

MEI 2024 / BIL. 11 / 2024

# EON

Epitome of Nature

KESIHATAN DAN KESEJAHTERAAN



MAJALAH PP BIOLOGI  
UITMCNS

ISSN 2773-5869



## EFFECT OF DIATOMS BLOOMS TO HUMAN HEALTH AND ENVIRONMENT

Nur Hafizah Hisham, Siti Nur Syifaa Jamaludin, Nurshahirah Rahizar, Alyssa Safiyah Abd Malek, Nur Syawanie Abdul Aziz, Siti Nur Shazwani Shukor, Aida Qasrina Noor Hisham, Sharir Aizat Kamaruddin, Aimie Rifhan Hashim  
Fakulti Sains Gunaan, Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600, Arau, Perlis, Malaysia

*shariraizat@uitm.edu.my*

EDITOR: DR. NURHAMIMAH ZAINAL ABIDIN

Diatoms are a type of phytoplankton, which are microorganisms that contain chlorophyll and require sunlight to live and grow. They are unicellular, and photosynthetic organisms of various colors, and diverse forms. Diatoms come under the kingdom Protista which is called as photosynthetic protists. Photosynthetic protists are mostly planktonic in which they grow and cover the surface of the water body and move on the mercy of water currents. Diatoms belong to the group of algae known as "hard algae" due to its silica frustule which is sometimes covered with spikes, thorns, or spines (Scotese, 2019). A frustule is the external, siliceous part of the diatom cell wall. Diatom blooms as shown in Figure 1 are dynamic system events in which some single-celled photosynthetic organisms that can take advantage of both biotic and abiotic conditions become dominant. This is caused by a combination of high nutrient concentrations and elevated temperatures. Diatoms



Figure 1: Diatom bloom on water (Source: Boothe, 2020)

are photosynthetic organisms that also thrive in high-nutrient coastal waters. They feed mainly off of silicates but also consume dissolved organic compounds, phosphate, and nitrates.

**Diatoms belong to the group of algae known as "hard algae" due to its silica frustule which is sometimes covered with spikes, thorns, or spines**

Red tides are a common term for harmful algal blooms of diatoms that have the ability to turn water red. This occurs when diatoms grow in massive quantities in surface waters.

The photosynthetic organelles of these organisms, known as plastids or chloroplasts, are golden brown, and the abundance of cells in surface waters produce a red or brown color.

Diatoms can be harmful to both humans and animals if they produce toxins or become extremely dense. These toxin-containing marine algae can be inhaled by humans and animals through tiny airborne droplets, eaten as shellfish or fish, and swimming or other water-based activities. In addition to creating long filamentous ribbons or chains, certain diatoms also have spines or sharp projections. For example, the blooms of *Skeletonema* and *Chaetoceros* in Figure 2 are known to cause harmful bloom due to their anatomical enhancements that can clog or puncture fish gills with their needle-like setae (Scotese, 2019). This shows that red tide can kill the fish as shown in Figure 3.

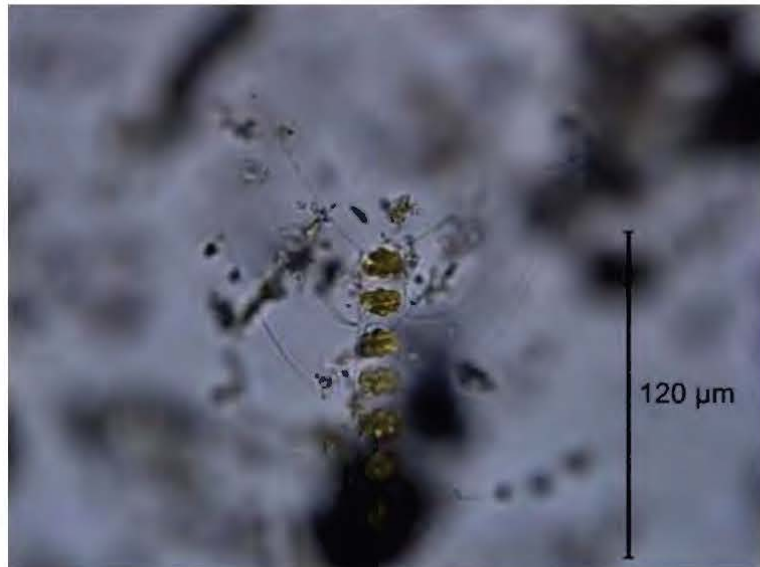


Figure 2: *Chaetoceros didymus* from (Source: Scotese, 2019)

**‘the blooms of *Skeletonema* and *Chaetoceros* known to cause harmful bloom ‘**



Figure 3: Dead fish caused by red tides (Source: Waymer, 2018)

Other effects from blooms include production of phycotoxins, low dissolved oxygen from their decomposition by bacteria, and water fouling taste and odor problems. For example, drinking water can taste earthy and musty or have a fishy or rancid smell from metabolites produced by proliferative diatom growth and degradation. According to Alaska Sea Grant (2015), *Pseudo-nitzschia* can occasionally produce and release potent toxins such as domoic acid which causes Amnesic Shellfish Poisoning (ASP) also called Domoic Acid Poisoning (DAP).

Ingestion of toxins can result in developmental, immunological, neurological, and reproductive damage of the host organism. People who eat shellfish contaminated with red tide can experience nausea, diarrhea, vomiting, dizziness and muscular aches (Waymer, 2018). Amnesic Shellfish Poisoning (ASP) can also lead to memory loss, permanent brain damage or even death. Humans can become poisoned after consuming molluscan shellfish (e.g. mussels, clams, oysters, scallops, cockles) that have filtered the toxic diatom cells out of the water, therefore concentrating the toxin in their digestive system as shown in Figure 4.

Even though there are many negative effects of having too much diatom, they actually can benefit the water. This is because diatoms are the

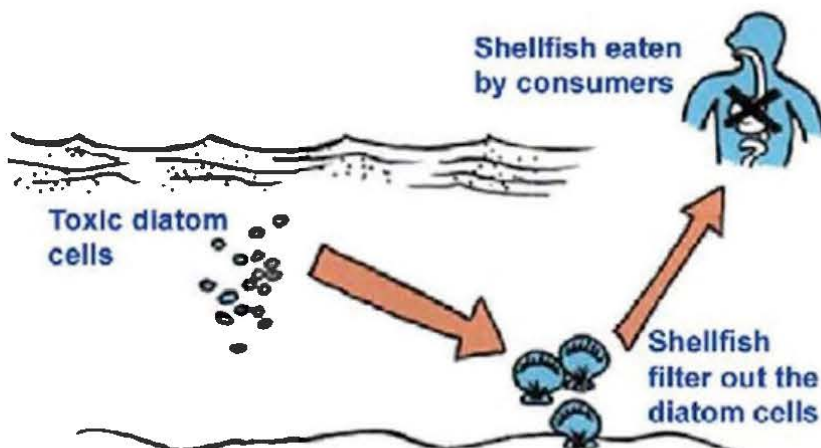


Figure 4: Ways domoic acid reaches humans by contaminated shellfish (Source: Schroeder et. al., 2015)

primary food source at the base of the food chain for everything living in freshwater, which includes zooplankton, crustaceans, and amphibians.

Another huge advantage of diatoms is that they have a silica cell wall or shell, and the nitrates and phosphates absorbed by diatoms are enclosed by this shell and cannot be released back into the water body. Diatoms also considered as the largest primary producers of oxygen on our planet. It is estimated that through photosynthesis, diatoms produce between 20% and 40% of the oxygen we breathe.

During photosynthesis, diatoms use energy from light to convert water and carbon dioxide into sugars for food. So, monitoring and understanding diatom blooms are essential for managing aquatic ecosystems. In some cases, the occurrence of diatom blooms may indicate underlying issues with water

quality that need to be addressed to maintain a healthy and balanced aquatic environment.

Diatom blooms, influencing water quality and ecosystem health, exemplify the interconnected challenges that necessitate an integrated approach to achieving SDG 3 and ensuring good health and well-being for all.

References

