Unique 'giant-colony' ecotype leads to intense blooms of Phaeocystis globosa in South China Sea

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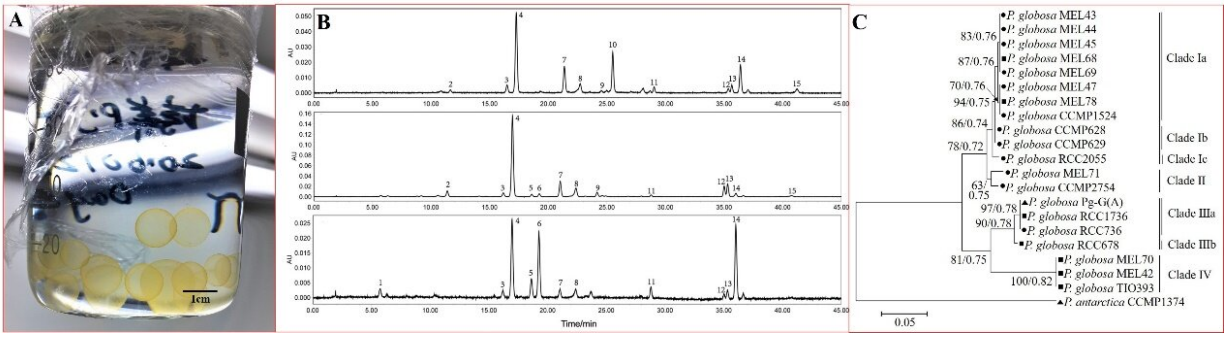

Giant colonies of P. globosa collected from the SCS (A), pigment chromatograms of representative P. globosa isolates (B), and phylogenetic tree of different geographic isolates of P. globosa (C). Credit: IOCAS

Haptophyte Phaeocystis globosa is an important causative agent of harmful algal blooms. Outbreaks of P. globosa blooms usually occur in the eutrophic coastal waters in the form of colonies and influence marine ecosystems and mariculture industry.

The South China Sea (SCS) is a typical region with a large number of P. globosa blooms that are characterized by the formation of "giant colony," the unique diagnostic pigment, and the strong hemolytic toxicity.

Recently, a research team led by Prof. Yu Rencheng from the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) provided new insights into the intense blooms of P. globosa in the SCS, and identified the causative species of the blooms as a unique "giant-colony" ecotype.

The study was published in *Harmful Algae* on March 23.

The researchers used a high-resolution chloroplast molecular marker to analyze the genetic diversity of more than 19 strains of P. globosa collected from different regions of the Pacific and Atlantic Oceans. They determined colony sizes and pigment profiles of these P. globosa isolates.

These P. globosa strains could be divided into four genetic clades based on their sequences, or two groups based on colony size and the diagnostic pigments (19'-hexanoyloxyfucoxanthin, hex-fuco, and 19'-butanoyloxyfucoxanthin, but-fuco).

Three strains from the SCS, all belong to the same genetic clade, showed unique biological features in forming "giant colony" and possessing but-fuco as their diagnostic pigment. Based on these findings, the researchers suggested that these SCS strains should be a unique "giant-colony" ecotype of P. globosa.

They analyzed more than 1,000 sequences of the chloroplast molecular marker obtained from P. globosa colony and phytoplankton in the SCS during the period 2016-2021. Phylogenetic analysis indicated that more than 95% of the sequences from P. globosa colonies in the SCS were comprised of the "giant-colony" ecotype, whereas the genetic diversity of solitary cells was much higher. Therefore, the intense blooms of P. globosa in the SCS were mainly caused by this "giant-colony" ecotype of P. globosa.

P. globosa exhibits varying morphological and physiological features and high genetic diversity, yet the relationship among these has never been elucidated. "Our work provides a valuable molecular marker to examine the intraspecific diversity of P. globosa, which will help to understand the morphological, physiological and genetic differentiation of P. globosa," said Dr. Zhang Qingchun, first author of the study.

"The studies on this unique 'giant-colony' ecotype of P. globosa will help to reveal the mechanisms of P. globosa blooms in the coastal waters of China, and to develop the monitoring and early-warning system," said Prof. Yu.

More information: Qing-Chun Zhang et al, Intense blooms of Phaeocystis globosa in the South China Sea are caused by a unique "giant-colony" ecotype, *Harmful Algae* (2022). DOI: 10.1016/j.hal.2022.102227

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