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Proliferation of a harmful algal species under ocean acidification

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By altering the competitive fitness of interacting species, ocean acidification can shift the composition of marine communities. If the change in community composition involves the loss of a keystone species or a shift between functional groups, this can alter the functionality of an ecosystem, with potential impacts on food webs and biogeochemical processes. The most severe impacts can arise where community change favours the proliferation of harmful algal species. Although expansion of nuisance species is often considered a potential risk of ocean change, information on the effects of ocean acidification on the physiological performance and cellular toxicity of harmful algal species is scarce and contradictory.

To assess the responses of an oligotrophic plankton community to ocean acidification we conducted a 9-week in situ mesocosm experiment off Gran Canaria (Spain) in the subtropical oligotrophic North Atlantic in the fall of 2014. In nine mesocosms, each enclosing a volume of 35 m^3, seawater carbonate chemistry was manipulated to cover a range of CO_2 concentrations from 400 to 1100 μatm. Ocean acidification benefitted the toxic algal species *Vicicitus globosus*, which increased it's abundance at CO_2 levels higher than 600 μatm and developed blooms above 700 μatm CO_2. The mass development of this harmful species had massive impacts on the plankton community, preventing the development of the micro- and mesozooplankton community and disrupting the trophic transfer. This, in turn, prolonged the residence of particulate matter in the water column and caused a drastic decline in export flux. Considering *V. globosus*' wide geographical distribution and its potential to cause fish kills in coastal ecosystems, increased competitive fitness of this species under ocean acidification may pose an emergent threat to coastal communities, aquaculture and fisheries.