

ID: W2060613340

TITLE: Massive outbreaks of *Noctiluca scintillans* blooms in the Arabian Sea due to spread of hypoxia

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ABSTRACT:

In the last decade, the northern Arabian Sea has witnessed a radical shift in the composition of winter phytoplankton blooms, which previously comprised mainly of diatoms, the unicellular, siliceous photosynthetic organisms favoured by nutrient-enriched waters from convective mixing. These trophically important diatom blooms have been replaced by widespread blooms of a large, green dinoflagellate, *Noctiluca scintillans*, which combines carbon fixation from its chlorophyll-containing endosymbiont with ingestion of prey. Here, we report that these massive outbreaks of *N. scintillans* during winter are being facilitated by an unprecedented influx of oxygen deficient waters into the euphotic zone and by the extraordinary ability of its endosymbiont *Pedinomonas noctilucae* to fix carbon more efficiently than other phytoplankton under hypoxic conditions. We contend that *N. scintillans* blooms could disrupt the traditional diatom-sustained food chain to the detriment of regional fisheries and long-term health of an ecosystem supporting a coastal population of nearly 120 million people.

SOURCE: Nature communications

PDF URL: <https://www.nature.com/articles/ncomms5862.pdf>

CITED BY COUNT: 170

PUBLICATION YEAR: 2014

TYPE: article

CONCEPTS: ['Dinoflagellate', 'Phytoplankton', 'Algal bloom', 'Diatom', 'Photic zone', 'Oceanography', 'Bloom', 'Hypoxia (environmental)', 'Biology', 'Plankton', 'Population', 'Ecology', 'Nutrient', 'Chemistry', 'Oxygen', 'Geology', 'Demography', 'Organic chemistry', 'Sociology']