

植物DNA条形码促进系统发育群落生态学发展

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Plant DNA barcodes promote the development of phylogenetic community ecology

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摘要

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摘要 系统发育群落生态学是近年兴起的一个重要生态学研究分支, 它以群落生态学为基础并引入了系统发育的分析方法, 全面动态地反映了群落中物种内和物种间的相互作用关系, 揭示了群落格局形成的生态学过程, 研究了生物多样性的形成及维持机制。巴拿马BCI (Barro Colorado Island) 样地的成功例子说明, 在固定样地进行长期的群落生态与系统发育研究切实可行且极具意义; DNA条形码的快速兴起对这一研究发挥着重要作用。本文先列举了群落生态与系统发育综合分析能解决的群落系统发育结构、群落生态位结构、生物地理学和性状进化等生态学问题; 接着介绍了标准植物DNA条形码以及利用片段组合(*rbcl*+*matK*+*trnH-psbA*)进行快速物种识别和近缘种区分、精确群落系统发育关系的构建以及群落生态学研究; 随后提出DNA条形码研究在类群水平上需注意两片段的条形码组合(*matK*+*rbcl*)在同属种鉴别能力上的不足, 而在较大尺度群落水平上需对实验设计进行优化。DNA条形码将为探讨物种多样性及其维持机理、系统发育beta多样性以及群落水平上功能性状进化研究提供新的思路。

关键词: 群落系统发育重建 群落生态学 *rbcl* *matK* *trnH-psbA* 大型固定样地 APG分类系统

Abstract: There is a dynamic interplay between ecology and evolution within community ecology. Phylogenetic community ecology describes the intraspecific and interspecific relationships within a community, aiming to reveal the processes driving community assembly at multiple scales. Previous research has highlighted the role of phylogenetic and historical biogeographical data in explaining current patterns of global biodiversity. The success of using DNA barcoding in the construction of tropical forest community phylogenies highlights the usefulness and challenges of long-term research on community ecology and phylogenetics based on forest dynamic plots. In this paper, we illustrate the feasibility of a synthesis between community ecology and evolutionary biology in order to resolve particular ecological issues on community phylogenetic structure, community niche structure, biogeography, and trait evolution. We summarize progress on the development of a plant DNA barcoding system, and introduce the usage of a combination of DNA markers (*rbcl*+*matK*+*trnH-psbA*) for fast species discrimination and community phylogenetic reconstruction. We also explore the utilization of well-resolved phylogenies to understand community ecology. We discuss the limitations of core plant DNA barcodes (*rbcl*+*matK*) when identifying congeners, and propose an improved sequencing strategy suitable for studies at the community level. We expect that plant DNA barcodes will prove very useful for the study of species diversity, mechanisms of biodiversity maintenance, phylogenetic beta diversity and functional trait evolution.

Keywords: community phylogenetic reconstruction community ecology *rbcl* *matK* *trnH-psbA* large scale permanent plot APG

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