

Environmental DNA metabarcoding of pan-trap water to identify arthropods and the plants they interact with

Joshua Kestel¹, David Field², Phil Bateman¹, Nicole White¹, Karen Bell³, and Paul Nevill⁴

¹Curtin University - Perth Bentley Campus

²Institute of Science and Technology Austria

³New South Wales Department of Primary Industries

⁴Curtin University Bentley Campus

June 24, 2023

Abstract

Globally, the diversity of arthropods and the plants upon which they rely are under increasing pressure due to a combination of biotic and abiotic anthropogenic stressors. Unfortunately, conventional survey methods used to monitor ecosystems are often challenging to conduct at large scales. Pan traps are a commonly used pollinator survey method and environmental DNA (eDNA) metabarcoding of pan-trap water may offer a high-throughput alternative to aid in the detection of both arthropods and the plant resources they rely on. Here, we examined if eDNA metabarcoding can be used to identify arthropod and plant species from pan-trap water, and investigated the effect of different DNA extraction methods. We then compared plant species identified by metabarcoding with observation-based floral surveys and also assessed the contribution of airborne plant DNA (plant DNA not carried by arthropods) using marble traps to reduce putative false positives in the pan trap dataset. Arthropod eDNA was only detected in 17% of pan trap samples and there was minimal overlap between the eDNA results and morphological identifications. In contrast, for plants, we detected 64 taxa, of which 53 were unique to the eDNA dataset, and no differences were identified between the two extraction kits. We were able to significantly reduce the contribution of airborne plant DNA to the final dataset using marble traps. This study demonstrates that eDNA metabarcoding of pan-trap water can detect plant resources used by arthropods and highlights the potential for eDNA metabarcoding to be applied to investigations of plant-animal interactions.

Hosted file

002_Manuscript.docx available at <https://authorea.com/users/568014/articles/651204-environmental-dna-metabarcoding-of-pan-trap-water-to-identify-arthropods-and-the-plants-they-interact-with>

Hosted file

004_Scopus_search.xlsx available at <https://authorea.com/users/568014/articles/651204-environmental-dna-metabarcoding-of-pan-trap-water-to-identify-arthropods-and-the-plants-they-interact-with>