Spectral diversity of phycoerythrins and diazotroph abundance in tropical waters

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ABSTRACT: Phycoerythrin (PE) spectral diversity was investigated in eastern tropical Australian waters and around New Caledonian and Fijian archipelagos. Colony sorting of filamentous cyanobacteria revealed slight differences in the PE excitation spectrum of *Trichodesmium thiebautii* and *T. erythraeum*. Spectra of PE from *Katagnymene spiralis* and *Richelia intracellularis* were examined for the first time. PE spectra of filamentous cyanobacteria (*Trichodesmium*, *Katagnymene*, and *Richelia*) showed a broader phycoerythrobilin (PEB) band than those of *Synechococcus*. The influence of PE *Trichodesmium* on the global spectrum of PE in natural waters was clearly visible at various stations. The PEB band was large at the surface and narrower at increased depth, suggesting a shift of the cyanobacterial community from a dominance of diazotrophic filamentous cyanobacteria to small *Synechococcus*. Size fractionation of water samples confirmed this. A good linear relationship was observed between PE concentration in the >10-µm cellular-size fraction and the abundance of filamentous cyanobacteria expressed by either trichome numbers, total trichome surface area, or total trichome volume. PE in the >10-µm fraction is a useful tool for rapidly quantifying filamentous cyanobacteria. Neither diel variations nor photoacclimation significantly influenced the PE fluorescence excitation spectra in *T. thiebautii* and *T. erythraeum*. Using this method, we identified green colonies of filamentous cyanobacteria in deep waters (50- 120 m) of the Coral Sea with a novel high-phycourobilin PE. While morphologically similar to *Trichodesmium*, it possesses distinctive photosynthetic responses and could be a new species.