Ocean geo-engineering produces toxic blooms of plankton

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Sunset is seen over the sea. Adding iron to the world's oceans to capture carbon and fight global warming could do more harm than good, as the mineral appears to boost the growth of a plankton that produces a deadly neurotoxin, a study published Monday shows.

(PhysOrg.com) -- New research led by The University of Western Ontario warns of the potential for ecological harm caused by the fertilization of oceanic waters with the trace element iron. This fertilization method is being proposed to remove carbon dioxide from the atmosphere and sequester it into the ocean depths.

Ever since scientists were able to demonstrate in the early 1990s that supplementing regions of the world ocean with minute quantities of iron could quickly generate massive booms of phytoplankton, there has been controversy surrounding proposals to commercialize this strategy as a

potential means to regulate climate by removing carbon dioxide from the atmosphere.

Adding iron to large regions of iron-deficient but otherwise nutrient-rich, ocean waters stimulates massive blooms of phytoplankton (photosynthetic, microscopic plant-like organisms), thereby increasing carbon dioxide uptake and removal from surface waters as these cells die and sink, or are eaten by zooplankton and then sink as faecal pellets, and sequestering the excess carbon flux into the deep sea for many years to come.

In a new collaborative study published in the *Proceedings of the National Academy of Science (PNAS)*, oceanographers and students from Canada and the United States have demonstrated that iron enrichment sharply increases the chances of developing toxic diatom blooms. The phytoplankton species of concern belong to the pennate diatom genus Pseudo-nitzschia, a group of species known to be responsible for the death and illness of thousands of marine mammals and birds along the west coast of North America since its initial discovery as a neurotoxin producer in Atlantic Canada in 1987.

Using deckboard experiments in the Gulf of Alaska, the researchers found that water samples enriched with iron developed into the population of the toxic algae Pseudo-nitzchia, doubled the level of toxin in each cell, and created conditions that give the toxic species an advantage over non-toxic species; all factors that increase the chances of an ecologically harmful outcome to iron enrichment.

“It is an indication that we are not the masters of nature when it comes to large-scale ecological manipulations. Any positive carbon sequestration must be balanced against the evident and unforeseen environmental consequences” says Charles Trick, Beryl Ivey Chair for Ecosystem Health, Schulich School of Medicine and Dentistry at The University of

Western Ontario, and lead author of the research report.

The collaborative study entitled 'Iron enrichment stimulates toxic diatom production in High Nitrate Low Chlorophyll areas' is co-authored by Charles Trick (The University of Western Ontario), Brian Bill and William Cochlan (Romberg Tiburon Center, San Francisco State University), Vera Trainer (NOAA Fisheries) and Mark Wells and Lisa Pickell (University of Maine).

Provided by University of Western Ontario