

Water heating, fish movement: how climate change is reshaping Iceland

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Isafjordur, ICELAND – Before it became a "Game of Thrones," location, before Justin Bieber stalked the Fjadrargljufur trails, and before hordes of tourists descended on this small island nation, there were the fish.

"Fish," said Gisli Palsson, professor of anthropology at the University of Iceland, "made us rich. "The money that Iceland earned from commercial fishing helped the island, which is about the size of Kentucky, become independent from Denmark in 1944.

But the warming of the waters associated with climate change is causing some fish to look for colder waters elsewhere, out of the reach of Icelandic fishermen. Ocean temperatures around Iceland have increased between 1.8 and 3.6 degrees Fahrenheit in the last 20 years. For the past two seasons, Icelanders have not been able to harvest chaplain, a type of smelt, as their numbers plummeted. Warmer waters mean that when some fish leave, causing financial disturbances, other species of fish arrive, which triggers geopolitical conflicts.

Worldwide, research shows that the oceans are simmering. Since the middle of the last century, the oceans have absorbed more than 90 percent of the excess heat trapped by greenhouse gas emissions. To combat the heat, the fish move to colder waters closer to the poles.

Last year, the chaplain fishery, the country's second most economically important export fishery, was closed during the winter fishing season on the recommendation of the Icelandic Freshwater and Marine Research Institute, which cited a decline in stocks of fish that he attributed to unusually warm waters.

capLin is captured and then sold both for direct consumption (its flavor is said to resemble herring), as for fishmeal and for its eggs, or eggs, commonly called masago. men 2017 the largest bank in the country Landsbankinn, valued the fishery at approximately \$ 143 million. Last month, The research institute recommended keeping the chaplain fishery closed during a second winter season.

"They moved further north, where there are colder seas," said Kari Thor Johannsson, who, lmany icelanders a certain generationl fished in family boats when l was younger. These days you can find it, behind the counter of his fish to stock in Isafjordur

"For the first time last winter, we didn't fish because the fish moved," said Petur Birgisson, a fishing captain whose trawl is based on Isafjordur. With 2,600 residents, it is the largest community in the West fords, a region that is still heavily invested in fishing. Over the years, it has adapted to a number of changes, including the development of a quota system that allows individuals and businesses the right to capture, process and sell a predetermined amount of fish each year. But you can't conceive an Iceland without fish.

If there are no fish, he said, "we can't live in Iceland."

The concern is not limited only to the chaplain. The blue whiting is moving more and more north and west towards Faroe Islands " waters And cod, which this year brought record profits of \$ 1 billion, feeds on chaplain. But Mr. Birgisson said that the best place to fish for cod was where warmer ocean temperatures meet colder ocean temperatures, and that moves more and more northward according to global patterns.

Different species of fish evolved to live at specific water temperatures, and some fish such as sea bass require temperate ocean climates. such as those found in the mid-Atlantic region of the United States, and tropical fish such as the Spanish hogfish that prefers warmer waters like those in the Caribbean. But these days fishermen They are finding sea bass in Maine and the Spanish pigfish in North Carolina. And as the fish run away, they are leaving some areas, such as parts of the tropics, completely stripped of fish.

In addition, fish "need more oxygen when the temperature is higher," he said. Daniel Pauly, professor of aquatic systems at the Institute of Oceans and Fisheries at the University of British Columbia, but warmer water contains less oxygen than colder water.

The fish are swimming for their lives, according to Jennifer Jacquet, a Associate Professor of Environmental Studies at N.Y.U. "They are moving to breathe," he said.

In colder climates, such as Iceland, when fish such as chaplain are heading north, other fish that were previously farther south move towards their waters.

"Mackerel and monkfish used to be south of the country," said Kari Thor Johannsson. "But now they are here or west of the country where it used to be colder."

As fish cross political borders, that can create a platform for conflict.

In the case of the Atlantic mackerel, the fishery is co-managed by Norway, the Faroe Islands and the European Union. The mackerel arrival in significant numbers in Icelandic waters in 2005 changed the relationship.

"Much of the fisheries management is about the allocation between groups. So everyone is fighting for a piece of the cake," said Andrew Rosenberg, director of the Center for Science and Democracy of the Union of Concerned Scientists.

In subsequent discussions, Britain would accuse Iceland of stealing its fish, a Norwegian official would accuse Iceland of inventing its own rules, and all parties would accuse each other of varying degrees of dirty fighting.

"It's not just a conflict of fisheries management," said Malin Pinsky, an assistant professor in the department of ecology, evolution and natural resources at Rutgers College.

"In the case of Iceland it also spilled and became a trade war," he said. "It affected international negotiations and seems to be part of the reason why Iceland decided not to join the European Union."

Negotiations between Norway, the Faroe Islands, the European Union and Iceland on mackerel never reached a consensus, in part because the fish migrated to waters where Iceland has exclusive fishing rights and the nation chose to unilaterally set its own quotas. This year it increased its mackerel quota by 30 percent, to 140,000 tons from 108,000 tons.

At a meeting in October, the European Union and the other two countries criticized Iceland's behavior, saying: "Such an action, which has no scientific justification, undermines the efforts made by the European Union, Norway and the Faroe Islands to promote the long-term sustainability of the population." Greenland and Russia, which are also unilaterally establishing mackerel quotas were also criticized, but less hard.

Reprisals remind those who contributed to a series of conflicts, known as the cod wars, between Iceland and Britain from the late 1940s to 1976. The British accepted when Iceland threatened to withdraw from NATO and deprive the block of a critical ally at that time.

A study led by Sara Mitchell, a professor of political science at the University of Iowa, found that, since World War II, a fourth of militarized disputes between democracies have been about fishing.

So, while fisheries management problems have been around for a long time, climate change is exacerbating conflicts. Many fisheries that were not shared in the past are now riding across the borders as the fish move. Dr. Pinsky is co-author of a study that found that there will be approximately 35 percent more fisheries that cover the limits for 2060 if we do not control emissions.

"So now two countries have access to this population where in the past only one had access, and what we discovered is that we are not very good at beginning to share," said Dr. Pinsky.

"I was in Dakar in West Africa and said: " They know their fish are moving towards Mauritania, "which is north of Senegal in West Africa," said Dr. Pauly. The response he received was: "" We are going to catch them, we are going to catch them before they arrive. "This was a naive answer that you will find everywhere."

In the tropics, this problem is especially acute because, as the fish move towards the poles, they are not replaced, creating a food vacuum. According to the Food and Agriculture Organization, in some tropical countries, which emit a small fraction of greenhouse gases compared to countries further north, fish provide up to 70 percent of people's nutrition .

"My mom is from Ghana, my dad is from Nigeria, and I tell them that for many people along the coast, the only animal protein they eat is fish, and the fish are moving," said Rashid Sumaila, director of the Fisheries Economics Research Unit of the University of British Columbia.

Not only does this have huge consequences for people living in those regions, he said, but it also has global implications, because the lack of a critical food source can make people move.

While Iceland can still fish in the wild, although for different species, fish farming seems an increasingly attractive option. In 2017, the country harvested 23,000 tons of farmed fish, according to government data, although fish farming also presents environmental concerns.

Fishing is "dangerous work. I don't want my children to be at sea," said Saethor Atli Gislason, standing in his fishing boat in Bolungarvik, a city about 10 miles north of Isafjordur. While still fishing in the summer, his father works on a fish farm.

"Fish farms are a good job," he said.

"We have to start fish farms because we can't count on the sea," echoed Petur Birgisson.

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