Diversity squared: New insights into patterns of heterobranch species richness and diversification of lineages

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Expeditionary field work still remains the most fundamental tool to discover novel species and repetitive sampling in high diversity portions of the Indo-Pacific tropics continues to provide large numbers of previously undocumented taxa. Multidisciplinary collaborative teams and large expeditions are an immense source of novel biodiversity. Micro-scale temporal changes in diverse ecosystems provide a catalyst for new species discovery, as well as insights into the discovery of patterns of trophic and symbiotic divergence. Additionally, phylogenetic analyses of large samples of diverse taxa across geographical gradients have increasingly detected cryptic and pseudo-cryptic species complexes that have dramatically altered our view of species richness. Aposematic and extreme camouflaged colour patterns within the context of fish predatory behaviour provides an evolutionary framework for divergence and convergence of colour patterns. Similarly, recent studies of temperate nudibranch assemblages in temperate waters in Europe, southern Africa and the Pacific coast of North America also demonstrate previously undetected diversity and the presence of colour patterns that likely reflect similarity derived from both common ancestry and convergence. Combining these approaches has documented astonishingly high levels of previously undetected diversity, has huge implications to our knowledge of global biodiversity with a likely 3–5x increase in global species richness, and has developed more appropriate regenerative conservation strategies.

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