Abstract

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Title

Cryptic diversity and phenotypic plasticity: implications for bloom monitoring and management

Description

Cyanobacteria within and between natural populations are known to exhibit highly variable phenotypes, particularly in relation to characters such as trichome morphology, facultative cyanotoxin production, and toxin quota. Phenotypic plasticity is underpinned by genes which encode functions that selectively enable a genotype to survive under a wide range of prevailing and changing environmental conditions. Such phenotypic plasticity is an important aspect of the successful colonisation of cyanobacteria across diverse aerophytic, terrestrial and aquatic habitats. Understanding the full range of intraspecific variability across a species range is important for their delimitation and recognition in nature. Therefore, careful observation of morphological and physiological phenotypes under a range of conditions likely for a given species' biophysical niche is critical to progress this understanding. We examined a population of filamentous cyanobacteria which dominated the plankton of a temperate lake in Victoria, Australia; based on features observed using light microscopy, it was putatively identified as the cylindrospermopsin producer *Chrysosporum ovalisporum*. Multilocus phylogenetic analyses and analysis of the secondary structure of the ITS region of the 16S-23S rRNA gene, combined with unique morphological characteristics indicated the strains we isolated from the lake represented a novel species which we designated as *Dolichospermum brachiatum*. Importantly our study has shown that both wild material and laboratory strains of *D. brachiatum* are capable of significant morphological plasticity under varying nutrient regimes. Unrecognised intraspecific diversity is as much of a hinderance to the practice of morphology-based identification of cyanobacterial taxa as is cryptic diversity. In this case study, the management responses to the bloom from which this material originated was based on an understanding developed for the toxigenic species *C. ovalisporum*, leading to unnecessary toxin analysis and monitoring expenditure. It's likely that *D. brachiatum* has been mistaken for *C. ovalisporum* elsewhere in Australia over the past decade.