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CRYPTIC BLOOMS: ARE THIN LAYERS THE MISSING CONNECTION?

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Harmful algal blooms (HABs) are common in many coastal areas and have resulted in repeated closures of shellfish fisheries and the poisoning and death of marine mammals. In the majority of instances, HAB events in this region are first detected by the presence of sick or dying animals. The phrase “cryptic blooms” was adopted to denote the appearance of poisoning at higher trophic levels with no prior evidence of a large phytoplankton bloom. We hypothesize that the onset of many HAB events goes undetected because the bloom is initially concentrated in discrete thin subsurface layers in the water column that are easily missed by conventional sampling and monitoring methods. Here we report on the detection and monitoring of a subsurface layer of phytoplankton in northern Monterey Bay, CA using a high-resolution, autonomous profiler. This ‘thin layer’, which measured from 10 cm to 3 m in thickness (85% < 2 m; 54% < 1 m), persisted over a 7-day period near the base of the pycnocline. The phytoplankton assemblage in the layer was primarily composed of a multi-species assemblage of Pseudo-nitzschia including the toxin-producing species P. australis. Concentrations of toxic phytoplankton (P. australis), cyanobacteria, and bacteria in the layer were significantly higher than outside the layer ($P<0.05$). Counts of total Pseudo-nitzschia spp. showed similar levels of enrichment in the layer, compared to outside the layer. Our findings indicate that when monitoring for HABs, it is critical to sample at scales appropriate to resolve thin layers. Thin layers have been identified as a common recurrent feature in a variety of coastal systems, suggesting that the use of autonomous high-resolution vertical profilers coupled with targeted sampling, could allow more timely detection of HABs in many coastal environments.

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