Background

The human population and its demand for food and nutrition is growing. At the same time, climate change is challenging the ability of food systems to meet these rising demands. Feeding and nourishing a growing human population will therefore require advances across all food production sectors. In this web application, we illustrate the opportunities for reforms in marine fisheries and expansion of marine aquaculture to reduce the negative impacts of climate change and jointly contribute to the growing demand for nutritious food.

Maximizing marine fisheries production under climate change will require rebuilding overfished stocks, sustainably developing fisheries for underexploited stocks, and maintaining sustainable exploitation rates as stocks’ distributions shift. This will require fisheries management reforms that account for shifting productivity (i.e., how much fish can be caught) and that maintain this accounting while stocks shift between national waters. In this web application, we leverage Free et al. (2020) to examine food and nutritional outcomes under two potential fisheries management scenarios: (1) business-as-usual management, in which current harvest rates degrade to open access as stocks shift into new waters; and (2) climate-adaptive fisheries management, in which economically optimal harvest rates are maintained as stocks shift into new waters.

Maximizing the potential for sustainable marine aquaculture (hereafter called “mariculture”) under climate change will require (a) establishing clear guidelines for sustainable mariculture; (b) establishing policies that promote the expansion of sustainable mariculture; (c) reforming capture fisheries to maximize the amount of feed ingredients derived from capture fisheries available to fed mariculture; (d) eliminating the use of marine fish ingredients in non-carnivorous aquaculture feed; (e) advancing feed technology to be more efficient while also utilizing fewer ingredients from capture fisheries; and (f) siting mariculture in areas that are environmentally-suitable over medium-term time periods. In this web application, we leverage Free et al. (in review) to examine the potential for mariculture to add to the food and nutritional production of the oceans under two scenarios: (1) business-as-usual feed practices, in which 21% of global feed production is directed to mariculture and capture fish are converted to farmed fish according to the FIFO (“Fish In, Fish Out”) ratios projected for 2030; and (2) reformed feed practices, in which 75% of global feed production is directed to mariculture and capture fish are converted to farmed fish according to the FIFO ratios projected for 2050.

We pair projected seafood production outcomes with projected human population growth and food and nutrition demands to determine (1) changes in the per capita availability of food and nutrition from marine seafood under climate change and adaptation; and (2) the extent of this contribution to projected human nutritional requirements. Projections of human population growth come from the *United Nations’* [*2019 Revision of World Population Prospects*](https://population.un.org/wpp/) and the nutrient content of seafood groups comes from the GENuS database (Smith et al. 2016). We forecast human nutritional requirements using the EAR cut point method (citation) and nutrient requirements (Estimated Average Requirements, EARs; citation) for XX critical micronutrients.