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Paralytic Shellfish Toxins' production and oxidative stress response of a HAB-inducing dinoflagellate (Gymnodinium catenatum) under marine heat waves

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Abstract

Not only the global sea surface temperature is increasing and expected to increase further, but extreme events, such as marine heat waves (MHWs) are becoming more frequent, intense and long-lasting. MHWs can be described as intervals of time, where ocean temperatures are higher than usual, and can be categorized by their duration, intensity, rate of onset and spatial distribution. The duration of these events is variable, lasting between days and months.Typically, with increasing temperatures, phytoplanktonic species tend to have higher growth rates until a species-specific temperature threshold is met. Algal blooms, as natural occurrences, are defined by the sudden overgrowth of microscopic algae under certain environmental conditions. These events are beneficial to the ecosystems, unless the overgrowing species produces toxins, leading to harmful algal blooms (HABs). Among HAB-toxins, Paralytic Shellfish Toxins (PSTs) are one of the most abundant HAB-toxins in oceans worldwide. These toxins are responsible for Paralytic Shellfish Poisoning in humans, shellfish closures worldwide and detrimental impacts on marine organisms. *Gymnodinium catenatum*, a PST producer, is an unarmored, chain-forming dinoflagellate, that occurs more abundantly in Portugal following upwelling events. Within this context, the aim of the present work was to determine toxin production and oxidative stress response upon exposure to two simulated MHWs (categories I and IV). The present findings are of paramount importance for the understanding of how these bloom forming species are affected by MHWs, what potential cascading effects they can have in human health and the overall health of coastal ecosystems.

Keywords

Paralytic Shellfish Toxins, Gymnodinium catenatum, Oxidative stress , Marine heat waves