Preserving large females could prevent overfishing of Atlantic cod

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Cod are among Sweden's most common and most popular edible fish and have been fished hard for many years. One consequence is the risk of serious changes in cod stocks, reveals research from the University of Gothenburg, Sweden.

In overfished areas, there is often a shortage of large and old cod, and the fish become sexually mature at a younger age. Researchers have feared that this change may have impacted on the fish's health, physiological ageing and reproductive capacity.

In a recently published study, a research group from the University of Gothenburg working with the Swedish University of Agricultural Sciences therefore looked into the health and ageing of male and female cod.

"We measured various aspects of oxidative stress, a condition in the cells that can lead to irreparable damage, antioxidant capacity, which protects against oxidative stress, and telomere length," says researcher and marine biologist Helen Nilsson Sköld.

Telomeres are repeated DNA sequences that protect the ends of chromosomes. The length of these telomeres and the rate at which they get shorter are closely linked to health and ageing. The researchers compared the health of cod in the Öresund, Skagerrak and Kattegat. Cod in the Öresund have been protected from trawling since 1932 and so stocks include larger and older fish, but cod in the Skagerrak and

Kattegat have been seriously overfished.

"Our results show that older males generally have shorter telomeres and a reduced antioxidant capacity," Helen Nilsson Sköld explains. "However, we didn't see the same pattern among females – there were no signs of physiological ageing in the age span we looked at for the females (two to eight years)."

The researchers were surprised to see such marked gender differences. Although older males were fatter and seemed less stressed than younger males, the females were generally in better shape than the males.

"Our theory for why the males age and are more stressed during spawning is that they have to compete for territory and mates. This stress seems to be more acute among the younger males."

The researchers were unable to find any signs of the overfished stocks of the Skagerrak and Kattegat being less healthy than the Öresund population. A key factor in this context is that larger fish produce a much higher number of eggs – it can vary from half a million to five million depending on the size of the cod.

"Our study also shows that large older females are healthy and don't seem to have aged physiologically," Helen Nilsson Sköld adds. "The conclusion is that it's important to look after the large older females, as they produce many more eggs than younger ones. A conservation strategy of this kind would be ideal in the Skagerrak and the Kattegat."

More information: Gender differences in health and aging of Atlantic cod subject to size selective fishery, bio.biologists.org/content/ear … 30/bio.20121446.full

Provided by University of Gothenburg

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