Maximizing passive eDNA collection using varied membrane materials

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Passive collection is an emerging sampling method for environmental DNA (eDNA) in aquatic systems. Efficient and effective eDNA collection, combined with metabarcoding, will enable greater levels of biological sampling, which increases the range of ecological questions that can be addressed. Here we investigate the effectiveness of various membrane materials at passively collecting fish eDNA in an aquarium setting with known species composition. We submerged nine different materials (cellulose, cellulose with 1% and 3% chitosan, cellulose overlayed with electrospun nanofibers and 1% chitosan, cotton fibres, hemp fibres and sponge with either nitrate or active carbon) in an aquarium fish tank for various times (5, 10, 30, 60 and 1080 minutes) to determine which passively collected the most eDNA, as measured by the highest abundance of amplified template and resulting species diversity. Using a universal fish metabarcoding assay, we show that all trialled materials passively captured eDNA, regardless of time submerged, and the resulting fish diversity detected was comparable to that obtained using conventional filtering methods. Our results support the use of passive eDNA collection methods, using an array of membrane materials, as an effective and time-efficient technique for fish species detection in a relatively low diversity (~50 species) system. We also present a field application of how passive eDNA sampling can be used for the detection of cryptobenthic fishes in a coral reef ecosystem (the Ningaloo Coast World Heritage Area), yielding a more comprehensive monitoring program than current alternatives.

Biography:

Cindy Bessey is a marine ecologist whose passion is understanding the role of lower trophic level organisms in sustaining diverse, productive and healthy ecosystems. Cindy's research projects have included investigating trophic interactions in threatened seagrass ecosystems, evaluating how commercially important fish populations are affected by varying environmental conditions, and assessing the risk that genetically modified fish pose to the natural environment. She currently works on advancing environmental DNA (eDNA) techniques for successful implementation into bio-monitoring programs which are cost-effective, easily deployed and accessible to anyone. Her focus is on obtaining diversity data in coastal and offshore systems in order to evaluate ecosystem changes resulting from both anthropogenic and natural pressures. Her international employment experience includes positions with the Western Australian Department of Biodiversity Conservation and Attractions, the National Oceanic and Atmospheric Administration in California, USA, and the Department of Fisheries and Oceans in British Columbia, Canada.

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ABOUT eDNA

The Southern environmental DNA Society (SeDNA) is a newly established Australian and New Zealand society of environmental DNA researchers and end users. We aim to promote best practices and help the adoption of methods across sectors.

Our mission is promoting science and industry collaboration across Australia and New Zealand to advance best practice eDNA methods and adoption in government, private and community sectors.

Visit our website to find more about the society and what we do here. Membership registration is open on our website.

https://sednasociety.com/

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In the spirit of reconciliation we acknowledge the Traditional Custodians of country throughout Australia & New Zealand and their connections to land, sea and community. We pay our respect to their Elders past and present and extend that respect to all peoples today.