Toxic dinoflagellates produce true grazer deterrents - DTU Orbit (10/12/2018)

**Toxic dinoflagellates produce true grazer deterrents**

Many phytoplankton species produce toxic substances, but their functional role is unclear. Specifically, it remains uncertain whether these compounds have a toxic or deterrent effect on grazers; only, the latter is consistent with toxins as defensive tools. Here, we show that 10 of 12 species or strains of toxic dinoflagellates were consumed at lower rates than a similarly sized nontoxic dinoflagellate by a copepod. Through video observations of individual prey–grazer interactions, we further demonstrate that the dominating mechanism is through capture, examination, and subsequent rejection of vital cells, that is, a true deterrent effect that offers a straightforward explanation to its evolution. We argue that the diversity of grazer responses to toxic phytoplankton reported in the literature, including toxic effects, and the high diversity of toxin profiles between strains of the same phytoplankton species reflect different stages of an ever-ongoing evolutionary arms race, facilitated by rapid adaptation of grazers to toxic substances. We further argue that defensive toxicity requires a chemical signal exterior to the cell that informs the grazer about the toxicity of the cell. The signal can be the toxin itself or just an aposematic signal of toxicity. In the former case, allelochemical effects may emerge at high cell concentrations as a nonadaptive side effect of a predator defenses.

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Centre for Ocean Life, East China Normal University
Contributors: Xu, J., Kiørboe, T.
Pages: 2240-2249
Publication date: 2018
Peer-reviewed: Yes

**Publication information**

Journal: Ecology
Volume: 99
Issue number: 10
ISSN (Print): 0012-9658
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 5.02 SJR 2.998 SNIP 1.753
Web of Science (2017): Impact factor 4.617
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.8 SJR 3.325 SNIP 1.731
Web of Science (2016): Impact factor 4.809
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 5.24 SJR 3.942 SNIP 1.903
Web of Science (2015): Impact factor 4.733
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 5.09 SJR 3.696 SNIP 1.968
Web of Science (2014): Impact factor 4.656
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 5.43 SJR 3.704 SNIP 2.056
Web of Science (2013): Impact factor 5
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 5.38 SJR 4.061 SNIP 2.098
Web of Science (2012): Impact factor 5.175
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 5.03 SJR 4.274 SNIP 1.937