**Disentangling the impacts of climate warming and fishing pressure on freshwater fish populations**

Alternative title: **The relative impacts of warming and fishing on freshwater fish populations**

**Abstract:**

Climate change and fishing pressure are the two most widespread drivers of change in the abundance of freshwater fish populations. However, the relative importance of these two stressors has been widely debated, as disentangling their impacts on fish populations has been a challenge. Here, we use a temperature-dependent population dynamics model to simultaneously quantify the impact of lake warming and fishing on the abundance of freshwater fish populations in the American Midwest. Of the 520 populations analyzed, 60 populations have experienced a significant positive response to warming (11.5%) and 47 populations have had a significant negative response to warming (9.1%). The directions and magnitudes of the warming impacts are related to the thermal affinity of the species, the latitude of the population, and the level of exploitation experienced by the population. By comparing the relative contributions to changes in population size, we find that in only 1% of the populations, temperature variation depletes abundance more than fishing. For 47% of the populations, temperature variation exacerbates the decline of abundance, but its relative contribution is lower than that of fishing. For 6% and 46% of the populations, the productivity benefits gained from temperature variation fully and partially compensate for the depletion caused by fishing. An accurate understanding of the primary causes of population fluctuations and the mechanisms by which fish populations respond to climate change can help managers choose appropriate fisheries management strategies.

**Keywords:** fish productivity; fishery population dynamics; surplus production model; climate change