



April 2, 2021

Benjamin Friedman

Deputy Under Secretary for Operations, Performing the Duties of Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator

National Oceanic and Atmospheric Administration

1401 Constitution Avenue NW, Room 5128

Washington, DC 20230

RE: Climate: Recommendations for Fisheries and Protected Resources

Dear Mr. Friedman:

The Good Food Institute (GFI) appreciates the opportunity to provide input on “how to make fisheries and protected resources more resilient to climate change.” GFI is an international 501(c)(3) nonprofit organization that is developing the roadmap for a sustainable, secure, and just protein supply. GFI’s team of scientists, entrepreneurs, and policy experts supports research and innovation in alternative proteins to meet consumer demand and feed a growing world. We urge you to prioritize open-access research on alternative seafood as a central component of NOAA’s climate change agenda.

Demand for seafood globally is increasing. The Food and Agriculture Organization of the United Nations estimates that global seafood demand will reach 21.5 kilograms per capita by 2030, a nearly 5 percent increase from 2020 levels.¹ In the U.S., per capita seafood consumption has remained relatively constant over the past several decades but population growth has driven expanding total demand. The increase in seafood sales during the Covid-19 pandemic, along with the consistent recommendations under the Dietary Guidelines for Americans to consume more seafood, could further increase domestic seafood demand in the coming years. Ensuring the resilience of our seafood supply is essential to the long-term sustainability of seafood in the U.S.

Alternative seafood production is more resilient to climate change. Current mainstream seafood production models—capture fishing and aquaculture—rely on marine and freshwater environments to produce seafood. However, as climate change intensifies, our marine resources are becoming stressed. Over 90 percent of excess heat from climate change has been absorbed by our oceans since 1970, the rate of ocean warming has doubled since 1993, and the frequency of marine heat waves has doubled since 1982.² Just maintaining current production levels from fisheries and aquaculture is challenging in a changing climate, let alone increasing the supply of seafood as demand grows.

¹ FAO. 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. <https://doi.org/10.4060/ca9229en>

² IPCC, 2019: Summary for Policymakers. In: IPCC Special Report on the Ocean and Cryosphere in a Changing Climate [H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama, N.M. Weyer (eds.)]. In press.

Plant-based and cultivated seafood, known together as alternative seafood, are two promising production methods for meeting that growing demand. Plant-based seafood is produced by biomimicking conventional fish and shellfish products using plant ingredients and advanced food science technology. The goal of plant-based seafood is to give consumers the taste, texture, and full seafood experience, but without the adverse external health and environmental costs. Cultivated seafood is produced from a small sample of fish or shellfish cells grown in a tank called a cultivator, which provides warmth and the water, proteins, carbohydrates, fats, vitamins and minerals needed to grow muscle. The result is seafood that looks, tastes, and cooks the same as the traditional version. Because alternative seafood does not rely on ocean resources, the production models are resilient to the rapid changes occurring in aquatic environments.

Alternative seafood production is not directly disrupted by warming and acidifying marine environments. While seafood production systems that rely on the use of live fish and shellfish are affected by climate-driven population migration³ and heat stress mortalities,⁴ plant-based and cultivated seafood production is not disrupted by ocean temperature changes. The alternative seafood industry can also support coastal resilience strategies such as mangrove restoration by moving the supply of commonly farmed species such as shrimp away from fragile marine ecosystems.

In addition to resiliency, we need to incorporate climate change mitigation strategies into U.S. seafood production. Alternative seafood can boost climate change mitigation efforts. Conventional fishing is associated with increasing greenhouse gas emissions as depleted coastal fisheries force vessels to travel farther to catch the same number of fish.⁵ Bottom trawling damages ocean floors and releases stored seabed carbon.⁶ Diversifying our seafood production methods to include plant-based and cultivated seafood should be a core strategy to reducing emissions from the industry.

Marine-sourced plant ingredients can be included in alternative seafood and may boost climate change mitigation efforts. For example, several species of macroalgae exhibit promising sensory and functional benefits when used as ingredients in plant-based seafood. Cultivating and harvesting these ingredients can be done in concert with aquatic carbon sequestration methods and without the land use change associated with terrestrial agriculture.

Public research funding is the most effective way to accelerate the alternative seafood industry. Although private investment in alternative proteins is growing, open-access public research is crucial to accelerate growth. Public research will have a significantly broader impact on innovation and the economy by creating jobs and generating new opportunities to feed Americans and the world, rather than primarily benefiting specific companies. Despite promising growth, plant-based seafood products only represent a small portion of the total plant-based meat market, are not available for the full range of proteins, and are typically not price competitive with their conventional counterparts. NOAA has a critical role to play in funding research to accelerate the development of resilient and sustainable seafood that is affordable and accessible to all Americans.

³ Free, Christopher M., et al. "Impacts of historical warming on marine fisheries production." *Science* 363.6430, 979-983 (2019). doi: 10.1126/science.aau1758

⁴ Reid GK, Gurney-Smith HJ, Marcogliese DJ, Knowler D and others (2019) Climate change and aquaculture: considering biological response and resources. *Aquacult Environ Interact* 11:569-602. <https://doi.org/10.3354/aei00332>

⁵ Parker, R.W.R., Blanchard, J.L., Gardner, C. et al. Fuel use and greenhouse gas emissions of world fisheries. *Nature Clim Change* 8, 333–337 (2018) doi:10.1038/s41558-018-0117-x

⁶ Sala, E., Mayorga, J., Bradley, D. et al. Protecting the global ocean for biodiversity, food and climate. *Nature* (2021). <https://doi.org/10.1038/s41586-021-03371-z>

Public investment in alternative seafood offers a competitive advantage to the United States in this growing industry. The US is home to the several of the top alternative seafood companies in the world, but we will fall behind if the U.S. government does not support these game-changing industries with funding for open-access research and development. Other countries are actively supporting the development of plant-based and cultivated meat and seafood. For example, the European Union includes alternative proteins as a key research area in Horizon Europe's \$12 billion research and innovation program, and Singapore is investing \$144 million into a variety of next-generation technologies intended to bolster their bioeconomies, including cultivated meat.⁷ Canada, the Netherlands, India, Israel, and Japan are making similar investments.

We would be happy to discuss the promise of alternative seafood further. Please do not hesitate to reach out with any questions.

Sincerely,



Jennifer Lamy
Senior Sustainable Seafood Initiative Manager
The Good Food Institute
jenl@gfi.org

⁷ Yoolim Lee & Joyce Koh, Singapore Backs Lab-Grown Meat, Robots in \$535 Million Push, Bloomberg (Mar. 27, 2019), <https://bloom.bg/2FI4PKu>.