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The taxonomic potential of integrating morphological and molecular approaches to enhance ant (Hymenoptera, Formicidae) identifications for biosecurity: bridging the gap between DNA sequences and reliable species-level confirmation.

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In Australia, ants play a significant role as ubiquitous and ecologically influential components of terrestrial systems, boasting exceptionally high levels of endemic diversity. Despite this, there remains a great deal of uncertainty at the species level, with some of the most diverse, widely distributed, and ecologically dominant genera in urgent need of revision. Additionally, recent molecular studies strongly suggest the presence of overlooked cryptic diversity, even 'megadiversity,' in certain species groups, which is yet to be corroborated by traditional taxonomy. Introduced ant species can pose significant environmental and economic threats as destructive invasive species. These species are easily transported by human activities and possess traits that enable them to thrive in new environments, potentially outcompeting native species. The timely distinction between exotic species and their native counterparts is vital to reduce the risk of establishment in Australia. However, the lack of species-level knowledge within diverse genera can lead to substantial delays in detecting congeneric exotic species. Here, we present examples of the utility of biosecurity research and surveillance measures that combine molecular DNA barcoding (COI sequencing) and morphological identifications with high quality diagnostic images of specimens accessioned into collections to provide verifiable identifications, as well as taxonomic advances.

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