



## Life Science and World War I

During WWI, the allies and Germany tried to blockade each other in order to prevent the opposing side from receiving vital food and supplies via ship. Germany developed and used submarines effectively during the war, sinking many allied military and civilian ships. One of the major reasons why the United States eventually joined in the fighting was this unrestricted submarine warfare, which most famously sank the ship *Lusitania*, a passenger ship, killing approximately 150 Americans in the process. In 1917-1918, the US helped its allies place sea mines over a large section of the North Sea. These mines were designed to prevent enemy ships, including submarines, from getting too close to allied vessels. During the North Sea Mine Barrage, approximately 70,000 mines were put in the North Atlantic.

### Effect of Sea Mines

World War I has been over for almost 100 years. Some mines that were put down during that time (and later during WWII) are still in the North Sea.

Read the articles, "A terrible thing that waits (under the ocean)" by Sam LaGrone (Article may be found at <http://www.popsci.com/blog-network/shipshape/terrible-thing-waits-under-ocean>) and "Dangerous Depths: German Waters Teeming with WWII Munitions" by Carsten Holm (found at <http://www.spiegel.de/international/germany/dangers-of-unexploded-wwii-munitions-in-north-and-baltic-seas-a-893113.html>).

If possible, also look at the following articles: (Note, these are written by scientists for scientists. Don't let that scare you away, though!)

"Underwater Unexploded Ordnance—Methods for a Cetacean-friendly Removal of Explosives as Alternatives to Blasting," by Koschinski and Kock, found at: [http://literatur.ti.bund.de/digbib\\_extern/dk041983.pdf](http://literatur.ti.bund.de/digbib_extern/dk041983.pdf)

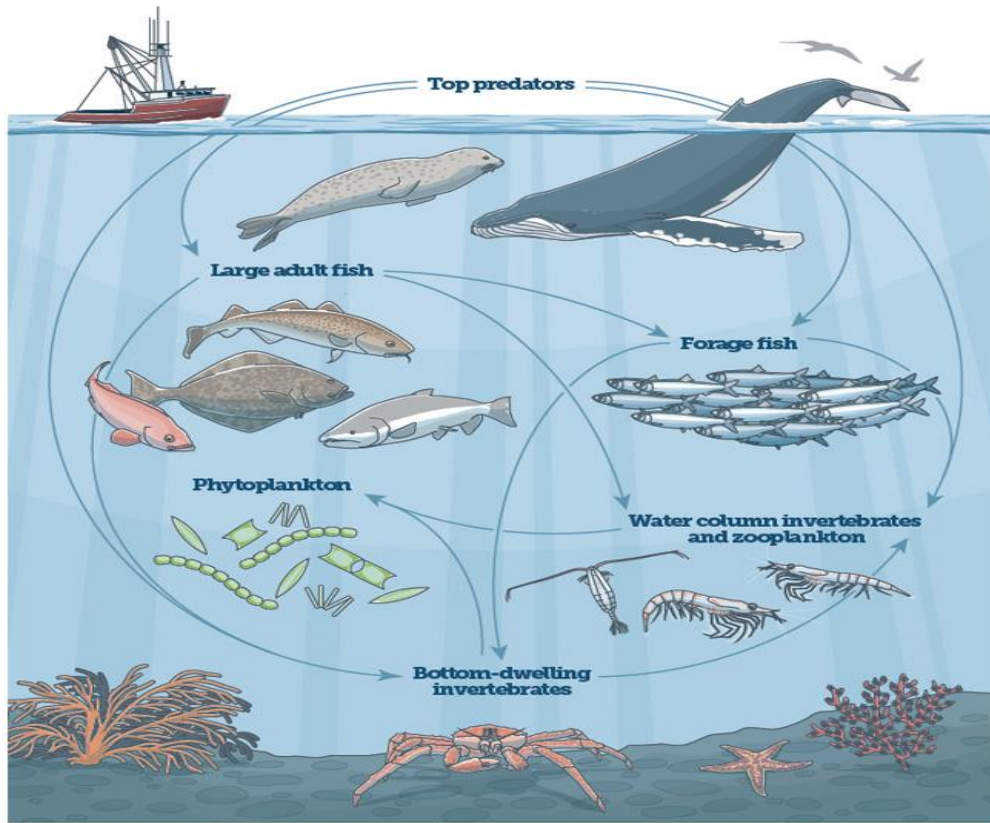
"Effects of Underwater Explosions on Larval Fish: Implications for a Coastal Engineering Project," by Govoni, et al. Found in the Journal of Coastal Research, March 2008.

"Assessing the Impact of Underwater Clearance of Unexploded Ordnance on Harbour Porpoises (*Phocoena phocoena*) in the Southern North Sea," by von Benda-Beckman, et al. Found in the journal *Aquatic Mammals*, 2015, 41(4).

After reading over these articles, what lasting impacts do unexploded mines have on ocean life?

Look at the food web below. This is a similar ecosystem to one that would be found in the North Sea. Pay attention to the arrows—they may not be pointing the way you expect!

The Bering Sea Food Web



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What producers are present?

What are the first-order consumers?

Second-order consumers?

Tertiary consumers?

What examples of mutualism, commensalism, or parasitism might you find in this ecosystem? (You don't need to come up with examples for every one).

Based on what you read in the articles, how would WWI/ WWII sea mines affect or change this ecosystem? Follow that through for several steps up or down the food chain. For example, don't say, "there would be more large adult fish," say, "there will be more large adult fish, so they would eat more forage fish, so there would be fewer forage fish. Also, more large adult fish means that seals would have more to eat, so the seal population would increase." Note: your answer should not just be recopying the example!

What other effects, positive or negative, do you think sea mines might have on the ocean or ocean life?  
Explain your answers.