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Spiders as natural DNA samplers can recover arthropod community diversity and biotic interactions across space and time

ARTHROPOD DECLINE

BIODIVERSITY MONITORING

ENVIRONMENTAL DNA

GUT CONTENT ANALYSIS

METABARCODING

TROPHIC INTERACTIONS

AN

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Abstract

Global arthropod decline demands effective biodiversity monitoring strategies. However, most current monitoring approaches do not provide an exhaustive picture of arthropod community structure. In particular, biotic interactions and temporal patterns of biodiversity change are still poorly understood due to a lack of suitable monitoring approaches. Here we explore the possibility of addressing these two shortfalls using spiders, one of the most important predators of terrestrial arthropods, as natural samplers for arthropod community DNA. We conducted several experiments comparing the recovered community composition between spider gut contents and traditional monitoring methods. Additionally, we used archived spiders that were over a decade old to assess the preservation of prey DNA in spiders over time. Spiders proved to be highly efficient natural DNA samplers with gut content metabarcoding revealing similar community composition and α - and β -diversity compared to metabarcoding results of traditional methods. Unique arthropod taxa were detected by spider gut contents and traditional methods respectively, indicating that spider gut contents are not replacements but valuable complements to traditional sampling. Besides providing an overview of local diversity patterns, comparing gut contents across spider species simultaneously generates an overview of trophic interactions and dietary ecology in arthropod communities. Furthermore, well-preserved archived spiders can effectively reconstruct historical diets, making them valuable for studying past dietary diversity. Historical collections of spiders thus constitute time capsules of spider dietary diversity. Spider natural samplers can overcome critical shortfalls in biodiversity monitoring and contribute to our future understanding of community assembly across space and time.

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