# Fish's growth is not reduced by spawning

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Despite what is asserted in biology textbooks, the growth of fish doesn't decelerate upon and as a result of spawning. Instead, a recent publication in Science indicates that their growth speeds up after reproduction.

"According to Dr. Daniel Pauly, a fisheries researcher at the University of British Columbia (UBC) and co-author of the Science technical comment with Dr. Rainer Froese, a senior scientist at Germany's Geomar Helmholtz Centre for Ocean Research, fish are not faced with the dilemma of choosing between growth or reproduction because, in the actual world, these processes occur sequentially rather than simultaneously."

Dr. Pauly, who heads the Sea Around Us research initiative at UBC, further explains, "Only a fraction of the energy expended by fish - around 10% to 20% - is utilized for growth and reproduction. The remainder is largely allocated to other endeavors, such as evading predators by swiftly maneuvering. As a result, it is simple to generate the necessary energy savings for growth or reproduction by reducing the fish's movement rate, given that they consume the same amount of food and oxygen. This also explains why fish farmers tend to breed fish that are less active than their wild counterparts."

The technical comment is a rebuttal to an earlier study that incorrectly asserted that fish stop growing when they reproduce because all of their energy is allocated to this endeavor.

The authors of the original paper relied on a commonly used growth equation in fisheries science to argue that the growth of the North Sea stock of Atlantic horse mackerel decelerates when reproduction begins. However, they failed to disclose the size at which the fish actually reaches maturity and spawns.

Upon revisiting the study and incorporating data on maturation and spawning trends, Dr. Pauly and Dr. Froese showed that the very evidence cited to support the conventional claim in textbooks actually suggests the opposite: Atlantic horse mackerel experience accelerated growth after their initial reproductive event.

Dr. Pauly notes, "This is not an isolated instance. If we were to apply the growth parameters and size at first maturity for hundreds of fish in FishBase, the online fish encyclopedia, we would arrive at the same findings."

Dr. Froese also points out that there is little evidence to suggest that reproduction has a significant impact on growth, even in mammals. "Neutered or spayed pets follow the same growth patterns as their non-neutered counterparts," he explains. "Furthermore, dominant males in species that form harems, like sea lions, continue to grow and become larger than their non-dominant counterparts, despite dedicating a significant amount of resources to reproduction."

Fish obtain the necessary oxygen for growth via their gills, which function like the wind passing through blinds and rely on water flow. Gill surface area expands in length and width, but cannot keep pace with a fish's three-dimensional growth in length, width, and depth. As a result, as fish grow larger, their gills

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provide less oxygen per unit volume or weight due to the reduction in gill surface area.

Dr. Pauly explains that there comes a point during a fish's growth where its relative gill surface area decreases to a critical level of oxygen supply, prompting the fish to reach maturity and begin spawning. When a fish reproduces, it sheds gonadal tissue that was previously supplied with oxygen, leading to an increase in relative gill area, which in turn facilitates renewed growth until the next spawning season.