

1
2
3
4
5
6 **Uncertain seafood sustainability in a manufactured crisis**

7
8 Halley E. Froehlich^{1,2*} and Jessica A. Gephart³
9

10 ¹Environmental Studies, University of California, Santa Barbara, CA 93106
11

12 ²Department of Ecology, Evolution, & Marine Biology, University of California, Santa Barbara, CA
13 93106
14

15 ³School of Aquatic and Fishery Sciences, University of Washington, WA 98195
16

17 *Corresponding author: hefroehlich@ucsb.edu
18
19

Abstract

In 2025, the United States (U.S.) administration issued a new Executive Order (EO), *Restoring American Seafood Competitiveness*, intensifying efforts to deregulate the seafood sector under the guise of promoting domestic industry. Building on the 2020 EO (*Promoting American Seafood Competitiveness and Economic Growth*), this policy marks a significant escalation in dismantling federal regulatory frameworks, weakening scientific authority, and seemingly sidelining aquaculture development. This paper reflects on our first publication assessing the 2020 EO during the COVID-19 pandemic and evaluates four major areas of comparative concern: (1) regulatory dismantling rather than reform, (2) largely ignoring aquaculture from the national seafood strategy, (3) persistent and deepened data and research infrastructure gaps, and (4) a continued mischaracterization and inconsistency of U.S. seafood sourcing and trade realities. In contrast to science-informed management that enabled the recovery of many U.S. wild stocks, the 2025 EO and other actions reduce the role of the National Oceanic and Atmospheric Administration, threatens legal mechanisms for agency expertise (via *Chevron deference* repeal), and promotes ill-informed deregulatory timelines and actions (e.g., removal of marine protected areas). Aquaculture, the most regulated and underutilized sector, is also overlooked, despite its actual potential to help meet domestic seafood demand. Simultaneously, critical federal databases, climate-focused research, and inter-agency coordination mechanisms are being defunded or removed. Ultimately, weakening evidence-based governance structures and partnerships, as well as voluntarily inducing volatile trade dynamics jeopardize the ecological, economic, and food security benefits of a resilient seafood system, putting America last instead of first.

The new United States (U.S.) administration is upending agency structure and function, regulations, and law itself, including when it comes to seafood. However, the new 2025 Executive Order (EO), *Restoring American Seafood Competitiveness* expands on a previous Trump order from 2020: EO 13921, *Promoting American Seafood Competitiveness and Economic Growth*. Both orders purport to strengthen the U.S. seafood industry, but the 2025 declaration outlines far more aggressive changes. Reflecting on our previous evaluation of U.S. seafood disruption in 2020 [1], there are at least four major escalations worth highlighting:

- 1) **Regulatory dismantling instead of reform**
- 2) **Aquaculture overlooked**
- 3) **Data disconnect**
- 4) **Inconsistencies related to seafood consumption and sourcing**

Regulatory dismantling instead of reform

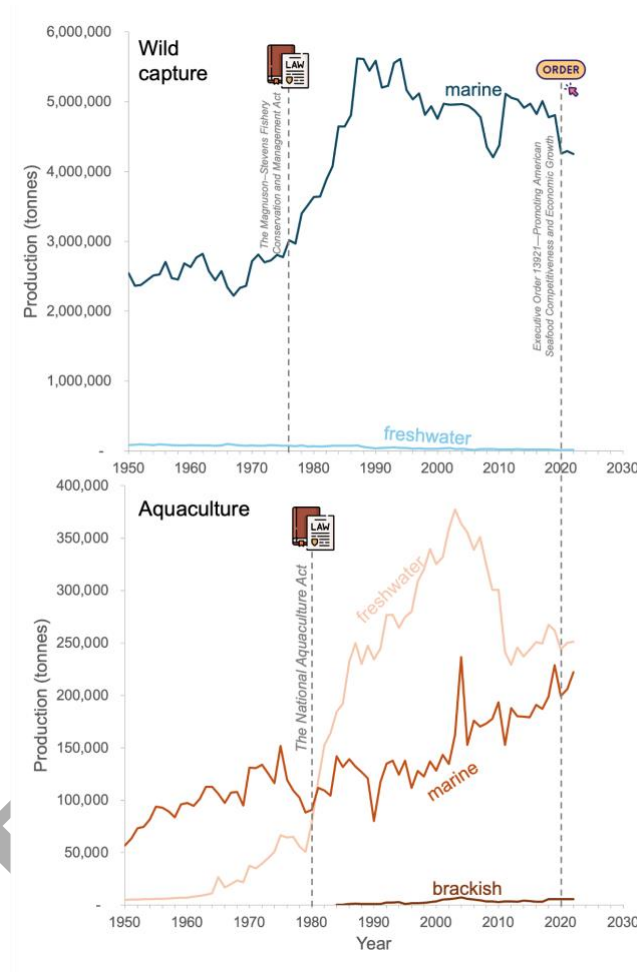
The 2020 order focused on *streamlining* existing regulations, while 2025 directs the Secretary of Commerce to address overregulation within 30 days, mandating to suspend, revise, or rescind “burdensome regulations” for wild capture fisheries, aquaculture, and processing. Similar to the first order, it once again calls for improvements from Regional Fishery Management Councils within 180 days. While aquaculture is the most regulated food sector in the U.S. [2,3], wild capture fisheries have rebounded *because* of fisheries regulations, not in spite of them [1] (Figure 1). Regardless of these facts, the abrupt and short timelines again demonstrate the lack of understanding of the complex regulatory and agency structures that ensure seafood is not only produced and distributed, but also safe for people and the environment. One of the most stunning distinctions between the orders is that there is only one mention of the National Marine Fisheries Service (NMFS) – also known as National Oceanic and Atmospheric Administration (NOAA) Fisheries, the operational arm of the Secretary of Commerce established by Republican President Richard Nixon in 1970 and descended from the Commission of Fish and Fisheries by Republican President Ulysses S. Grant in 1871 [4] – and no mention of *sustainability*. This is in stark contrast to the 2020 order, which mentioned NOAA and sustainability five times. The *Magnuson-Stevens Fishery Conservation and Management Act* does not explicitly codify NOAA as the lead agency for fisheries, but Section 2 assigns

responsibility to the Secretary [5], who typically delegates the role and actions to NOAA. Note, after Magnuson-Stevens was passed – which increased regulatory oversight *and* funding to support the management of wild capture fisheries –landings significantly *increased* over time (Figure 1). Nonetheless, omitting NOAA is likely not an oversight, but an active omission tied to the dismantling of the agency and threatening the very fisheries they espouse to support.

The administration has executed a multi-pronged assault on the agency responsible for federally managing the ca. 500 U.S. commercial fishery stocks. A proposed nearly two-billion-dollar budget cut and elimination of 1,300 NOAA employees (ca. 10% of the workforce), so far, dismantles much of NOAA's research division, especially focused on climate change [6,7]. In addition, a 2024 case concerning an Atlantic herring fishery, spurred the Supreme Court to overturn the *Chevron deference* (est. 1984), significantly reducing the authority of federal agencies, including NOAA, to interpret statutes [8]. Previously, courts deferred to agencies with appropriately staffed experts to interpret and act on the statutes written by Congress. Now, courts have greater power to decide what statutes mean, likely leading to more, not less, litigation, uncertainty and instability for domestic seafood and beyond [9]. The administration also has goals to transfer NOAA Fisheries' responsibilities for endangered species and marine mammal protection to the U.S. Fish and Wildlife Service under the Department of the Interior. Given the ecosystem context of U.S. fisheries (e.g., lobster and whale entanglement [10]), this move will undermine NOAA's integrated approach to marine conservation and fisheries management.

The removal of ecosystem considerations and protection is a continued misstep of the new and previous orders. The administration made a modified proclamation in 2020 to open the Northeast Canyons and Seamounts Marine National Monument to fishing [11], with little evidence for increased landings [1]. In fact, U.S. and global landings have been relatively stable for approximately 40 years *because* of management and protections [12–14] (Figure 1). Yet, doubling down, the executive branch is expanding a review of all marine national monuments and made another proclamation opening the Pacific Islands Heritage Marine National Monument [15], one of the largest marine protected areas in the world and first designated by Republican President George W. Bush in 2009 [16]. These actions ignore the long-term spillover benefits from protected areas to commercial [17] and recreational fisheries [18], as well as biodiversity [19,20]. Moreover, what fishing has occurred in the Pacific Remote Islands in the past – U.S.

105 tuna purse seining and drifting longlining – is such a small fraction effort[21], it will again do
 106 little to address the scale of the production gap [1], especially compared to aquaculture potential.
 107



108
 109 Figure 1. Total U.S. production of wild capture (*top panel*) and aquaculture (*bottom panel*) over
 110 time (1950-2022), with major wild and farm legislation, respectively. The 2020 executive order
 111 applies across both sectors. Note the decline in 2020 was likely the effect of COVID-19
 112 disruptions across the supply chain [22]. All data sourced from [14].

113 *Aquaculture overlooked*

114 The recent efforts largely focus on wild capture fisheries, while aquaculture takes a
 115 backseat compared to the 2020 order. Aquaculture is only mentioned twice in the new order,
 116 compared to 47 times five years ago. Granted, the 2020 order was not overturned under the
 117 Biden administration, but the aquatic food sector with the most potential to *actually, sustainably*

increase seafood production in the U.S. was given little to no attention. The regulatory reviews and dismantling will affect aquaculture, but 30 days is not sufficient to address the regulatory web of U.S. aquaculture. Aquaculture is the most regulated food sector in the nation [2,3], with rules and regulations spanning nearly every agency at the federal level because it extends across land, freshwater and sea [23]. Moreover, the U.S. Department of Agriculture (USDA) largely oversees aquaculture, but it is unclear if the agency will suffer the same or similar budgetary and employee fate as NOAA. As of April 2025, states with the most reported aquatic farms (e.g., Louisiana) and sales (e.g., Washington) are largely not those with the largest USDA funding cuts and freezes (Figure 2). Instead, the loss of funding will disproportionately affect smaller aquatic farms, likely compounding effects with NOAA reductions.

The 2025 EO claims success in “*enhance[ing] the competitiveness of United States seafood, streamlined regulations, supported maritime jobs and coastal economies, and improved data collection,*” little of that is evident on the ground. Three Aquaculture Opportunities Areas (AOAs) have been identified by NOAA since the 2020 order (e.g., [24]) and the total number of aquaculture farms and sales has increased by 18 and 26%, respectively, since 2018 [25]. However, the five-year growth is modest, likely due in part to the fact EOs do not allocate funding, a Congressionally held power. This is evidenced by the passing of the National Aquaculture Act of 1980 under Democratic President Jimmy Carter, which set out to promote and support the development of (mostly freshwater) aquaculture and coordination among federal agencies, appearing to correspond with a substantial and rapid increase in freshwater aquaculture production shortly after (Figure 1).

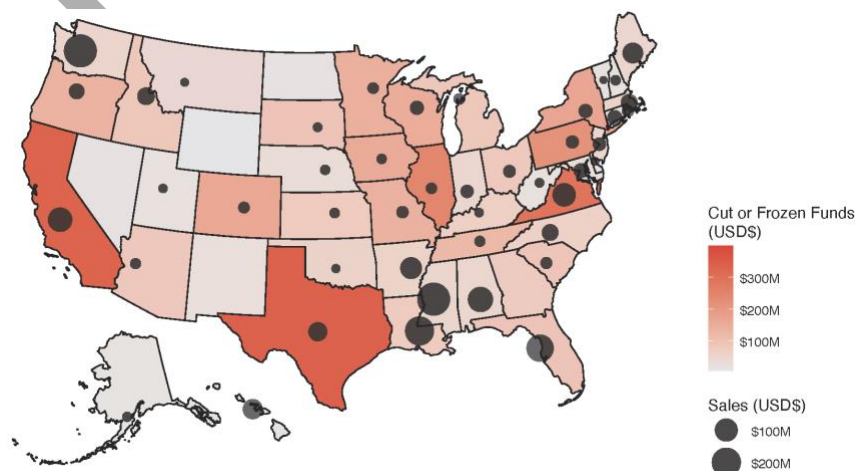


Figure 2. State level cut or frozen USDA grants (*red*) and total reported aquaculture sales (*black point*) per state. Data from [26] and [25].

Presently, the bolstering of the aquaculture industry we have seen has come from Congressional actions. For instance, federal grants from Democratic President Joe Biden’s 2022 Inflation Reduction Act, which provided Alaska’s \$49 million grant for the Alaska Mariculture Cluster, accelerating seaweed and oyster aquaculture in the state [27]. Or the 2021 expansion of USDA’s federal Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program (ELAP) made available to aquaculture producers [28]. But instead of financially supporting aquatic farming, funding research and development, and maintaining reliable seafood purchase programs, they are being frozen or eliminated [29]. And again, the loss of Chevron deference has increased instability and uncertainty [9]. Perhaps aquaculture could principally benefit from regulatory release – more so than wild capture – but science, management and stable markets are components to actually benefit from fewer regulations [1], which are all under attack by the current administration.

Data disconnect

Data are power. In 2020, data were not a central focus of the administration, which we highlighted in Froehlich et al. [1], suggesting targeted needs in wild fisheries *and* aquaculture. Notably, the 2025 order does call for “*NMFS to incorporate less expensive and more reliable technologies and cooperative research programs into fishery assessments...*” which could include vessel video monitoring for compliance [30]. That said, there was no reference or directive to address the need for the dearth of aquaculture data, which is likely underestimating the diversity, scale, and value of the sector [31]. Of note, NOAA is well positioned to support and house better marine aquaculture through the Fisheries Information Networks (FINs). Yet, counter to the suggestions and potential solutions to benefit wild and farm systems, numerous NOAA databases and online resources are slated for decommissioning, including those focused on climate change [32]; which they aim to defund and de-emphasize in role and research more broadly [33]. Yet, fisheries and aquaculture are on the front lines of climate change because the species we harvest and consume are largely poikilotherms—organisms that cannot regulate their internal temperatures and thus are more affected by their surrounding environment [34]. Because

of fisheries data collection, expert stock assessment scientists, basic animal biology, and the understanding that anthropogenic climate change is real, when ten billion highly valuable snow crabs disappeared in 2018 in the Bering Sea of Alaska, temperature driving starvation was relatively quickly identified as the culprit and the fishery could respond accordingly [35]. Without the data, expertise, and capacity to study and understand these systems we run the risk of fishery collapses becoming more common and long lasting.

Inconsistencies related to seafood sourcing

Around two-thirds of seafood consumed in the U.S. is imported [36]. While substantially lower than the 90% import reliance stated in the EO, it still supports the fact that the U.S. has become increasingly dependent on imported seafood [36]. The EO places heavy focus on reducing the “seafood deficit,” but includes several inconsistencies related to seafood sourcing.

The EO highlights eliminating illegal, unreported, and unregulated (IUU) fishing products and products involving forced labor from supply chains as a priority and instructs the U.S. Trade Representative to pursue negotiations or trade enforcement authority solutions. Simultaneously, the EO inaccurately states that the Seafood Import Monitoring Program (SIMP) was recently expanded and suggests the expansion should be revised or rescinded even though SIMP and its proposed improvements focus on strengthening measures to eliminate IUU sourced products from imports and to coordinate efforts across relevant agencies to address forced labor in supply chains [37]. The EO also directs relevant agencies to improve thorough checks at ports to prevent IUU sourced products from entering the U.S. markets and consider options to use improved technology, which is aligned with the existing SIMP program and its proposed expansion [37]. Meanwhile, scaling back the coverage of SIMP creates more opportunities for products to enter the U.S. under products not covered and the reduced data hampers efforts to improve risk identification [38,39].

Next, treating seafood supply as a homogenous food item ignores the vast diversity of species, production methods, and product forms, which cater to specific demand profiles and price points [40]. The EO focuses on reducing the seafood trade deficit by replacing imported seafood with increased consumption of U.S. production. However, in reality, U.S. imports are

dominated by farmed seafood which are not generally substituted by more expensive domestic wild-caught seafood [36]. Indeed, the species the U.S. tends to produce in volume (e.g., catfish, oysters) are not the species of highest demand domestically (e.g., salmon, shrimp, tuna) [41]. While policy changes can increase growth of domestic aquaculture, providing greater federal monetary support for expansion and diversification is essential – something USDA and NOAA grant and loan programs have done and could expand [42,43]. These efforts also do little to address the social resistance to aquaculture in the states as well, which we highlight in Froehlich et al. 2021 [1]. If the U.S. is to expand its domestic seafood consumption going forward, policies must acknowledge the diversity of species and production methods represented in U.S. consumption and funding will be critical to grow the national aquaculture sector.

In addition to the above-mentioned inconsistencies, the voluntarily induced trade war is an extreme version of the administration's first term trade policies. The trade war is larger and more sweeping than before, which will make both foreign seafood and U.S. landed but foreign-processed seafood more expensive for Americans, who already do not consume the recommended level of seafood [44]. The administration initiated a baseline 10% tariff on all trading partners, plus larger reciprocal tariffs on select countries [45], including China, which has escalated quickly to 145% [46]. China is a global leader in seafood production, consumption and processing [14], and the top seafood exporter (by volume) to the U.S. While some fishermen applaud the efforts (e.g., shrimpers in Louisiana) to potentially make local products price competitive, the vast volume (ca. 90%) of shrimp is imported and cannot presently be met domestically because the U.S. does not farm large quantities of shrimp [47]. In the absence of strategic financial support to boost the infrastructure and management of our seafood systems, instead of gutting them, these indiscriminate tariffs are likely to cost seafood consumers in the states, potentially leading to higher consumption of less sustainable [48] and less healthy animal source foods [49].

Conclusion

The 2020 and 2025 seafood EOs claim 'America first', but with the attacks and elimination of science, especially NOAA, overlooking financial support for aquaculture, and the manufactured trade crisis, the U.S. is at risk to come last in seafood and more [50]. While we

reflect on our past study from 2020 focused on seafood, U.S. science and governance collectively are in uncertain territory. No sector operates in isolation, no matter the seeming potential benefits of a single EO. Larger endeavors to fundamentally diminish the partnership between government, industry, and academia – some argue the backbone of the U.S. science and innovation success [50] – will likely undercut any intention of ‘good’ from a non-binding order. Unfortunately, in fishery sciences we know what happens in the absence of science-informed, responsive management: collapse, harming nature and the people who depend on those finite resources [51,52].

Acknowledgements

Thank you to federal employees and Universities working to support research and science for all. Extra thanks to baby Jade for taking naps so Dr. Gephart could co-author this manuscript.

References

- [1] H.E. Froehlich, R.R. Gentry, S.E. Lester, R.S. Cottrell, G. Fay, T.A. Branch, J.A. Gephart, E.R. White, J.K. Baum, Securing a sustainable future for US seafood in the wake of a global crisis, *Mar. Policy* (2021) 104328. <https://doi.org/10.1016/j.marpol.2020.104328>.
- [2] A.J. Staples, D. Chambers, R.T. Melstrom, T. Malone, Regulatory restrictions across US protein supply chains, *J. Agric. Appl. Econ.* 54 (2022) 1–27.
- [3] A.J. Staples, E. Abaidoo, L.N. Jescovitch, D. Chambers, R.T. Melstrom, T. Malone, Regulatory Landscape of the US Aquaculture Supply Chain, *Choices* 36 (2021) 1–9.
- [4] NOAA Fisheries, Our History | NOAA Fisheries, (2019). <https://www.fisheries.noaa.gov/about-us/our-history> (accessed April 18, 2025).
- [5] NOAA Fisheries, Magnuson-Stevens Fishery Conservation and Management Act | NOAA Fisheries, NOAA (2024). <https://www.fisheries.noaa.gov/resource/document/magnuson-stevens-fishery-conservation-and-management-act> (accessed April 18, 2025).
- [6] V. Volcovici, V. Volcovici, White House aims to eliminate NOAA climate research in budget plan, *Reuters* (2025). <https://www.reuters.com/sustainability/climate-energy/white-house-proposes-eliminate-noaa-climate-research-budget-proposal-2025-04-11/> (accessed April 18, 2025).
- [7] K.S. Daly, Attacking NOAA and the EPA: Can They Do That?, *Conserv. Law Found.* (2025). <https://www.clf.org/blog/attacking-noaa-and-the-epa-can-they-do-that/> (accessed April 18, 2025).
- [8] M. Moore, The Supreme Court Threw Us—and the Chevron Deference—Overboard with Its Fish Ruling, *Sci. Am.* (2024). <https://www.scientificamerican.com/article/the-supreme-court-threw-us-and-the-chevron-deference-overboard-with-its-fish/> (accessed April 18, 2025).
- [9] Aquaculture Regulation and Policy in a Post-Chevron World, Washington, DC, 2025. <https://www.youtube.com/watch?v=dgYTdW95pL0>.

- [10] B.J.W. Greenan, N. Shackell, K. Ferguson, P. Greyson, A. Cogswell, D. Brickman, Z. Wang, A. Cook, C.E. Brennan, V.S. Saba, Climate Change Vulnerability of American Lobster Fishing Communities in Atlantic Canada, *Front. Mar. Sci.* 6 (2019). <https://doi.org/10.3389/fmars.2019.00579>.
- [11] Proclamation 9496, Proclamation on Modifying The Northeast Canyons And Seamounts Marine National Monument, 2020. <https://www.federalregister.gov/documents/2016/09/21/2016-22921/northeast-canyons-and-seamounts-marine-national-monument> (accessed November 10, 2020).
- [12] R. Hilborn, D. Ovando, Reflections on the success of traditional fisheries management, *ICES J. Mar. Sci.* 71 (2014) 1040–1046.
- [13] R. Hilborn, Measuring fisheries management performance, *ICES J. Mar. Sci.* (2020). <https://doi.org/10.1093/icesjms/fsaa119>.
- [14] FAO, The State of World Fisheries and Aquaculture 2024 – Blue Transformation in action, Rome, Italy, 2024. <https://doi.org/10.4060/cd0683en>.
- [15] Proclamation, Unleashing American Commercial Fishing in the Pacific, White House (2025). <https://www.whitehouse.gov/fact-sheets/2025/04/unleashing-american-commercial-fishing-in-the-pacific/> (accessed April 18, 2025).
- [16] N. Fisheries, Pacific Islands Heritage Marine National Monument | NOAA Fisheries, NOAA (2025). <https://www.fisheries.noaa.gov/pacific-islands/habitat-conservation/pacific-islands-heritage-marine-national-monument> (accessed April 18, 2025).
- [17] S. Medoff, J. Lynham, J. Raynor, Spillover benefits from the world’s largest fully protected MPA, *Science* 378 (2022) 313–316. <https://doi.org/10.1126/science.abn0098>.
- [18] S. Franceschini, J. Lynham, E.M.P. Madin, A global test of MPA spillover benefits to recreational fisheries, *Sci. Adv.* 10 (2024) eado9783. <https://doi.org/10.1126/sciadv.ado9783>.
- [19] C. Stevenson, L.S. Katz, F. Micheli, B. Block, K.W. Heiman, C. Perle, K. Weng, R. Dunbar, J. Witting, High apex predator biomass on remote Pacific islands, *Coral Reefs* 26 (2007) 47–51. <https://doi.org/10.1007/s00338-006-0158-x>.
- [20] I.D. Williams, B.M. Richards, S.A. Sandin, J.K. Baum, R.E. Schroeder, M.O. Nadon, B. Zgliczynski, P. Craig, J.L. McIlwain, R.E. Brainard, Differences in Reef Fish Assemblages between Populated and Remote Reefs Spanning Multiple Archipelagos Across the Central and Western Pacific, *J. Mar. Sci.* 2011 (2011) 826234. <https://doi.org/10.1155/2011/826234>.
- [21] emLab, Analysis of historic fishing activity within the proposed National Marine Sanctuary for the Pacific Remote Islands, UC Santa Barbara, California, USA, 2023.
- [22] D.C. Love, E.H. Allison, F. Asche, B. Belton, R.S. Cottrell, H.E. Froehlich, J.A. Gephardt, C.C. Hicks, D.C. Little, E.M. Nussbaumer, Emerging COVID-19 impacts, responses, and lessons for building resilience in the seafood system, *Glob. Food Secur.* (2021) 100494.
- [23] M. Hegwood, H.E. Froehlich, M. Clark, M.G. Burgess, P. Newton, Aquaculture is subject to more regulations than any other food sector in the United States, *Nat. Food* (In Review).
- [24] J. Morris, An Aquaculture Opportunity Area Atlas for the Southern California Bight, 2021. https://coastalscience.noaa.gov/data_reports/an-aquaculture-opportunity-area-atlas-for-the-southern-california-bight/ (accessed November 16, 2021).
- [25] NASS, 2023 Census of Aquaculture, (2025). https://data.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/Aquaculture/index.php (accessed April 22, 2025).

- [26] R. Schewe, USDA Programs Freeze: What We Know, Natl. Sustain. Agric. Coalit. (2025). <https://sustainableagriculture.net/blog/usda-programs-freeze-what-we-know/> (accessed April 22, 2025).
- [27] Sea Grant Alaska, Alaska Sea Grant: Federal grant to boost Alaska's mariculture industry, Alsk. Sea Grant (2022). <https://alaskaseagrant.org/2022/09/federal-grant-to-boost-alaska-mariculture-industry/> (accessed April 18, 2025).
- [28] Farm Service Agency, USDA Expands Aquaculture Disaster Assistance to Include Fish Raised for Food, USDA (2021). <https://www.fsa.usda.gov/news-events/news/05-06-2021/usda-expands-aquaculture-disaster-assistance-include-fish-raised-food> (accessed April 18, 2025).
- [29] C. Blank, US federal funding cuts eliminating traditionally steady purchases of seafood, SeafoodSource (2025). <https://www.seafoodsource.com/news/supply-trade/us-federal-funding-cuts-eliminating-traditionally-steady-purchases-of-seafood> (accessed April 18, 2025).
- [30] C. Ewell, J. Hocevar, E. Mitchell, S. Snowden, J. Jacquet, An evaluation of Regional Fisheries Management Organization at-sea compliance monitoring and observer programs, Mar. Policy 115 (2020) 103842. <https://doi.org/10.1016/j.marpol.2020.103842>.
- [31] H.E. Froehlich, R.R. Gentry, S.E. Lester, M. Rennick, H.R. Lemoine, S. Tapia-Lewin, L. Gardner, Piecing together the data of the U.S. marine aquaculture puzzle, J. Environ. Manage. 308 (2022) 114623. <https://doi.org/10.1016/j.jenvman.2022.114623>.
- [32] NOAA, Notice of Changes, Natl. Environ. Satell. Data Inf. Serv. (2025). <https://www.nesdis.noaa.gov/about/documents-reports/notice-of-changes> (accessed April 19, 2025).
- [33] A. Freedman, NOAA told to search its grants for climate change terms, Axios (2025). <https://www.axios.com/2025/02/09/noaa-search-grants-climate-change-terms> (accessed April 19, 2025).
- [34] J. Kingsolver, R. Huey, Size, temperature, and fitness: Three rules, Evol. Ecol. Res. 10 (2008) 251–268.
- [35] C.S. Szuwalski, K. Aydin, E.J. Fedewa, B. Garber-Yonts, M.A. Litzow, The collapse of eastern Bering Sea snow crab, Science 382 (2023) 306–310. <https://doi.org/10.1126/science.adf6035>.
- [36] J.A. Gephart, H.E. Froehlich, T.A. Branch, Opinion: To create sustainable seafood industries, the United States needs a better accounting of imports and exports, Proc. Natl. Acad. Sci. 116 (2019) 9142–9146. <https://doi.org/10.1073/pnas.1905650116>.
- [37] N. Fisheries, NOAA Fisheries Announces Action Plan to Enhance the U.S. Seafood Import Monitoring Program | NOAA Fisheries, NOAA (2024). <https://www.fisheries.noaa.gov/feature-story/noaa-fisheries-announces-action-plan-enhance-us-seafood-import-monitoring-program> (accessed April 24, 2025).
- [38] J.A. Gephart, R. Agrawal Bejarano, K. Gorospe, A. Godwin, C.D. Golden, R.L. Naylor, K.L. Nash, M.L. Pace, M. Troell, Globalization of wild capture and farmed aquatic foods, Nat. Commun. 15 (2024) 8026. <https://doi.org/10.1038/s41467-024-51965-8>.
- [39] J.A. Gephart, P. Maxson, J. Simeone, R. Agrawal Bejarano, C.M. Anderson, F. Asche, J. Barnes, L. Hauser, D.C. Love, T. Mallory, M.D. Smith, Existing seafood traceability tools are insufficient for enforcing import restrictions, Npj Ocean Sustain. 4 (2025) 1–7. <https://doi.org/10.1038/s44183-025-00103-y>.

- [40] D.C. Love, A.L. Thorne-Lyman, Z. Conrad, J.A. Gephart, F. Asche, D. Godo-Solo, A. McDowell, E.M. Nussbaumer, M.W. Bloem, Affordability influences nutritional quality of seafood consumption among income and race/ethnicity groups in the United States, *Am. J. Clin. Nutr.* 116 (2022) 415–425. <https://doi.org/10.1093/ajcn/nqac099>.
- [41] D.C. Love, F. Asche, R. Young, E.M. Nussbaumer, J.L. Anderson, R. Botta, Z. Conrad, H.E. Froehlich, T.M. Garlock, J.A. Gephart, A. Ropicki, J.S. Stoll, A.L. Thorne-Lyman, An Overview of Retail Sales of Seafood in the USA, 2017–2019, *Rev. Fish. Sci. Aquac.* (2021) 1–12. <https://doi.org/10.1080/23308249.2021.1946481>.
- [42] N. Fisheries, NOAA Aquaculture Strategic Plan (2023–2028) | NOAA Fisheries, NOAA (2025). <https://www.fisheries.noaa.gov/resource/document/noaa-aquaculture-strategic-plan-2023-2028> (accessed April 25, 2025).
- [43] NIFA, Aquaculture, USDA (2025). <https://www.nifa.usda.gov/grants/programs/animal-programs/aquaculture> (accessed April 25, 2025).
- [44] M.D. Smith, The Hidden Health Penalty of Seafood Tariffs, *Think Glob. Health* (2025). <https://www.thinkglobalhealth.org/article/hidden-health-penalty-seafood-tariffs> (accessed April 24, 2025).
- [45] A. Sherter, C. Yilek, based in Washington, D.C.S. previously worked for the W. Examiner, T. Hill, was a member of the 2022 P.M.W.R.F. with the N.P.F.R.F.B.C. Yilek, Key moments and reaction to Trump’s “Liberation Day” announcement of new tariffs, (2025). <https://www.cbsnews.com/live-updates/trump-liberation-day-announcement-tariffs/> (accessed April 19, 2025).
- [46] A. Bao, China strikes back with 125% tariffs on U.S. goods as trade war intensifies, *CNBC* (2025). <https://www.cnbc.com/2025/04/11/china-strikes-back-with-125percent-tariffs-on-us-goods-starting-april-12.html> (accessed April 19, 2025).
- [47] C.K.W. Peck Emily, U.S. shrimpers cheer on Trump tariffs — but food prices are likely to rise, *Axios* (2025). <https://www.axios.com/local/new-orleans/2025/04/07/tariffs-imported-shrimp-seafood-coffee-how-much> (accessed April 19, 2025).
- [48] J.A. Gephart, P.J.G. Henriksson, R.W.R. Parker, A. Shepon, K.D. Gorospe, K. Bergman, G. Eshel, C.D. Golden, B.S. Halpern, S. Hornborg, M. Jonell, M. Metian, K. Mifflin, R. Newton, P. Tyedmers, W. Zhang, F. Ziegler, M. Troell, Environmental performance of blue foods, *Nature* 597 (2021) 360–365. <https://doi.org/10.1038/s41586-021-03889-2>.
- [49] C.D. Golden, J.Z. Koehn, A. Shepon, S. Passarelli, C.M. Free, D.F. Viana, H. Matthey, J.G. Eurich, J.A. Gephart, E. Fluet-Chouinard, Aquatic foods to nourish nations, *Nature* 598 (2021) 315–320.
- [50] S. Blank, How the United States became a science superpower — and how quickly it could crumble, *Nature* 640 (2025) 599–601. <https://doi.org/10.1038/d41586-025-01146-4>.
- [51] J. Roughgarden, F. Smith, Why fisheries collapse and what to do about it., *Proc. Natl. Acad. Sci.* 93 (1996) 5078–5083. <https://doi.org/10.1073/pnas.93.10.5078>.
- [52] K.W. Shertzer, M.H. Prager, Delay in fishery management: diminished yield, longer rebuilding, and increased probability of stock collapse1, *ICES J. Mar. Sci.* 64 (2007) 149–159. <https://doi.org/10.1093/icesjms/fsl005>.