

The tide turns: Episodic and localized cross-contamination of a California coastline with cyanotoxins

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ABSTRACT

The contamination of coastal ecosystems from a variety of toxins of marine algal origin is a common and well-documented situation along the coasts of the U.S. and globally. The occurrence of toxins originating from cyanobacteria along marine coastlines is much less studied, and little information exists on whether toxins from marine and freshwater sources co-occur regularly. The current study focused on the discharge of cyanotoxins from a coastal lagoon as a consequence of an extreme tide event (King Tides; December 3-5, 2017) resulting in a breach of the berm separating the lagoon from the ocean. Monthly monitoring in the lagoon throughout 2017 documented more than a dozen co-occurring cyanobacterial genera, as well as multiple algal and cyanobacterial toxins. Biotoxin monitoring before and following the King Tide event using Solid Phase Adsorption Toxin Tracking (SPATT) in the lagoon and along the coast revealed the co-occurrence of microcystins, anatoxin, domoic acid and other toxins on multiple dates and locations. Domoic acid was ubiquitously present in SPATT deployed in the lagoon and along the coast. Microcystins were also commonly detected in both locations, although the beach berm retained the lagoonal water for much of the year. Mussels collected along the coast contained microcystins in approximately half the samples, particularly following the King Tide event. Anatoxin was observed in SPATT only in late December, following the breach of the berm. Our findings indicate both episodic and persistent occurrence of both cyanotoxins and marine toxins may commonly contaminate coastlines in proximity to cyanobacteria-laden creeks and lagoons.

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