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Reconciling Fisheries Yields and Ocean Productivity in a Changing Climate

Phytoplankton provide the energy that sustains marine fish populations. The relationship between phytoplankton productivity and fisheries catch, however, is complicated by uncertainty in catch estimates, fishing effort, and marine food web dynamics. We enlist global data sources and a high-resolution earth system model to address these uncertainties. Results show that cross-ecosystem fisheries catch differences far exceeding differences in phytoplankton production can be reconciled with fishing effort and variations in marine food web structure and energy transfer efficiency. Furthermore, food web variations explaining sharp spatial differences in contemporary fisheries catch act to amplify projected catch trends under climate change, suggesting catch changes that may exceed a factor of 2 for some regions. The prospect of large regional changes in fisheries capacity argues strongly for adaptive management strategies to account for rapidly changing baselines. Recent developments in climate and earth system prediction on seasonal to multi-annual timescales offer promising new tools in this regard.