

Harmful Algae

Devastating farmed abalone mortalities attributed to yessotoxin-producing dinoflagellates

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Abstract

A large dinoflagellate bloom in Walker Bay (South Africa) in January 2017 impacted 3 land-based abalone farms resulting in the death of several million animals. Satellite-derived images of Chl-a from the Ocean and Land Colour Imager (OLCI) on board the European Space Agency Sentinel-3 A showed bloom initiation in late December 2016 and dispersal in mid-February 2017. The bloom was dominated by two dinoflagellate species identified by light microscopy as *Gonyaulax spinifera* (Claparède & Lachmann) Diesing, 1866 and *Lingulodinium polyedrum* (Stein) Dodge, 1989. These morphologically based identifications were confirmed by phylogenetic analysis using partial sequences of the large subunit rDNA of both dinoflagellates. The appearance of yessotoxins (YTX) in abalone clearly coincided with increases in dinoflagellate concentrations. Yessotoxins in both the plankton and abalone were dominated by the two analogues homo-YTX and 45-hydroxy-YTX. The absence of toxins in a clonal culture of *L. polyedrum* implicated *G. spinifera* as the likely source of YTX. Toxin concentrations were found to be highest in the gills which showed the most significant pathology, including severe, generalized disruption of the gill epithelium characterized by degeneration and necrosis of epithelial cells accompanied by a modest inflammatory response. Some farms undertook pre-emptive or emergency harvesting to reduce financial losses.