



## What will be the impact of rising ocean temperatures?

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The ocean has always been a treasure of the earth. It not only provides habitat for aquatic life, but also absorbs 90% of the heat in the atmosphere. But in recent decades, due to the development of human industry, global temperatures have continued to rise. Even with the vast area, the temperature of global ocean surface has increased by about 1 degree Fahrenheit since 1970. Apparently, every fish has a favorite temperature to survive. So it's reasonable that they would like to move where the ocean temperature is appropriate. In 2005, Science reported a study: Reynolds's team collected data on seabed fish between 1977 and 2001 and found that two-thirds of them had migrated to colder places. No coincidence, Portuguese fishermen have caught nearly 20 new species in recent years. Both of them indicate that fish migration has become unavoidable due to rising ocean temperatures.

Scotland's oceans are the fourth largest body of water in the core of Europe, accounting for more than 60%

of Britain's total waters. And it is one of the largest sea fishing nations in Europe. Scotland's fishing boats landed in the United Kingdom to capture about two thirds of the total number of fish caught. Herring and mackerel are the main fish caught in Scotland, which are sold overseas and known worldwide.

In this study, we collected and processed the ocean temperature data of Scotland from 1970 to 2019, and used the method of establishing the ARIMA model to predict the ocean temperature in this area in the next 50 years. We then predicted the position changes of herring and mackerel in the next 50 years based on the habits of herring and mackerel combined with the ocean temperature in the next 50 years. For example, this background image shows the distribution of herring in 2070.

It is clear from the picture that both mackerel and herring will move significantly northward in the future. After some time, they will be far enough from Scotland that fishing companies can no longer easily capture them. This will severely hurt the interests of fisheries companies that mainly fish for herring and mackerel. To this end,

we compared two solutions for fisheries companies by building an AHP model: A. Relocating the company as the position of the fish changed B. Using a higher proportion of small fishing boats. And we conclude that the comprehensive evaluation of scheme B is higher than that of scheme A. However, considering that the position of the fish moved to the sea area of the neighboring country, we re-evaluated the two schemes and obtained the results that the scheme B is better than the scheme A.

Finally, we strongly recommend that fishery companies pay more attention to the impact of rising sea temperatures on fish, and in the future process of fish migration north, a higher proportion of small fishing boats can be used first. And then, adopting the location of their company could be a good choice. We sincerely hope that the Scottish fishery will develop better in the future.

***"In the face of life, we should save for a rainy day, and do the next right thing."***