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Fishing at the bottom of the Earth: The Ross Sea Antarctic toothfish

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Abstract

In October of 2014, nations gathered to discuss protection of the Ross Sea, Antarctica a region publicized as The Last Ocean due to its high ecological and conservation value. Instead of designating a marine reserve, nations agreed to continue fishing in this most remote stretch of ocean. Vessels venture into these ice-choked waters, risking life and limb, for Antarctic toothfish, the top fish predator in the Southern Ocean. These huge fish, sold on the market as "Chilean sea bass" are also known as "White Gold" for the incredible price they fetch in up-scale markets across the world. These incredible fish thrive at the edge of possibility – only surviving the frozen Antarctic waters due to the anti-freeze in their blood. Like many deep-dwelling fish, they are long-lived, late to mature and slow-growing, making them more vulnerable to overexploitation. The largest fish have already been removed from the Ross Sea, with potential impacts cascading throughout the ecosystem. While ending the fishery may not be politically feasible, designating a marine protected area, which includes regions off-limits to fishing, would be a powerful management tool to ensure that toothfish and the greater Ross Sea ecosystem endures for many generations to come.

Keywords

CCAMLR, Antarctic toothfish, Chilean Sea Bass, Ross Sea, Southern Ocean.

Introduction

The address is 181 Macquarie Street, Hobart, Tasmania. It is not an unassuming building, but even its castle-like appearance hides the importance of what happens here every October. The gravity of the building is better embodied by the line of flags, which announce the castle as the home of the Commission for the Conservation of Antarctic Marine Living Resources, or CCAMLR. CCAMLR is a treaty between 24 nations and the European Union that governs marine life, including fishing access, in the Southern Ocean, 10% of the entire global ocean.

In October of 2014, these nations gathered here again to discuss protection of the Ross Sea, a small region of the Southern Ocean that is deemed by many to be the most pristine large ocean ecosystem left on the planet. But for the third year in a row, the Commission could not agree to designate the Ross Sea, Antarctica as an international marine protected area (MPA). Instead, they agreed to continue fishing in this most remote stretch of ocean. But what are they fishing for and why would anyone send vessels to travel such great distances into this dangerous and ice-choked corner of the Antarctic?

The Last Ocean

The Ross Sea, long celebrated for its contributions to science and protected by its icy remoteness, abounds with life and beauty. One-third of all Adélie penguins and one-quarter of all Emperor penguins make their home there. Antarctic minke whales abound. In most of the world's oceans, top predators have been removed through overfishing, but in the Ross Sea predators still thrive, including Weddell and leopard seals, a unique subspecies of orca and the Antarctic toothfish – the top fish predator in the Southern Ocean. The Ross Sea can support all this life because it is the most productive stretch of ocean on Earth, with a phytoplankton bloom so large it can be seen from outer space.

While most of the world's oceans have suffered severe overfishing and pollution, the Ross Sea has remained largely unscathed. Scientists consider it a living laboratory, which may offer a last chance to study how a healthy marine ecosystem functions. For more than a decade, these scientists have fought alongside conservationists, celebrities, artists, media and the public, all advocating for a Ross Sea marine reserve. Because of its ecological and conservation significance, the Ross Sea has come to be called The Last Ocean.

The most remote fishery on Earth

A rusty longline vessel pushes through the ice, working to deploy up 15-kilometer-long lines of hooks. The captain is racing alongside perhaps 20 other vessels from a dozen different countries to catch as many fish as his lines can haul before the fishery reaches the total allowable catch and is shut down for the season. With no rules requiring vessels to be ice-strengthened, many become lodged in the ice, stuck and drifting for days. The lucky ones eventually break free, while others sink or catch fire, as happened to two Korean fishing vessels in 2010 and 2012, leaving two dozen dead. These were not the first lives lost while fishing "White Gold" in the Ross Sea, nor will they likely be the last. The deep-dwelling Patagonian toothfish was first discovered in the 1970's along the coast of Chile.

The fish were caught as by-catch, which was usually discarded, while fishermen were targeting other more marketable species. An American fish merchant on the lookout for new fishes to sell in the United States happened to spot the huge beast of a fish - toothfish can grow in excess of two meters and 100 kilograms - and began marketing them as "Chilean sea bass."

With heavy marketing pressure and their clever new name, toothfish quickly went from fish sticks to fancy. The fish's fatty white flesh proved to be a chef's dream. It could take on any flavor and was almost impossible to overcook. The dish was suddenly found on menus of upscale restaurants throughout the United States. To provide more fish to the market, fishing vessels began searching for toothfish beyond Chile and into the Southern Ocean. Populations of Patagonian toothfish were found around almost every subantarctic island. But pirate fishermen - known as illegal, unregulated and unreported, or IUU - also wanted their share of this lucrative trade. Throughout the 1990's IUU fishers ravaged the Southern Ocean toothfish populations. Local populations crashed and fishing vessels were pushed further south, until they finally penetrated the icy waters of the Ross Sea to find the Antarctic toothfish, the Patagonian toothfish's southern cousin. The Antarctic toothfish population in the Ross Sea now supports the most remote fishery on the planet.

The remarkable Ross Sea Antarctic toothfish

Prior to their explosion on the seafood market, scientists marveled at the Antarctic toothfish's amazing physiology and life history adaptations. They thrive in the subzero waters of the Ross Sea by producing antifreeze proteins that keep their blood from turning to ice. Instead of swim bladders, which most fish use to control their buoyancy in the water column, toothfish produce lipids (or fats) to achieve perfect buoyancy with zero effort. Unfortunately for toothfish, it is also these lipids that make them such a rich and palatable fish. Like other deep-dwelling fish, toothfish live a long time, 40 years or more, and grow slowly, only maturing in their teen years.

In recent years, scientists have begun to reveal even more of the remarkable secrets of the Ross Sea toothfish's life history. While still unconfirmed, evidence suggests they make a remarkable spawning migration starting at the depths of the Ross Sea continental slope, then catching the Ross Gyre out 500 km north to the Pacific Antarctic Ridge System. Here they likely spawn, release their eggs, and catch the same gyre to return to the Ross Sea. Despite the increasing knowledge about the Ross Sea Antarctic toothfish, much remains unknown. Incredibly, no one has ever found a larval fish or an egg. No one knows when or how often the fish spawn, but it's likely not every year. No one knows how big the population actually is. These gaps in knowledge, in addition to their deep-dwelling vulnerable characteristics, make a sustainable fishery difficult, if not impossible to achieve.

Harvesting the Last Ocean

Fishers now remove more than 3000 tons of Antarctic toothfish every year, with effects rippling through the system. Long-line fishing targets the biggest (and oldest) fish, removing this key life history stage from the population. Analyses of the catch in the Ross Sea have already revealed the loss of the largest fish from the Ross Sea population, and scientists have no longer been able to catch large toothfish for research in the McMurdo Sound region of the Ross Sea, south of the commercial fishing grounds. In many other fish species, the largest fish produce the most offspring and their removal can be devastating to the population, with potential effects cascading throughout the ecosystem. Toothfish prey on silverfish, squid, and other fish, and are thought to be a significant proportion of the diets of Weddell seals and Ross Sea killer whales. Scientists are already beginning to report fewer sightings of these whales in the Ross Sea.

Beyond the risks of targeting a top predatory fish, many scientists would argue that because of their life history characteristics, deep-sea fisheries are simply not resilient to heavy commercial exploitation. In the past we've realized this far too late, long after the deepwater fishes had been over-harvested.

Meanwhile, consumer demand for toothfish may continue to grow due to more toothfish stocks achieving the Marine Stewardship Council eco-label and green listing from consumer information programs such as the Monterey Bay Aquarium's Seafood Watch. These controversial ratings, which suggest that the Ross Sea toothfish fishery is sustainable, were achieved despite heavy opposition from the scientific and conservation communities. As outlined above, many scientists believe that we still do not know enough about the life history of Antarctic toothfish or about the impacts of the fishery on the ecosystem. These ratings also do not properly consider the lack of rules around vessel safety, which pose a risk to human life but also to marine life through the risk of spills. Finally, these certifications have no metric for considering the intergenerational values of protecting one of the last remaining healthy ocean ecosystems.

Navigating a way forward

A plan for a Ross Sea MPA will again come up for discussion in 2015 during CCAMLR's annual meeting. The plan, in its current form, would not reduce the amount of fish caught in the Ross Sea, nor would it interfere with the major fishing grounds. The MPA would, however, close almost the entire Ross Sea continental shelf and a large portion of the continental slope as well as the region around the biologically rich Balleny Islands and seamounts north of the Ross Sea.

While protecting the Ross Sea in its entirety may be a political impossibility, the closures proposed would still enhance precautionary management for the Antarctic toothfish. The MPA plan has reference areas for understanding (and potentially managing for) the effects of climate change while also looking to assess the effects of fishing on the population and ecosystem. The large swaths of the Ross Sea designated as off limits to fishing would protect at least some of the toothfish population, hopefully ensuring that the Ross Sea stock doesn't follow the collapsing trend of so many other fisheries across the world.

This fish, that exists at the edge of possibility, surviving in the icy southernmost reaches of the ocean and playing a key role in the Ross Sea ecosystem, deserves to thrive. Beyond overcoming the political barriers of achieving an Antarctic MPA - which requires consensus among CCAMLR's 25 member nations - individual people across the world have been fighting to help protect this remarkable fish.

More than half of the toothfish caught in the Southern Ocean wind up in the United States, sold as a luxury item to those who can foot the bill. Due to the global outreach effort via conservation groups like the Last Ocean, the Antarctic and Southern Ocean Coalition, the Pew Charitable Trusts and the Antarctic Ocean Alliance, citizens from all reaches of the globe have petitioned in favor of ending fishing in the Ross Sea. Further, due to pressure from non-profits advocating for sustainable seafood, like Greenpeace and Fishwise, an increasing number of markets throughout the United States now refuse to sell Ross Sea Antarctic toothfish.

With these collective efforts, under the watch of the world's eye, as the Ross Sea MPA plan comes up for discussion for the fourth time, CCAMLR decision-makers may do more than set another toothfish quota in the Ross Sea. Recognizing the power of an MPA as a fisheries management tool and in setting aside an extraordinary stretch of ocean for the sake of future generations, perhaps CCAMLR will find the political will to see a Ross Sea MPA through.

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