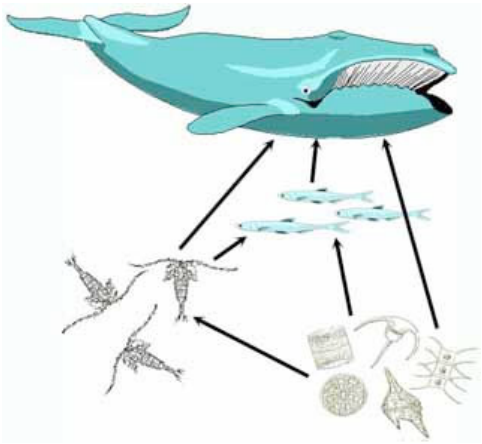
Toxic and Harmful Algal Blooms
"Tracing the Toxins"

Harmful algal blooms (HABs) can negatively impact organisms in a variety of ways that can range from cell and tissue damage to organism death. Some HABs are not toxic; in other words, they are caused by algae that do not produce a toxin that directly kills organisms, but they are harmful in that they create unhealthy conditions in the environment (e.g., too little oxygen, decreased sunlight). The impacts of these algae are discussed further in "Help! It's an HAB!" (http://www.bigelow.org/edhab/help_hab.html). In contrast, toxic blooms are caused by algae that produce potent toxins that can cause massive fish kills, marine mammal deaths, and human illness.



There are several types of toxins produced by these harmful algae. Commonly, the toxins affect the functioning of nerve and muscle cells. Other toxins affect proteins or act like amino acids. Toxic blooms have been responsible for causing respiratory irritation and distress, diarrhea, vomiting, numbness, dizziness, paralysis, and even death. For more information on individual toxins and toxin biochemistry, visit "Toxic and Harmful Algal Blooms" (http://www.bigelow.org/hab).

How can a toxin in phytoplankton cells cause such serious illnesses in so many different organisms? *The key is how the toxins move through the food web.*

Although a phytoplankton cell may only contain a tiny amount of toxin, imagine how much toxin a copepod would contain if it ate dozens of phytoplankton cells a day! Now imagine how much toxin a right whale would contain if it ate thousands of those copepods a day!

An important component involved in our scenario above is bioaccumulation. Bioaccumulation is the process by which compounds accumulate or build up in an organism at a rate faster than they can be broken down. Several organisms, including copepods, krill, mussels, anchovies, and mackerel, have been found to retain toxins from phytoplankton in their bodies. These organisms are often not affected by the toxins, but act as vectors and transport the toxins up the food web. There have been several cases of whale and sea lion illness and death attributed to this process.

In many cases the toxins can be transported through the food web to humans, often through contaminated shellfish. The toxins can impact humans in different ways leading to mild symptoms or even death. The toxins cause many illnesses, including Ciguatera Fish Poisoning, Diarrhetic Shellfish Poisoning, Neurotoxic Shellfish Poisoning, Paralytic Shellfish Poisoning, and Amnesic Shellfish Poisoning.

Visit "Toxic and Harmful Algal Blooms" (http://www.bigelow.org/hab).to learn more about the impact of toxins on the food web, and the specific human ailments caused by individual blooms.