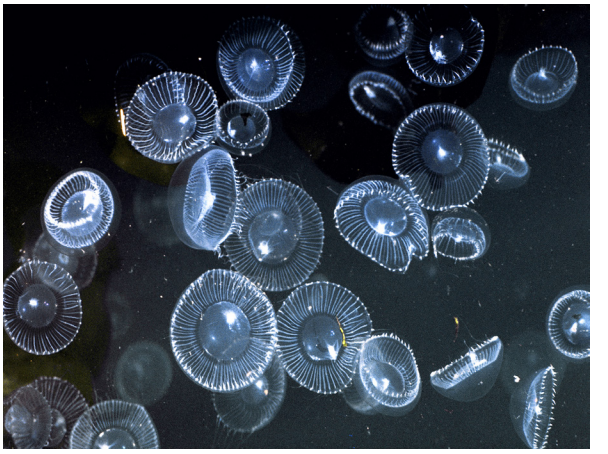
Jelly population explosions can happen all over the world. This photo shows lots of jellies in a shallow part of the ocean near Denmark.

Jelly Population Explosion: How Competition Can Affect Population Size

Jelly Population Explosions

In some ecosystems, the population of jellies has increased so much over a short period of time that people call it a population explosion. Ecologists, fishermen, and many other people around the world are concerned about jelly population explosions. In some places where jelly populations are getting bigger, the increase in population can affect human activities and the ecosystems we depend on: masses of jellies damage fishing nets, clog water pipes for power plants, and drive swimmers away from beaches. Scientists around the world are hard at work trying to understand why these population increases occur and how we can avoid causing them.

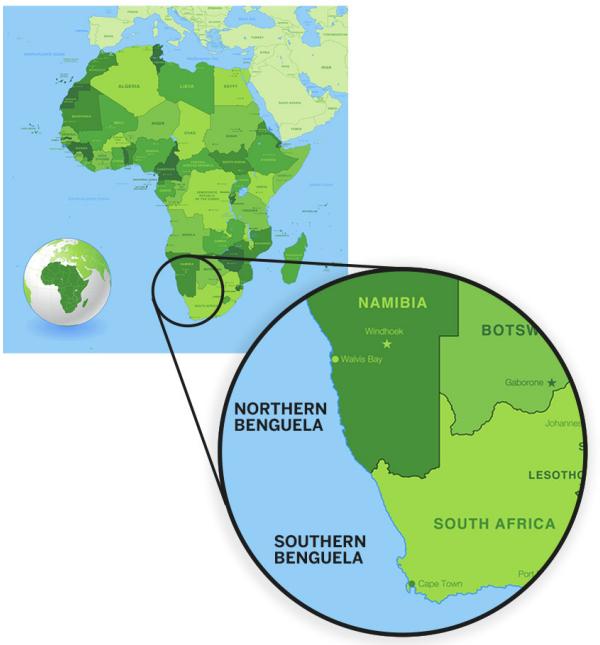


Moon jellies are one of the most common types of jelly living in the ecosystems of Northern and Southern Benguela.

Two Jelly Populations

To understand what can cause jelly populations to increase, a team of ecologists studied two ocean ecosystems near the southwestern coast of Africa—Northern Benguela and Southern Benguela. Northern Benguela is off the coast of Namibia, while Southern Benguela is off the coast of South Africa. A strong ocean current divides Northern Benguela from Southern Benguela. These two ecosystems are very similar: both include populations of jellies, zooplankton, and fish such as sardines and anchovies, as well as African penguins and Cape fur seals. Humans have fished in both of these ecosystems for a long time.

The team of ecologists studying the two jelly populations analyzed data that had been collected over the last 50 years by other scientists and by fishermen. Based on the samples of jellies counted in each region, they determined that the jelly population increased in Northern Benguela, but not in Southern Benguela. Today, the population of jellies in Northern Benguela is much larger than has ever been recorded there before. Yet in Southern Benguela, the jelly population has remained relatively stable.



Northern Benguela and Southern Benguela are two ocean ecosystems off the coast of Africa.

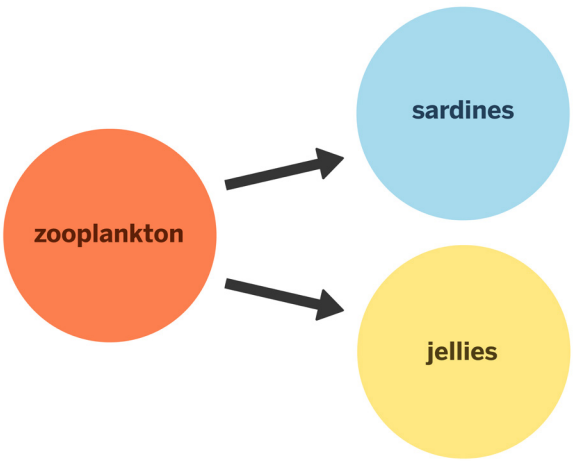
Fishing with a net like this red one can catch thousands of sardines and anchovies at a time. People catch these fish for food.

In comparing these two ocean ecosystems, the ecologists found an important difference: laws prevented people from catching too many fish in Southern Benguela. In the 1950s, commercial fisheries began to catch large numbers of sardines and anchovies from both Northern and Southern Benguela. However, starting in the 1970s, people passed laws that limited the number of sardines and other fish that could be caught each year in Southern Benguela, in an effort to protect the fish populations there. In contrast, there were no limits placed on fishing in Northern Benguela.

Without laws limiting the number of fish they could catch in Northern Benguela, people caught huge numbers of sardines and other fish there, causing the fish populations to decrease. By the early 2000s, the fish populations returned to near-normal levels in Southern Benguela, but had dropped to record low numbers in Northern Benguela.

Competition for Food

In this ecosystem, the jellies do not eat fish, and the fish do not eat jellies. So why did a decrease in the size of the fish populations in Northern Benguela affect the jelly population? Let's look at the sardine population as an example. Jellies and sardines eat the same food: zooplankton. The relationship between jellies and sardines is called competition because they are competing for the same resource population.



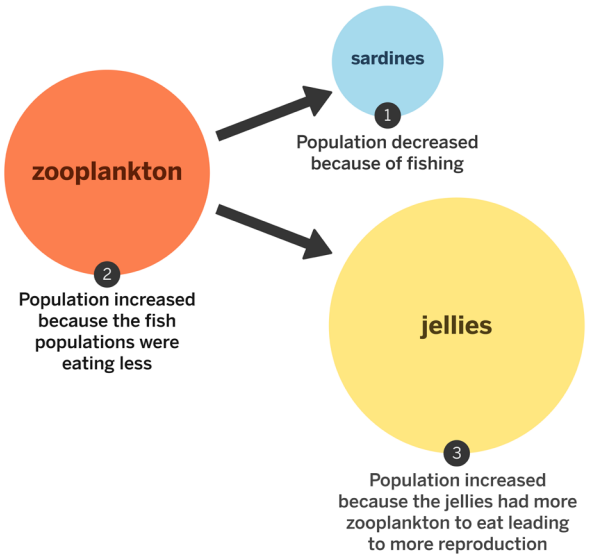
Jellies and sardines are not directly connected on the food web, but they both eat zooplankton. This relationship is called competition because both populations are competing for the same resource population.

When the sardine population decreased due to unlimited fishing in Northern Benguela, fewer sardines were around to eat zooplankton. With fewer zooplankton eaten by the sardines, the zooplankton population increased—leaving more zooplankton for the jellies to eat. Having a larger resource population made more energy storage molecules available to the jellies. This allowed them to reproduce more. More reproduction led to more births than deaths, so the jelly population increased. This is how the change in the sardine population was able to affect the jelly population, even though jellies are not directly connected to sardines on the food web. A change to the sardine population caused the zooplankton population to change, which caused the jelly population to change. This is an example of an indirect effect, the result of a chain of causes and effects, where one cause leads to an effect that then causes another effect.

In Southern Benguela, the jelly population did not increase. Because of limits on fishing, the fish population in Southern Benguela was relatively stable. This meant the fish consumed the same number of zooplankton as usual, leaving the same number of zooplankton for jellies and not causing any change to the jelly population. In a stable ecosystem, biodiversity—the number of different kinds of living things in the ecosystem—also stays the same. Biodiversity is a measurement of how healthy an ecosystem is. When an ecosystem becomes less biodiverse, it is because the ecosystem is so unstable that entire populations are dying out. In order to maintain healthy ecosystems, people need to come up with plans like Southern Benguela's fishing limits to help keep ecosystems stable and maintain their biodiversity.

Looking at lots of population data helped ecologists figure out what caused the jelly population increase in Northern Benguela. However, jelly populations are increasing in other ecosystems all over the globe. Since every ecosystem is unique, other jelly increases may have different causes.

After Overfishing in Northern Benguela



This diagram shows an indirect effect of overfishing in Northern Benguela: a jelly population increase.