Optimizing environmental DNA sampling effort for fish assessment in tropical streams and rivers.

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Abstract

Since Earth experiences a notable decline of biodiversity and considering the services that it provides to humanity, there is an urgent need to develop accurate and efficient methods to measure species diversity. The environmental DNA (eDNA) metabarcoding is a promising tool to measure aquatic biodiversity. It is based on the capture of DNA from a water sample, but the water volume sampled (*i.e.* sampling effort) displays a high variability among studies. We determined the optimal sampling effort to detect fish assemblages in tropical streams and rivers. We collected eDNA replicates in Guianese sites (streams and rivers). We show that a single eDNA replicate of 34 litres of filtered water detected more than 64% of the expected fish fauna, with little variation between replicates. The number of detected species per site saturated after 2 replicates, with a detection rate higher than 71%. Considering fish assemblages, we reveal a strong consistency between replicates that permitted to distinguish the fauna between sites and between ecosystem types (stream *versus* rivers) using a single eDNA replicate.

These results testify that filtering eDNA from few litres of water is sufficient to achieve relevant inventories of local species assemblages and to distinguish sites according to their fauna. Therefore, this method deserves to be used in the assessment of human impacts such as gold mining, logging and intensive agriculture in highly diverse and threatened ecosystems such as Amazonian rivers.

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