Predicting how many fish it is safe to catch without damaging fish stocks is essential for commercial fisheries to be run sustainably. However, new research has found that it is much more difficult to predict fish numbers than previously thought, as figures can vary greatly from year to year.

Using global fisheries data, including fish stocks in Northern Canada, home to some of the most important areas for commercial fishing in the world, the research showed that the survival rate of young fish becomes highly unstable and variable when adult population levels are low. A model was created to estimate this variability, which could be used to develop and improve sustainable fisheries management.

Annual estimates of the number of young fish (and the number of adults) are an essential component of current management strategy. A measure of the adult population is used to calculate how quickly fish stocks will recover, as the number of adults is assumed to be directly proportional to the number of eggs they produce, and therefore how many young fish join the population.

However, this straightforward pattern of population increase does not appear to hold true when the adult population is very depleted. This could be because, when adult populations are high, there is a stable and highly predictable reduction in the survival of juvenile fish because juvenile fish compete for a limited amount of space and the adults of some species hunt juveniles. As the adult population shrinks, so does this effect on juvenile survival (i.e. more juveniles survive). However, at very low population levels other factors come into play, such as reduced duration of spawning (seen in cod) which can increase the variability in juvenile survival. Reasons for depletion in adult populations can include a failure to find mates or predator attack as well as overfishing.

For certain species of fish, such as the downs herring in the North Sea and the Iceland spring-spawning herring, which have been greatly overfished, current models are poor predictors of species recovery because they do not adequately take into account variability in juvenile survival at very low population levels. The new research suggests that current projections of species recovery used for fisheries management are not sufficient for very depleted fish species.

The new study highlights the importance of a thorough understanding of the dynamics of the population for the regulation and control of any living resource.


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