

Overfishing increases fluctuations in aquatic ecosystems

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Intense fishing of primarily larger fish not only makes fish populations smaller, it changes the remaining fish. When the fish which have a chance to reproduce before being caught are smaller and have reached sexual maturity earlier, these characteristics are passed down to future generations. In many fish populations targeted by intense fishing, e.g., Atlantic cod across the west coast of North America, the sizes of fish have been observed to have decreased and the age of sexual maturity to have reduced.

Fish are often at the top of the food web in the aquatic ecosystem, so changes in fish can have broader consequences which involve the entire ecosystem.

Together with her American and German colleagues, Academy of Finland Research Fellow Anna Kuparinen from the University of Helsinki studied how fishing changes the ways aquatic [ecosystems](#) function. The researchers used computer-generated simulations to help them model the interactions between species and the flow of energy through the food web as well as the overall dynamics of the ecosystem. The research focused on the fishing of perch and whitefish in Lake Constance, which borders Switzerland, Germany and Austria.

Simulations describing the development of the ecosystem targeted by fishing indicated that once intense fishing causes fish to become smaller and reach sexual maturity earlier, the production of plankton in the lake becomes unstable. Similarly, the sizes of the [fish populations](#) and their

production of offspring fluctuate greatly from one year to the next.

"If the changes in fish are genetic, the stability of the fish populations and the lake ecosystem cannot be regained even if fishing was permanently ended. The study demonstrates how important it is to consider the entire ecosystem and indirect impacts on other species when the impact of fishing is evaluated. For example, the production of offspring among perch is more dependent on the fluctuations of the production of plankton in the lake than the number of female fish producing eggs," says Anna Kuparinen.

"The many food chains leading to fish form complex food webs. The better we understand this complexity, the better we understand how fishing impacts [fish](#) and the environment," says Professor Neo Martinez from the University of Arizona, US.

More information: Anna Kuparinen et al. Fishing-induced life-history changes degrade and destabilize harvested ecosystems, *Scientific Reports* (2016). [DOI: 10.1038/srep22245](https://doi.org/10.1038/srep22245)

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