

<b>FORUM:</b>	Environment Commission
<b>ISSUE:</b>	Measures to Combat the Spread of Urchin Barren
<b>STUDENT OFFICER:</b>	Jimin Lee
<b>POSITION:</b>	President of Environment Commission

---

## Introduction

Urchin barrens are specific regions in the ocean where sea urchins have eaten up enormous amounts of kelp plants and eventually turned a kelp forest into a nearly empty desert. The main cause of



*Urchin Barrens*

this phenomenon is the large population of sea urchins. Sea urchins, also known as the Echinoidea, are spiny species that live under the seashore down to about 5000 meters. They have a spherical shape and are covered in spines. These spines play a crucial role in their survival as they protect the sea urchins from getting eaten by other hungry predators including the sea otters, lobsters, crabs, eels, and birds. Apart from their predators, sea urchins are omnivores who commonly diet on

algae, plankton, kelp, jellyfish, and deceased fish. Even if sea urchins are mostly known to consume plants, they are able to eat other species as well. Recently, the purple sea urchin population on the north coast has exploded from the warming waters which led to a disease that killed its natural predator, starfish.

One of the main diets of sea urchins is kelps. Kelps are large brown algae that live in cool, relatively shallow waters close to the shore. The large population of kelp can also form an underwater forest that provides food and shelter for thousands of fish and other marine animal species. They allow many organisms to use the long and thick blades as a protective shelter from other large predators or strong storms. Like this, kelp provides a safe and comfortable environment for many species living underwater. However, their population is declining at an increasing rate because of the sea urchins, who are endlessly consuming large amounts of kelp. The great loss of kelp resulted in several urchin barren.



## Background

Sea urchins and kelp lived together underwater in balance until recently, more and more kelp forests have been getting destroyed by hungry sea urchins. Urchin barrens mostly occur along the coastal areas of the Pacific Ocean. In the summer of 2022, Rennick and her colleagues published a paper in the journal *Ecology* that included reasons for the shift in sea urchin behavior. They wrote that sea urchins



Kelp Forests

usually feed mostly on the small scraps, detritus, of kelp that shed naturally from algae. However, now that the kelp detritus is scarce, the sea urchins started to feed directly on the live kelp.

Dan Reed, a research biologist, was deeply interested in sea urchins and kelp relations. After about 40 years of observation, he noticed something very contradicting to the existing explanation of urchin barren. People initially believed that urchin barren resulted

from the increase in sea urchin population. However, he found out that the population of sea urchins did not vary much throughout the years when kelp forests transitioned to urchin barren back and forth. Therefore, he concluded that there must be other causes that lead the sea urchins to consume great amounts of kelp. Noticing this fact, Reed and his colleagues made a hypothesis in 1985 that if there were enough detritus underwater to feed a given urchin population, the sea urchins would not have consumed the living kelp. Reed's hypothesis then led to several other experiments and helped marine biologists to approach closer to the cause of the phenomenon.

## Problems Raised

### *Loss of Habitat*

Kelp forests provide healthy, diverse, and productive ecosystems. They are known to be the home to many different species, including fish, sea urchins, and other marine animals. For example, these forests in Alaska attract about 20 or more species of fish with the food supply. Many marine plants and animals benefit from kelp forests because they provide habitat to them. In addition, they are beneficial to humans since they contain and keep greenhouse gases, including carbon dioxide. They are considered as the livelihood for marine animals since they provide diverse fish and other smaller organisms that could

become their diet. However, the sea urchins disrupted all the benefits that the kelp forest provided and led all the many types of fish and animals that depend on kelp forests to disappear along with the kelp.

### *Irreversible Changes*

Researchers like Dr. Rumrill say, “Sea urchins can persist when other marine life would perish.” Scientists have learned that sea urchins have a long lifespan of up to almost 50 years. They are able to go dormant and slow down their metabolism and growth dramatically when they are short of food supplies. Not only that but for their survival, they are also capable of



*Kelp Forests: home to many marine species*

reducing their body size when they cannot find much food to eat. This way, they can adapt to the situation effectively during periods of starvation. Even if the kelp forest gets destroyed by the sea urchins, only the kelp becomes extinct, not the urchins. Therefore, once a kelp forest completely perishes, it may never recover to its original shape.

## **International Actions**

### *Testing the Theory of Reed*

About thirty-seven years later, a group of researchers decided to test the hypothesis that Reed made in 1985. In the experiment, the researchers gathered sea urchins and fed them kelp. Some tanks were filled with sea urchins while some other tanks had a small amount of urchins inside. The researchers wanted to know whether the sea urchins’ feeding rate changed according to their population density. The results showed that regardless of the number of urchins there were in the tank, the urchins ate kelp at a steady rate showing that there was no notable correlation between the population of urchins and the loss of kelp.

### *Blue House Programme*

The Blue House Programme is a partnership between Struchtey Daughters & Sons, Kelp Blue, the Kelp Forest Foundation, and other organizations that aim to develop a sustainable ecosystem by

providing scholarships to students from universities abroad. The main goal is to create a future where humanity and nature coexist in better harmony.

### *Nature Coast Marine Group (NCMG)*

The Nature Coast Marine Group (NCMG) is an organization established to protect the marine environment in the south coast bodies of water. They provide various activities such as snorkeling, diving, and kayaking to increase people's awareness of environmental problems. The NCMG actively promotes local media coverage of the marine environment and highlights the beautiful marine life, with the need for marine conservation.



*Sea Otter, predator of sea urchin*

The NCMG has set up working groups to look at how the urchin barrens problem can be dealt with within the Batemans Marine Park. They state that they have not yet made a detailed plan for dealing with the urchin barren, but they will be actively engaged.

## **Key Players**

### *Kelp Forest Foundation (KFF)*

The Kelp Forest Foundation (KFF), is a Netherlands non-profit organization that aims to raise awareness of the economic and ecological importance of kelp forests around the world. They believe that not only do the kelp forests give benefits to the marine animals that depend on them, but also provide long-term solutions to climate change since it is able to isolate huge amounts of carbon.

One of their main focus areas is academic research. The KFF research program aims to further understand the ecological role of kelp forests in marine ecosystems and their impact on biodiversity. To reach their goal, they connect and work with some of the best-known international universities and research institutions to conduct various experiments.

In order to raise public awareness, the KFF participates in various conferences and organizes youth programs to increase ocean education. They also actively utilize social media and film to spread out their knowledge about kelp to a wider audience.

### *Kelp Forest Alliance*



The Kelp Forest Alliance brings together people and organizations working on kelp forest ecosystems and aims to enhance the protection and restoration of these valuable ecosystems. In order to achieve their goal, they have several activities. First, they have a web platform that promotes the value of kelp forest ecosystems, creates a restoration guidebook, and brings the network of members together. Members collaborate to discuss problems related to kelp forest restoration through the web platform. Next, they have monitoring guidelines. It allows them to look at the seven seas in one sight and it also helps them to record the results of their restoration projects. Lastly, their activity also includes the Hobart Challenge which is the kelp forest restoration in Hobart, Australia.

### *Norway*

Philip James, a senior scientist and sea urchin expert in Norway, believes that there is overwhelming evidence regarding the importance of kelp forests and the ecosystem services they provide. For example, kelp forests produce large amounts of oxygen and play a huge role in carbon sequestering. Also, they increase biodiversity and productivity in marine life. He is fully aware that the general solution to this urchin barren problem is to remove the sea urchins that eat up kelp. However, this will only be helpful if all the urchins from a given area are removed. Urchinomics, established by Brian Tsuyoshi Takeda in 2016, has an objective to restore the world's kelp forests with a self-financing business model and has established projects in Norway. Norway possesses highly developed marine technology, and it could help them find better solutions for catching, producing, and processing sea urchins. The country believes that like the oysters, the world sea urchin production market can also grow enormously through the introduction of aquaculture.

## **Possible Solutions**

### *Smashing Urchins*

One already known solution is the action of smashing urchins. According to Ali Krajewski, a diver and long beach resident, smashing urchins is one of the tricks for restoring kelp forests. Volunteer divers like Krajewski herself, spend time below the water killing sea urchins in the urchin barren. With the urchins gone, the kelp forests can regrow and provide essential habitats for thousands of ocean





Purple urchins devour kelp forests, so divers fight

creatures once again. Data collected by the researchers say that in the past 100 years, 75 percent of the kelp forests of the Palos Verdes coast have disappeared.

### *Reducing Greenhouse Gas Emissions*

One of the most serious environmental problems is global warming. Specifically, ocean heating is becoming a very serious problem.

According to research, the oceans have hit their highest recorded temperature of 20.96 °C. Warmer

oceans disturb many marine species as they try to move to cooler bodies of water, also disturbing the food chain. Greenhouse gas emissions are found to accelerate ocean heating since they trap more energy from the sun and make the oceans absorb more heat. This would result in an increase in sea surface temperatures and rising sea levels.

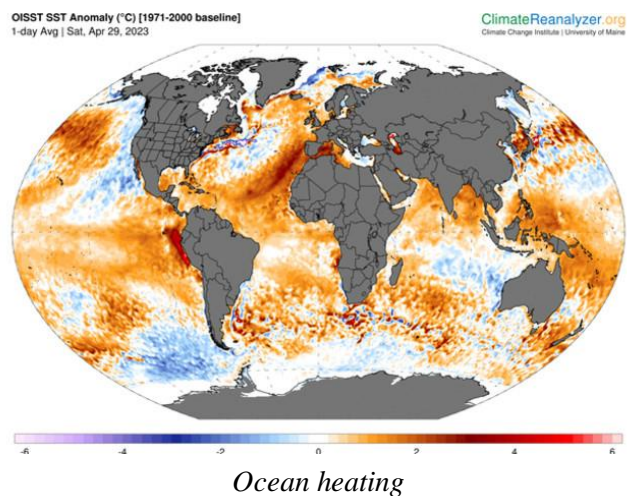
As mentioned earlier, ocean heating forces many animal species to migrate to comparatively cooler water regions. The sea urchins' main predators include sea otters and sunflower stars. The two marine species are crucial predators since they help keep urchin numbers steady in the ecosystem. However, because of ocean heating, urchin predators began to move to other parts of the ocean, leaving behind one of their food sources: sea urchin. This resulted in a decrease in urchin predators, which led to an increased population of sea urchins. Since their numbers dramatically increased without much disturbance, their consumption of kelps also increased. If people put more concerns into reducing greenhouse gas emissions, the number of urchin barren will slowly decline, and kelp forests will start to get restored.

## **Glossary**

### *Sea Urchins*

A marine echinoderm that has a spherical or flattened shell covered in mobile spines, with a mouth on the underside and calcareous jaws. Many species are harvested for food.

### *Omnivore*



An animal or person that eats food of both plant and animal origin.

### *Kelp*

A large brown seaweed that typically has a long, tough stalk with a broad frond divided into strips. Some kinds grow to a very large size and form underwater “forests” that support a large population of animals.

### *Detritus*

Loose material (such as rock fragments or organic particles) that results directly from disintegration.

### *Perish*

To die, especially in an accident or by being killed, or to be destroyed.

### *Aquaculture*

The rearing of aquatic animals or the cultivation of aquatic plants for food



## Sources

Academic Research. 16 July 2021, [kelpforestfoundation.org/academic-research](http://kelpforestfoundation.org/academic-research).

**Allen, Gabe. “Why Are Sea Urchins so Destructive to Kelp Forests?” Discover Magazine, Aug. 2022, [www.discovermagazine.com/environment/why-are-sea-urchins-so-destructive-to-kelp-forests](http://www.discovermagazine.com/environment/why-are-sea-urchins-so-destructive-to-kelp-forests).**

“Climate Change Indicators: Oceans | US EPA.” US EPA, 26 July 2023, [www.epa.gov/climate-indicators/oceans#:~:text=Why%20does%20it%20matter?,temperatures%20and%20rising%20sea%20level](http://www.epa.gov/climate-indicators/oceans#:~:text=Why%20does%20it%20matter?,temperatures%20and%20rising%20sea%20level).

Dale, By Georgina Rannard Mark Poynting, Jana Tauschinski, Becky. “Ocean Heat Record Broken, With Grim Implications for the Planet.” BBC News, 4 Aug. 2023, [www.bbc.com/news/science-environment-66387537](http://www.bbc.com/news/science-environment-66387537).

**Don, Cristen. “A Prickly Problem With Sea Urchins.” Oregon Marine Reserves, Feb. 2020, [oregonmarinereserves.com/2019/10/24/urchin#:~:text=Once%20an%20urchin%20barren%20occurs,urchins%20are%20incredibly%20resilient%20animals](http://oregonmarinereserves.com/2019/10/24/urchin#:~:text=Once%20an%20urchin%20barren%20occurs,urchins%20are%20incredibly%20resilient%20animals).**

How Norwegian Research Can Rescue the Seabed From Sea Urchins. [businessnorway.com/articles/how-norwegian-research-can-rescue-the-seabed-from-sea-urchins](http://businessnorway.com/articles/how-norwegian-research-can-rescue-the-seabed-from-sea-urchins).

Register, Orange County, and Aaron Orlowski. “Under the Sea: Smashing Urchins, Restoring Kelp Forests.” Orange County Register, Aug. 2014, [www.ocregister.com/2014/08/04/under-the-sea-smashing-urchins-restoring-kelp-forests](http://www.ocregister.com/2014/08/04/under-the-sea-smashing-urchins-restoring-kelp-forests).

Rosato, Joe, Jr. “Purple Sea Urchin Population Explodes in Northern Coast Forcing Divers to Smash Them.” NBC Bay Area, 14 Sept. 2022, [www.nbcbayarea.com/news/local/climate-in-crisis/purple-sea-urchin-population-northern-coast/3003234#:~:text=The%20purple%20sea%20urchin%20population,kelp%20beds%20that%20supported%20abalone](http://www.nbcbayarea.com/news/local/climate-in-crisis/purple-sea-urchin-population-northern-coast/3003234#:~:text=The%20purple%20sea%20urchin%20population,kelp%20beds%20that%20supported%20abalone).

Staff, Az Animals. “What Do Sea Urchins Eat?” AZ Animals, Sept. 2022, [a-z-animals.com/blog/what-do-sea-urchins-eat](http://a-z-animals.com/blog/what-do-sea-urchins-eat).

“Urchin Barrens — NCMG.” NCMG, [www.ncmg.org.au/urchin-barrens](http://www.ncmg.org.au/urchin-barrens).

### What Is a Kelp Forest?

**[oceanservice.noaa.gov/facts/kelp.html#:~:text=Kelp%20are%20large%20brown%20algae,invertebrates,%20and%20marine%20mammal%20species](http://oceanservice.noaa.gov/facts/kelp.html#:~:text=Kelp%20are%20large%20brown%20algae,invertebrates,%20and%20marine%20mammal%20species).**

Who We Are - Kelp Forest Alliance. [kelpforestalliance.com/who-we-are](http://kelpforestalliance.com/who-we-are).

