This web application is designed to help users explore the likely impacts of climate change on the supply of nutrients from national fisheries and the opportunities for nations to mitigate these impacts through fisheries reforms. The tool also allows the user to reliance of nations on fisheries food and nutrition, the vulnerability of the nation to losses in food and nutrition, and the gaps that will need to be filled through trade or other food provisioning sectors.

The web application is organized into the following four panels:

1. **Fish nutrition data:** This page allows the user to explore the nutrient content of >7000 fish species using data from Vaita et al. (2018). This allows the user to anticipate the nutritional consequences of losing or gaining access to a new fish stock, increasing long-term yield of a stock through reform, or retaining a stock for domestic consumption versus exporting it abroad.
2. **National nutrition data:** This page allows the user to asses the current and historical daily per capita nutrition supply of micronutrients and the contribution of marine fish and invertebrates to these rates using data from the GENUS. It allows the user to assess the current nutritional status of a country and the contribution of fisheries towards that status. It presents the baseline for understanding the impacts of climate change on nutrition from fisheries and the opportunities for fisheries reform to fill gaps and mitigate the widening of gaps.
3. **National fisheries and nutrition forecasts:** This page allows the user to explore the projected impacts of climate change on national fisheries with and without fisheries adaptation and the joint consequences of climate change and fisheries adaptation on national nutrition endowments. This page also exposes the gaps that might need to be filled through trade or through other food provisioning sectors such as aquaculture or agriculture.
4. **National report card:** This page summarizes the vulnerability of a nations food systems to climate change through the exposure, sensitivity, and adaptive capacity framework. The sensitivity is defined by level of nutritional health and reliance on fisheries. Exposure is defined by the projected rate of change in underlying nutrient availability and adaptive capacity is defined by the degree to which these impacts could be offset through reforms.

This web application focuses on the following nine nutrients:

* **Protein:** “Serves as the major structural component of all cells of the body, and functions as enzymes, in membranes, as transport carriers, and as some hormones”
* **Total fat:** “Energy source and, when found in foods, is a source of n-6 and n-3 polyunsaturated fatty acids”
* **Omega-6 polyunsaturated fatty acids (linoleic acid):** “Essential component of structural membrane lipids, involved with cell signaling, and precursor of eicosanoids. Required for normal skin function”
* **Omega-3 polyunsaturated fatty acids (α-linoleic acid):** “Involved with neurological development and growth. Precursor of eicosanoids”
* **Iron:** “Component of hemoglobin and numerous enzymes; prevents microcytic hypochromic anemia”
* **Zinc:** “Component of multiple enzymes and proteins; involved in the regulation of gene expression”
* **Vitamin A:** “Required for normal vision, gene expression, reproduction, embryonic development and immune function”
* **Vitamin B12:** “Coenzyme in nucleic acid metabolism; prevents megaloblastic anemia”
* **Vitamin D:** “Maintains serum calcium and phosphorus concentrations, and, in turn, bone health”

**References**

This web application uses data from the following papers:

Vaitla B, Collar D, Smith MR, Myers SS, Rice BL, Golden CD (2018) Predicting nutrient content of ray-finned fishes using phylogenetic information. *Nature Communications* 9(3742).<https://doi.org/10.1038/s41467-018-06199-w>

Smith MR, Micha R, Golden CD, Mozaffarian D, Myers SS (2016) Global Expanded Nutrient Supply (GENuS) model: a new method for estimating the global dietary supply of nutrients. *PLoS One* 11(1): e0146976. <https://doi.org/10.1371/journal.pone.0146976>

Free CM, Mangin T, García Molinos J, Ojea E, Burden M, Costello C, Gaines SD (2020) Realistic fisheries management reforms could mitigate the impacts of climate change in most countries. *PLoS One* 15(3): e0224347. <https://doi.org/10.1371/journal.pone.0224347>

**Citation**

Please cite the source references when referring to the data. When citing the web application, please use the following citation:

Free CM et al. (2020) Nutrition, fisheries, and climate change web explorer. Available online at:<https://cfree.shinyapps.io/nutricast/>