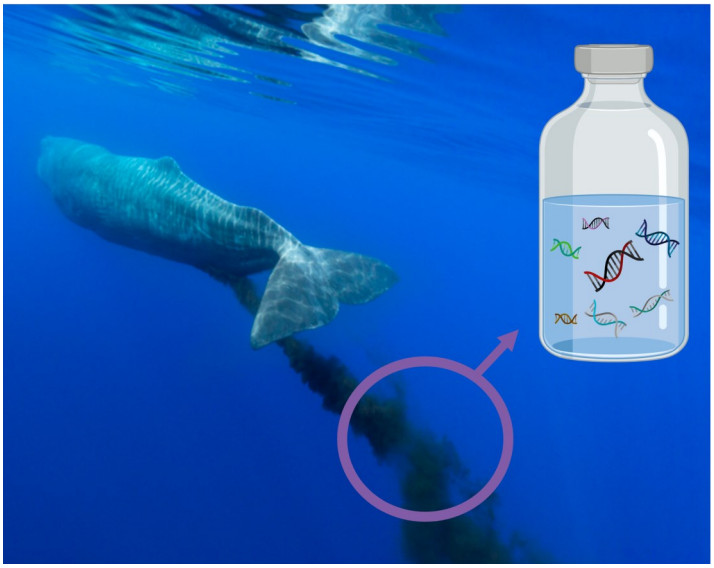
## Challenge

Cetaceans (whales, dolphins, and porpoises) are notoriously difficult to study and monitor. Biologists often depend on visual or acoustic observations of specific behaviours, such as coming up to the surface or making vocalizations, to track species. New eDNA based monitoring approaches do not rely on "catching them in the act" and have the potential to transform cetacean monitoring programs!



*Created with BioRender.com*

To detect and identify organisms with eDNA, specific molecular reactions ("assays") are used to target genetic markers for the biodiversity of interest. Depending on the design of the assay, we can isolate the eDNA from a single species (e.g., humpback whale, *Megaptera novaeangliae),* a group of species (e.g., porpoises*, Phocoenidae),* or a broad category of biodiversity (e.g., vertebrates, or all animals).



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To study cetaceans in the North Atlantic, we designed assays that would target eDNA from these marine mammals in water samples and uniquely identify them.

## What is eDNA?

Organisms constantly shed DNA into their environment (e.g. skin, scales, body fluids) and these DNA traces can be collected from the environment by sampling small amounts of water or sediment. The DNA is then isolated from the environmental material and the unique DNA sequences identify the organisms living in that environment.

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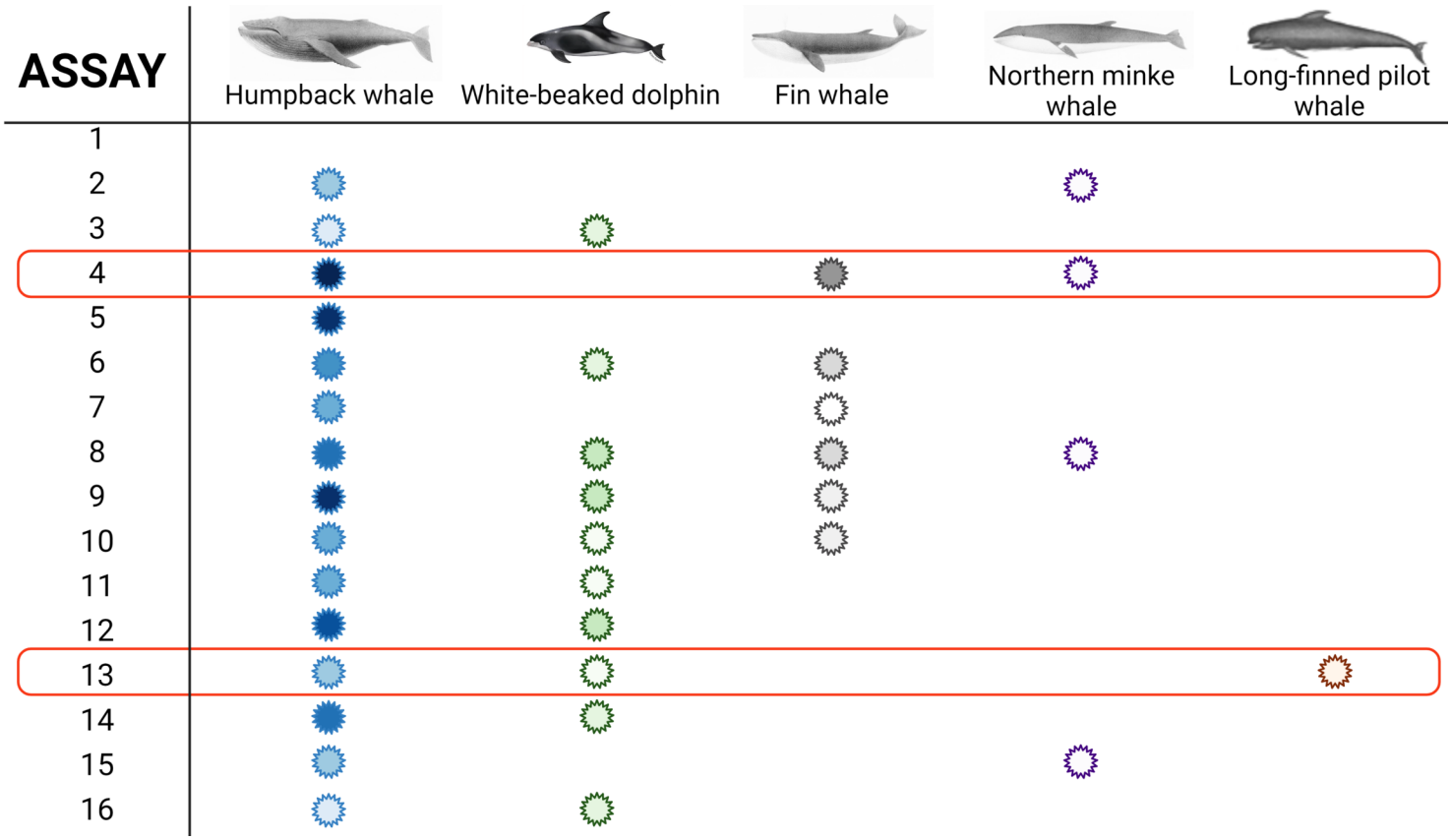
## Results

Sixteen possible cetacean assays were designed and evaluated against a set of 24 coastal marine eDNA samples from the Northwest Atlantic. Across all the test assays, five cetacean species were detected: humpback whales, northern minke whales, fin whales, white-beaked dolphins, and long-finned pilot whales.

Some assays were more sensitive, detecting a particular species in more of the samples, while some assays recovered a greater species diversity (richness), making the assay more versatile (Table 1). No single assay offered both high sensitivity AND complete species recovery so a combination of at least two assays is recommended for monitoring cetaceans.

***Table 1*** *Cetacean detections for each assay where darker cells indicate more sample detections.*




**CONCLUSION:** A multi-marker approach using a combination of two assays is recommended for most sensitive and robust detection of cetaceans in the North Atlantic from eDNA.

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