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Unlocking the Genetic Code: Exploring the Potential of DNA Barcoding for Biodiversity Assessment

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Abstract : DNA barcoding is a crucial method for assessing and monitoring species diversity amidst escalating threats to global biodiversity. The author explores DNA barcoding's potential as a robust and reliable tool for biodiversity assessment. It begins with a comprehensive review of existing literature, delving into the theoretical foundations, methodologies and applications of DNA barcoding. The suitability of various DNA regions, like the COI gene, as universal barcodes is extensively investigated. Additionally, the advantages and limitations of different DNA sequencing technologies and bioinformatics tools are evaluated within the context of DNA barcoding. To evaluate the efficacy of DNA barcoding, diverse ecosystems, including terrestrial, freshwater and marine habitats, are sampled. Extracted DNA from collected specimens undergoes amplification and sequencing of the target barcode region. Comparison of the obtained DNA sequences with reference databases allows for the identification and classification of the sampled organisms. Findings demonstrate that DNA barcoding accurately identifies species, even in cases where morphological identification proves challenging. Moreover, it sheds light on cryptic and endangered species, aiding conservation efforts. The author also investigates patterns of genetic diversity and evolutionary relationships among different taxa through the analysis of genetic data. This research contributes to the growing knowledge of DNA barcoding and its applicability for biodiversity assessment. The advantages of this approach, such as speed, accuracy and cost-effectiveness, are highlighted, along with areas for improvement. By unlocking the genetic code, DNA barcoding enhances our understanding of biodiversity, supports conservation initiatives and informs evidence-based decision-making for the sustainable management of ecosystems.

Keywords : DNA barcoding, biodiversity assessment, genetic code, species identification, taxonomic resolution, next-generation sequencing
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