

9 **Abstract**

10 Recent federal executive actions prioritize restoring American seafood competitive-
11 ness through deregulation and production targets, yet these policies overlook the fun-
12 damental threat posed by climate-driven natural hazards. We argue that true seafood
13 competitiveness cannot be achieved through production gains alone; it requires treat-
14 ing disaster resilience as a form of industrial policy. We use the Gulf of Mexico fisheries
15 as an example of a system increasingly exposed to natural hazards, the main of which
16 are hurricanes. The Gulf generates approximately \$910 million annually in commercial
17 dockside revenue, supports over 250,000 jobs, and accounts for one-third of the nation’s
18 recreational fishing expenditures—all concentrated in states with the highest hurricane
19 exposure in the nation. As such, hurricanes impose a double jeopardy on these fish-
20 eries by simultaneously degrading ecosystems and destroying physical infrastructure.
21 And while federal institutions such as NOAA and FEMA coordinate post-disaster re-
22 lief, these mechanisms remain reactive and administratively burdensome, leaving the
23 sector vulnerable to compounding losses. This climate vulnerability is not unique to
24 the Gulf nor to hurricanes. Other climate-driven impacts such as marine heatwaves
25 and harmful algal blooms are becoming increasingly prevalent and impose analogous
26 shocks in the Gulf, as well as on Atlantic and Pacific fisheries. We propose a three-
27 pillar framework—adaptive governance, a politically insulated safety net, and quantified
28 climate risk assessments—as the foundation for a durable, competitive, and resilient
29 American seafood industry.

30 **Keywords:** climate adaptation, disaster resilience, fisheries management, Gulf of Mexico,
31 hurricane impacts, seafood policy

32 Recent executive actions and federal directives in the U.S. have prioritized restoring
33 American seafood competitiveness to ensure food security and economic growth (Executive
34 Order 14276, 2025). However, policies do not exist in a vacuum, and concurrent climate
35 challenges, such as hurricanes and associated storms, may inadvertently undermine these
36 goals. As climate change drives ocean and atmospheric temperatures, the frequency and
37 intensity of North Atlantic hurricanes are increasing [Vecchi et al., 2021], placing the very
38 regions essential to domestic seafood production in the crosshairs (Fig 1). Here, we analyze
39 the intersection of seafood policy and hurricane disaster management, arguing that true
40 competitiveness cannot be achieved without a comprehensive resilience strategy for the Gulf
41 of Mexico (currently referred to as the Gulf of America by the U.S. government).

42 The Gulf of Mexico is the backbone of the southern coastal economy, yet it faces the
43 highest hurricane exposure in the nation [FEMA, 2025a]. The region generates approximately
44 \$910 million annually in commercial dockside revenue—roughly 15% of the U.S. total—and
45 lands the highest number of commercially harvested shrimp and oysters in the nation [NOAA
46 Fisheries, 2024b]. The Gulf’s recreational sector also contributes significantly to the U.S.
47 recreational fishing economy, accounting for over one-third of the nation’s fishing trip-related
48 expenditures at \$5.1 billion [NOAA Fisheries, 2024a]. Together, the Gulf’s commercial and
49 recreational fishing sectors support over 250,000 full- and part-time jobs [NOAA Fisheries,
50 2024a]. Beyond fisheries statistics, the Gulf also encompasses centuries-old cultural identities
51 and critical food systems. The concentration of these fisheries in states such as Louisiana,
52 Texas, and Florida creates a distinct vulnerability: the most productive and traditional
53 fisheries in the Southeastern U.S. are located in the most hurricane-prone waters (Fig 1).

54 Hurricanes and storms impose a double jeopardy on Gulf fisheries by simultaneously
55 degrading the ecosystem and destroying physical capital. Ecologically, storms induce rapid
56 salinity fluctuations, turbidity, and physical damage to habitats like seagrass and oyster beds,
57 which in turn destabilize food webs and reduce biomass of heavily modified environments
58 [Conner et al., 1989, Monnereau et al., 2015, Rothenberger et al., 2018]. Operationally, storm

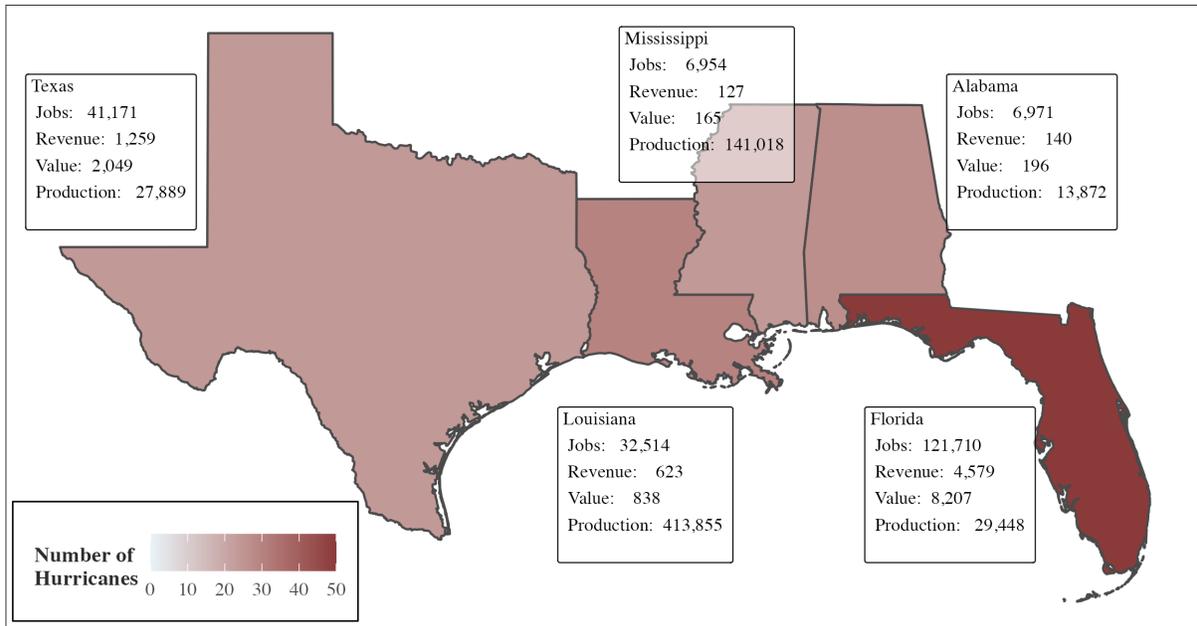


Figure 1: Commercial fisheries production and exposure to tropical cyclones in Gulf states. Colors in the map indicate the number of named storms that have made landfall in each state (2000 - 2025). The insets show fisheries socioeconomic statistics for jobs (number of jobs), revenue (Millions USD), value of the fishery sector as a whole (Millions USD), and seafood production figures (Tons) as reported by NOAA [NOAA Fisheries, 2024a].

59 surge and wind may destroy critical coastal infrastructure such as marinas, icehouses, and
 60 processing facilities, as well as vessels, while effectively halting the labor force as crews focus
 61 on personal recovery [Ingles, 2007, Impact Assessment Inc, 2007, Caffey et al., 2019].

62 Lost catch from disruptions to environmental and operational conditions is costly, with
 63 existing estimates varying widely from \$100,000 to \$100M per storm [Caffey et al., 2007,
 64 Solís et al., 2013]. Damages to commercial seafood infrastructure can be as large as \$260,000
 65 [Erlambang, 2008]. This combination of reduced yields and crippled capacity creates a
 66 feedback loop in which recovery can become slower and more expensive with each subsequent
 67 storm, thereby threatening the long-term viability and competitiveness of the sector.

68 In light of this risk, a complex web of institutions currently attempts to mitigate hur-
 69 ricane impacts. Federal support is bifurcated: NOAA focuses on forecasting and damage
 70 assessment, while FEMA and the Small Business Administration coordinate broader finan-

71 cial recovery through loans and disaster assistance [FEMA, 2025b]. State agencies, such
72 as the Florida Fish and Wildlife Conservation Commission and the Louisiana Department
73 of Wildlife and Fisheries, may bridge local gaps with emergency closures and state-level
74 aid. However, even with this support, fishers indicate that governmental assistance can be
75 administratively burdensome and slow to arrive [Ingles, 2007]. Consequently, recovery of-
76 ten depends on informal networks and NGOs rather than systemic resilience policies, which
77 leaves the sector precariously exposed to future shocks.

78 Despite this evident vulnerability, the current federal trajectory presents mixed signals
79 for resilience. The implementation of the Executive Order on Restoring American Seafood
80 Competitiveness has primarily focused on deregulation, technology adoption, and stream-
81 lining NOAA’s management to boost production and reduce the \$20 billion seafood trade
82 deficit. While this mandate calls for modernizing data collection and making management
83 more responsive to real-time conditions, including environmental shocks, its core emphasis on
84 reducing regulatory burdens and bypassing conservation efforts does not prioritize resilience.
85 Concurrently, NOAA’s ability to provide financial recovery has seen slight improvement fol-
86 lowing the Fisheries Disasters Improvement Act of 2022, which provided new criteria and
87 timeliness for assistance. However, it is our assessment that these changes merely refine the
88 reactive aid process, thereby falling short of implementing preventive strategies that would
89 mitigate losses before disasters occur.

90 Taken together, these factors suggest that the current policy landscape is attempting to
91 optimize the sector’s output in pursuit of a competitive advantage, but without systemat-
92 ically addressing the increasing threat of climate-driven shocks, including hurricanes, that
93 continue to undermine that output. This leaves Gulf fisheries in a delicate state where
94 short-term efficiency gains can be erased by a single catastrophic event.

95 This vulnerability extends to other shocks like marine heatwaves and harmful algal
96 blooms. In the Pacific and Atlantic coasts, for instance, marine heatwaves cause tempo-
97 rary redistribution of target species, leading to 40-60% reductions in biomass and catch

98 [Chaikin et al., 2026, Free et al., 2023, Villaseñor Derbez et al., 2024]. In extreme cases,
99 marine heatwaves can induce total collapse of populations, as observed for snow crab in
100 the Bering sea during 2021 [Szuwalski et al., 2023]. Harmful algal blooms also pose a seri-
101 ous threat to fisheries because high concentrations of toxic micro-algae can trigger fishery
102 closures, leading to large economic losses [Jardine et al., 2020, Mao and Jardine, 2020].

103 Importantly, all of these shocks –hurricanes, marine heatwaves, and harmful algal blooms–
104 are climate- and weather-related events with some degree of predictability. This feature high-
105 lights that reinforcing and expanding support for existing and new programs that monitor the
106 evolution and prediction of these recurrent shocks could further contribute to the formation
107 of robust and proactive fisheries management [Trainer et al., 2020].

108 **From Relief to Industrial Strategy**

109 To achieve the federal mandate of seafood competitiveness, strengthening FEMA and
110 NOAA’s capacity to predict and mitigate the impacts of climate shocks must be viewed as
111 an act of industrial policy rather than simple disaster relief. Historically, the U.S. lags behind
112 other developed nations in long-term investment in climate adaptation for coastal industries
113 [Bakkensen and Mendelsohn, 2016]. We argue that closing this gap requires treating disaster
114 management as strategic investment to stabilize and increase production when possible.
115 This approach could include a) expanding access to affordable index-based risk insurance to
116 reduce reliance on slow-moving federal aid; and b) streamlining Community Development
117 Block Grant–Disaster Recovery funds to prioritize “Build Back Better” grants for essential
118 supply chain infrastructure, such as storm-resistant cold storage and fuel systems. By viewing
119 resilience as a prerequisite for market stability, the U.S. can ensure that the Gulf and other
120 vulnerable regions remain as competitive pillars of the national seafood economy.

121 Achieving durable competitiveness also requires pairing physical infrastructure with ro-
122 bust information to guide decision-making under climate uncertainty. Currently, our under-
123 standing of the impacts of hurricanes and other climate shocks remains fragmented. Existing

124 analyses are often focused on disparate parts of the supply chain and may fail to capture
125 the integrated modern nature of the seafood trade, particularly at the national level. Ad-
126 vancing from reactive relief to proactive management requires a strategic commitment to
127 decision-support science. This involves integrating high-resolution bio-economic models that
128 treat fisheries not merely as biological stocks subject to management, but as sophisticated
129 social-ecological systems that are part of a complex supply chain. Following this framework,
130 scientific efforts should map the dependencies between stock status, fleet mobility, and fish-
131 eries infrastructure, as well as with processing and retail supply chains. With a stronger
132 understanding of the entire value chain—from vessel to consumer—we can transform science
133 into an actionable tool for decision-making.

134 Despite its strategic importance, there are reasons to believe that this scientific capac-
135 ity is currently vulnerable. The recent suspension and restructuring of the Sixth National
136 Climate Assessment (NCA) or the removal of federal climate data repositories represent a
137 withdrawal of essential information that contributes to the sector’s competitiveness. For
138 example, the NCA was designed to provide the high-level insights that policymakers and
139 stakeholders require to understand current environmental trends and volatility. Without
140 the precise and timely assessments championed by the NCA and similar federal efforts, we
141 conjecture, response to climate shocks is likely to remain reactive. Moving beyond this re-
142 active framework and treating ecological monitoring and economic impact assessments as
143 essential public capital, much like the maintenance of physical ports, presents a path toward
144 a proactive management to secure seafood competitiveness.

145 Ultimately, we argue that securing the competitiveness of the Gulf seafood sector re-
146 quires a multi-tier policy approach built on three foundational pillars. First, robust and
147 adaptive governance: Federal and state fisheries rules must remain clear, well-defined, and
148 sustainability-oriented while incorporating the flexibility needed to adapt to dynamic climate
149 realities and absorb climate shocks such as hurricanes, heatwaves and algal blooms. Second,
150 an independent safety net: The sector requires a politically insulated network of financial

151 and logistical support mechanisms, such as index-based insurance and streamlined disas-
152 ter funds. These support mechanisms must provide reliable stability against environmental
153 risk, free from the disruptions of partisan tensions. Third, enhanced clarity on systemic
154 climate risk: Policymakers must follow and deliver science-driven, quantified assessments of
155 hurricanes and other climate-related exposures. These assessments should comprehensively
156 cover the industry, from stock health, fleet operations, infrastructure, to distribution net-
157 works. Ideally, these assessments would be paired with a transparent menu of mitigation
158 and adaptation options tailored to fisheries and coastal communities. Together, we argue
159 that these pillars provide the integrated framework needed to build a truly competitive and
160 resilient American seafood industry, ensuring that short-term efficiency gains endure even
161 amid escalating climate threats.

162 **Acknowledgments**

163 No acknowledgments.

164 **Data Availability Statement**

165 All data and code to produce figure 1 is available at [https://github.com/jcvdav/
166 hurricanes_resilient_fisheries](https://github.com/jcvdav/hurricanes_resilient_fisheries).

167 **Conflict of Interest Statement**

168 The authors declare no conflicts of interest.

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