

Abstract

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Title

First report of anatoxin-a production by the freshwater filamentous cyanobacterium *Microcoleus* in Australia

Description

The genus *Microcoleus* contains over 50 filamentous species from marine, estuarine, and freshwater environments where it typically forms macroscopic mats on the substrate. Anatoxin production is associated with two species, *M. autumnalis* and *M. anatoxicus*. Significant blooms of the mat forming *M. autumnalis* in New Zealand cobble bed rivers have been associated with multiple dog deaths. Here we report anatoxin-a (ATX) production in mats of *Microcoleus* for the first time in Australia at several locations in the Tweed Valley, far north New South Wales. Benthic mats retrieved from sites across the Tweed caldera catchment were screened microscopically and tested by PCR for the presence of five cyanobacteria toxin genes. At seven localities, the anaC gene was detected from environmental samples of *Microcoleus/Phormidium* like mat material. Cultures of *Microcoleus* isolated from one of the sites were confirmed to be *Microcoleus* by 16S rRNA sequencing. A mat sample from this site was also found to produce ATX by LC-MS. Mats typically formed on top of silt covering submerged boulders and rock walls; water quality conditions include high dissolved oxygen, low nutrient levels, low conductivity and near neutral pH. The subtropical rain cycle and water temperatures of the Tweed catchment support regular accrual and release of *Microcoleus* mats from the substrate into the water column. The anaC gene was detected in mats found upstream of all three Tweed Council Water Treatment Plants. Given the detection of ATX in *Microcoleus* mats, a greater awareness and determination of the prevalence of potentially toxic benthic cyanobacteria algae throughout Australia is required.