

The fiendish fish killer *Prymnesium parvum*

Haptophyta is a phylum composed of unicellular algae with an unique distinguishing structure called the haptonema. Haptophytes are ubiquitous around the world in marine environments and some have been observed in freshwater environments as well. They are recognized as important members of these ecosystems, for the role they play in the carbon cycle through their ability to photosynthesize.

However, they can also have detrimental damaging effects on their environment through a so-called algal bloom, where a population of algae in a given body of water reaches such an high density that it can be seen with the naked eye.



Microscopic image of the haptophyte *Prymnesium parvum* with its signature haptonema.

Prymnesium parvum is an infamous haptophyte with the ability to form these kind of blooms, which are responsible for killing fish around the world. It is often referred to as 'golden algae', due to the golden colour the water takes on when a *P. parvum* bloom occurs. These blooms can span hundreds of kilometers along the coast or even land inwards in rivers, lakes and streams, causing huge damage to aquatic ecosystems in Europe, North America and even Australia. The first ever recorded case of an HAB (Harmful Algal Bloom) of *P. parvum* was observed in waters around Denmark and *P. parvum* blooms are currently running rampant in several lakes in Texas.

There are several reasons why *P. parvum* blooms are so devastating to the environment around them. First off all, *P. parvum* is mixotrophic, meaning that it is phototrophic as well as heterotrophic, which enables it to consume competitors in a body of water and quickly take over an entire ecosystem.

Secondly, *P. parvum* achieves this consumption of its competitors by releasing several toxins into the environment, which help to immobilize them. However, these toxins also affect macrofauna, such as fish and crawfish.

There is much uncertainty regarding the type of toxins produced and their corresponding working mechanisms. The toxins have been proposed to kill fish by inflicting damage to the gills, initially leading to increased oxygen consumption until it decreases and falls below standard oxygen consumption after enough exposure. This in addition with an elevated ventilation (breathing) rate and coughing frequency results in a significant decrease in per breath oxygen consumption, inevitably leading to death. Another hypothesis suggests that the toxins increase the permeability of the gills, making the fish far more susceptible for secondary toxins. Additionally, this could also effect the osmotic balance within the fish, leading to other health problems down the line.



Image taken of dead fish due to an *Prymnesium parvum* algal bloom.

References

- Archibald, J. M., Simpson, A. G., & Slamovits, C. H. (2017). Handbook of the Protists. In Springer eBooks. [Jouw alineatekst](#)
- Roelke, D. L., Barkoh, A., Brooks, B. W., Grover, J. P., Hambright, K. D., LaClaire, J. W., Moeller, P. D. R., & Patino, R. (2015). A chronicle of a killer alga in the west: ecology, assessment, and management of *Prymnesium parvum* blooms. *Hydrobiologia*, 764(1), 29–50. <https://doi.org/10.1007/s10750-015-2273-6>
- Henrikson, J. C., Gharfeh, M. S., Easton, A. C., Easton, J. D., Glenn, K. L., Shadfan, M., Mooberry, S. L., Hambright, K. D., & Cichewicz, R. H. (2010). Reassessing the ichthyotoxin profile of cultured *Prymnesium parvum* (golden algae) and comparing it to samples collected from recent freshwater bloom and fish kill events in North America. *Toxicon*, 55(7), 1396–1404. <https://doi.org/10.1016/j.toxicon.2010.02.017>
- Svendsen, M., Andersen, N., Hansen, P., & Steffensen, J. (2018). Effects of Harmful Algal Blooms on Fish: Insights from *Prymnesium parvum*. *Fishes*, 3(1), 11. <https://doi.org/10.3390/fishes3010011>
- Skovgaard, A., & Hansen, P. J. (2003). Food uptake in the harmful alga *Prymnesium parvum* mediated by excreted toxins. *Limnology and Oceanography*, 48(3), 1161–1166. <https://doi.org/10.4319/lo.2003.48.3.1161>
- Roelke, D.L.; Grover, J.P.; Brooks, B.W.; Glass, J.; Buzan, D.; Southard, G.M.; Fries, L.; Gable, G.M.; Schwierke-Wade, L.; Byrd, M.; et al. A decade of fish-killing *Prymnesium parvum* blooms in Texas: Roles of inflow and salinity. *J. Plankton Res.* 2011, 33, 243–253.
- Golden algae – Harmful algal blooms. (n.d.). <https://hab.whoi.edu/impacts/impacts-golden-algae/>