

# ANEMONE: Initiative for eDNA-Based Biodiversity Monitoring for a Sustainable Future

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The decline in biodiversity resulting from human activities has raised concerns regarding the long-term sustainability of society. Accurate assessment of ecosystems is essential for effective management and conservation efforts. However, the complexity of ecosystems poses challenges in accurately evaluating their biodiversity status.

A cost-effective approach gaining attention for biodiversity assessment is environmental DNA (eDNA) technology. This technique involves conducting biological surveys based on DNA shed by organisms in water, soil, and the atmosphere. Leveraging the strengths of eDNA methods, such as the ability to conduct surveys across multiple locations and obtain high-frequency observations, facilitates comprehensive biodiversity monitoring.

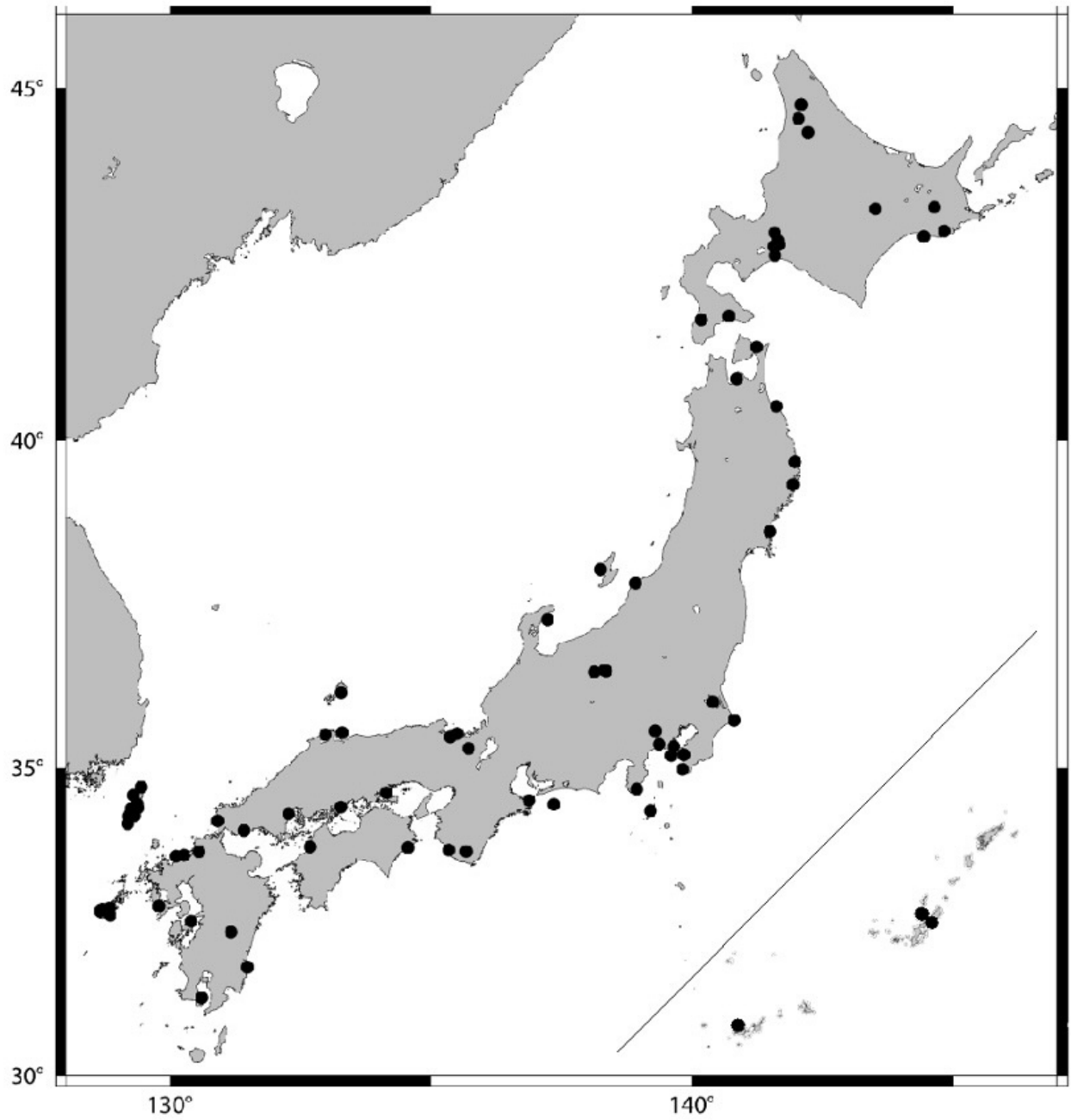
To effectively utilize extensive eDNA data for biodiversity assessments, it is crucial to establish a stable and functional observation network. The All Nippon eDNA Monitoring Network (ANEMONE) is a comprehensive biodiversity monitoring network in Japan that utilizes eDNA metabarcoding. Originating in 2015 with the first eDNA monitoring in Maizuru Bay, Kyoto, ANEMONE has conducted over 5,000 surveys at more than 1,000 sites. These surveys successfully identified and categorized over 900 distinct fish taxonomic groups.

ANEMONE primarily focuses on monitoring fish biodiversity across various aquatic ecosystems, including coastal and pelagic oceans, rivers, and lakes. Presently, ANEMONE operates 77 fixed monitoring stations with varying survey frequencies, supported by universities, research institutes, and local governments. Since 2020, local citizens have actively participated in eDNA-based surveys, with increasing engagement each year.

The eDNA metabarcoding procedure follows a standardized protocol provided by The eDNA Society. It involves water collection, filtration, DNA extraction, and molecular analysis using MiFish primers and sequencing. The resulting sequence data is processed through Claident, a high-throughput analysis pipeline, which translates it into taxonomic occurrences. This valuable data is accessible to the public through ANEMONE DB, a dedicated database hosted at Tohoku University.

Recognizing the significant potential of eDNA monitoring data in addressing various nature-related social issues, a consortium comprising academia, government bodies, and private sectors was established on June 1, 2022. This collaborative effort aims to explore and leverage the transformative power of eDNA monitoring data for innovative solutions across diverse fields. A promising next step involves establishing a foundation for international collaboration to build a sustainable society. This initiative seeks to enable scientists to collaborate in acquiring, providing, and accumulating biodiversity information, fostering a framework conducive to the development of a sustainable society through engagement with local communities.

Keywords: biodiversity, environmental DNA, monitoring network



The 77 ANEMONE stations for routine eDNA monitoring