New England Groundfish Fishery Disaster Report

A HARVARD INSTITUTE OF POLITICS REPORT

SHEYDA ABOII /REBECCA GRZYB/ CODY HE

INDEX

ACKNOWLEDGEMENTS

The authors of this report would like to acknowledge the contributions and support of Massachusetts State Senator Bruce Tarr (R-Gloucester), Laura Simolaris (Director of the National Campaign for Political and Civic Engagement at the Harvard University Institute of Politics), Hirak Shah (Deputy Legislative Director & Deputy Legal Counsel), and Anne Ziaja (Director of Legislative Education).

BACKGROUND

*"This economic disaster is **New England's underwater equivalent of a drought**, where the drops in stocks of fish are causing serious economic harm to fishing businesses, their families, and their communities. These people need help."*

(Metzger, 1)

New England's groundfishery stocks include many bottom dwelling species characteristic of the region such as Cod (Gadus morhua), Haddock (Melanogrammus aeglefinus), Winter Flounder (Pleuronectes americanus), Dabs (Hippoglossoides platessoides), Grey Sole (Glyptocephalus cynoglossus), Pollock (Pollachius virens), Whiting (Merluccius bilinearis) Red Hake (Urophycis chuss), and Redfish (Sebastes fasciatus) (Brewer, 16). The geographic range of the New England fishery spans across portions of the Atlantic Ocean seaward of the States of Maine, New Hampshire, Massachusetts, Rhode Island, and Connecticut (Magnuson-Stevens, 59). Two primary regulatory bodies oversee the conservation and management of the New England Fishery: the New England Fishery Management Council (NEFMC) and the North East Regional Office (NERO) of the National Oceanic and Atmospheric Administration (NOAA).

On September 13th of 2012, the Northeast Multispecies Groundfish Fishery was declared a fishery disaster area for the upcoming fishing year. This issuance was based on scientific findings indicating an unusually slow recovery of fish stocks categorized as overfished. These findings subsequently resulted in far-reaching cuts to fishing quotas, jeopardizing the livelihood of the New England fishing industry itself (Lindsay). Understandably, this determination has sparked much controversy. The announcement will likely pose serious economic implications for the fishing industry. The annual revenue accrued by New Bedford fishermen alone is roughly $20 million and, in all, the groundfish and scallop fisheries contribute about $1.3 billion in annual economic proceedings (Mitchell, para.4). Thus, even the most generous of government aid will likely be unable to wholly supplement the impending loss in annual revenue. In order to sufficiently counter these economic hardships the New England fishing industry is going to need more than just government aid.

While this report does not discount valuable conservation practices, it does take a critical look at the methods currently employed and the unintended effects that these methods might subsequently have on the overall objective of sustaining the environment and our bank of natural resources. The report first considers other factors (besides overfishing) that might be influencing the slow recovery of those groundfish deemed to be overfished. Specifically, the possible effects of climate change on the fishing industry are discussed. We then delve into the persistent mismatch between the science used to make official decisions regarding fishing quotas and local understandings among fishermen. Finally, the report discusses the implications of these findings on fishermen mitigation strategies overall.

ROLE OF CLIMATE CHANGE

"The federal disaster determination was a direct result of a document released on August 2, 2012 by the New England Fisheries Management Council (NEFMC) and the National Oceanic and Atmospheric Administration (NOAA) that indicated ***reductions ranging from 45% to 73% in the FY 2013 Annual Catch Limits*** *(ACLs) for a number of stocks in the groundfish fishery."*

(Mitchell Letter)

Despite the controversy that the phrase "global warming" still stirs in the public arena, it is widely accepted in the scientific community that significant climate changes will occur due to current emissions of greenhouse gases (Palmer & Räisänen) Climate change has the potential to alter all aspects of life, but has special consequences for the world of ocean biology. With climate change comes environmental change and the potential to wreak havoc on the delicate ecosystems of the ocean. However the changing ocean landscape is not just a problem for animals, it influences humans as well. The success of the fishing industry for example, is largely dictated by ecological cycles that in turn influence the rise and fall of commercially important fish stocks. In order to combat this, regulatory measures, such as catch limits, are established. These measures aim to minimize the harm to the ecosystem in order to avoid large drops in fish stocks for these purposes. However, no such regulatory measures are in place to tackle the problems that climate change poses. In the past fifty years, as global atmospheric temperatures have risen, the world's oceans have also experienced a net warming (Trenberth; Levitus, Antonov, Boyer, & Stephens). Fishes that have adapted physiologically to live within a specific range of environmental variation become threatened by these environmental changes which put significant stress on fish species and decrease survivability (Barton). However, a species' tolerance of an increase in temperature is not the only way climate change will affect ocean biology. Additionally, the temperature change resulting from global warming can cause lower oxygen content in the oceans which can lead to harmful effects on fish (Moyle & Cech). By impacting the physiology, development, reproduction and overall survivability of fishes, these changes will likely influence fish stocks (Brander). This report explores how the depletion of oxygen concentration and the limits of temperature tolerance among species of fish, could affect the fishing industry.

The effect of rising ocean temperatures is particularly concerning for the future outlook on global fisheries. Shifts in temperature are much more significant to fisheries when contrasted to other food production systems. This is due to the fact that fish are *poikilothermic*, meaning that their body

temperatures vary according to the temperature of their habitat. Thus, temperature changes can influence a wide range of factors regarding a fish species' metabolism, growth rate, productivity, seasonal reproduction, and even susceptibility to diseases and toxins (United Nations). Studies have shown that higher surrounding temperatures increase metabolic activity in fish. Cod, for example, tend to decrease in size as the temperature of their surroundings become warmer (Roessig et al.). However, increasing temperatures not only affect the physiology of individual fishes, but also impact the overall ecology of the marine system. Changing temperatures can affect the growth of the primary producers of the system, such as algae and phytoplankton, which in turn affects higher-level organisms such as fishes. Additionally, temperature-induced shifts in distribution may occur as fish seek habitats with optimal temperatures (Roessig et al.).

Another point of concern is the effect of climate change on ocean oxygen levels. Climate change models predict that the warming oceans will become less oxygenated posing detrimental consequences to fisheries around the world. Low oxygen levels can impact the physiology of fishes, affecting their size and metabolism. A recently published model predicts that lower oxygen sea levels could cause fish sizes to shrink by almost twenty percent over the next fifty years (Cheung et al.). This has direct consequences for the fishing industry, which favors larger fish. Additionally, the growth of low-oxygen zones, or large areas of ocean where primary producers have largely depleted the water of oxygen, remains of concern. A recently published scientific paper showed that low-oxygen zones are growing, and are increasingly sensitive to small climate changes (Deutsch, Brix, Ito, Frenzel, & Thompson). These low-oxygen zones can cause entire marine ecosystems to die off, which could be devastating to commercial fisheries.

Despite the controversy that the idea of climate change has created, ample evidence has already come to light to support the validity of the theory. In fact, some early evidence of the impact of climate change on fish has already been reported. This evidence, involving poleward expansions of warmer-water species and poleward contractions of colder-water species suggests that the proposed effects on ocean biology are already occurring. Shifts in ocean salinity due to rising temperatures have also already been recorded, with near-surface waters in the more evaporative regions of most of the world's oceans increasing in salinity, while marine areas in high latitudes are showing decreasing salinity due to greater precipitation, higher runoff, melting ice and other atmospheric processes.

Climate change therefore, will directly impact the fishing industry. As the factors of temperature tolerance and oxygen concentration of fish are affected by climate change, the fishing industry may experience dramatic changes to fish stocks. Commercial fishermen may experience a decrease in available stocks or substantial relocation of fish stocks due to climate change effects (Roessig et al.). Further, the possible effects of climate change on the fishing industry underline the importance of considering these backdrop effects when attempting to locate the causes behind the recent fishery disaster. With fishing quotas at remarkably low levels, overfishing at this point seems increasingly less likely to be the only aggravating factor (Conathan, 23). Rather, the slow recovery of at-risk fish stocks may also be due to larger environmental processes altering the biology, physiology and migratory patterns of groundfish.

This section intentionally left blank.

SCIENTIFIC MODELS & QUOTAS

"It is further declared to be the policy of the Congress in this Act to assure that the national fishery conservation and management program utilizes, and is based upon, the ***best scientific information available****."*

(Magnuson-Stevens Reauthorization Act, 3)

Historically, the management of New England's groundfish stocks has incorporated fleet quotas, gear restrictions, days-at-sea limitations, and the installation of quota-bearing sectors (Brewer; Schrope). The earliest attempts to manage groundfish stocks began with the installation of fleet and trip quotas by the National Atmospheric and Oceanic Administration (NOAA) in 1977 (Brewer). Fleet quotas allocated catch-shares (or the catch volume deemed allowable) according to vessel size while trip limits constricted the number of times a fishing vessel could go out to sea per day and per week (Brewer, 22). These early restrictions, however, led to unintended consequences. The most notable of which were increased nearshore fishing (which led to a depletion of stocks in this critical area) and increased dumping of already-dead but legally forbidden hauls (Brewer, 22).

Fishing gear restrictions have also featured prominently in the management of New England's groundfish resource. In 1953, minimum net mesh sizes were first established and have been modified numerous times thereafter (Brewer, 22-23). Management of days-at-sea has been another prominent aspect of New England's groundfish conservation effort in the past (Brewer, 25). Limiting days-at-sea, however, also posed negative consequences (Brewer, 23). In particular, fishermen were more likely to risk their lives in order to maximize their hauls during the time allotted, and fewer fishermen opted to fish away from the nearshore area since time spent navigating meant less time hauling. This in turn, further aggravated groundfish depletion nearshore (Brewer, 23).

A more recent management strategy has relied on quota-holding groups of fisherman, or sectors to encourage greater conservation of groundfish resources (Brewer, 25; Schrope, 541). The implementation of sectors was originally intended to foster greater conservation awareness among members of the fishing community. Yet, the allocation of catch-shares to these sectors based on historical landings (from 1996-2006) has centralized control in the hands of the few hauling in large sums of fish while simultaneously excluding small boats averaging moderate hauls (Brewer, 25).

Overall, the historic view of the New England fishery management system indicates an increasing reliance on catch-shares. This underscores the importance of allocation schemes (*how we decide who gets what*), the accuracy of population modeling *(how we decide that a certain species of*

fish is being overfished), and the methods by which quotas are officially established *(how we determine how to curb overfishing when a species is believed to be under duress)*.

The *Magnuson Fishery Conservation and Management Act (MFCMA)* was first established in 1976 to regulate the New England groundfishery (Crestin, 339). The reauthorization of the Act in 2007 put forth two new mandates: to eliminate the practice of overfishing (or the taking of fish above a sustainable level) by 2010 and to set total allowable catch each year for every stressed population (Magnuson-Stevens Act; Schrope, 541). The Act stipulates that NOAA scientists conduct *annual assessments* for each and every managed population. However, in most cases assessments are done about *once every five years* given NOAA's limited resources (Schrope, 541).

The narrow focus of the Act on single-species rather than cross-species indicators parallels the philosophy behind catch-shares or fish quotas. Both run the risk of neglecting larger ecosystem-based concerns by overlooking the sum of the ecological parts to focus on discrete considerations (Brewer). Catch-shares, which in theory are set using the annual findings of NOAA scientists, may over or under-compensate for perceived fluctuations in population well-being given the irregularity of assessment. And catch-shares may provide a negative incentive for fishermen to narrow their options. Whereas fishermen were capable of diversifying their pursuits before catch-shares were implemented (a practice that often proved environmentally sustainable), they now tend to focus on particular species as per the suggestion of catch-shares (Brewer, 21). Catch-shares can also be leased or sold, a characteristic that has allowed for the consolidation and increasing capitalization of the industry (Schrope, 540).

An interesting aspect of the modern fisherman's dilemma centers around the fact that historically, fisherman pursued diversified and environmentally-responsible practices (Brewer, 2011). In the communities of multigenerational fishermen which comprise many seaports in the New England region, the fishing tradition has long relied on a resilient understanding of environmental conditions and a tendency to diversify fishing operations in order to eliminate undue strain on any one species of fish (Mirarchi; Brewer). However, recent attempts to regulate fishing practices may have provided fishermen perverse incentives to stray from these traditional roots (Brewer).

When catch-shares were first explicitly proposed in the early 1990s, fisherman believed that such restrictions would jeopardize their livelihoods (Economist). Some fishermen went out of their way to circumscribe the regulations often falsifying their records (Mirarchi). Even today, Brewer (2011) reports that strong opposition to catch-shares remains among a considerable portion of the fishing community. In particular, a collection of public comments compiled by NOAA in 2010 reveals that among commercial and recreational fishermen, between eighty-three and ninety percent are opposed to catch-shares (Brewer, 16). Much of this opposition stems from the growing belief that catch-shares crowd out small fishermen, consolidating access and decision making into the hands of the few who are well-capitalized (Brewer, 16, 18; Schrope, 452).

The above discussion indicates the convergence of social and environmental concerns in the New England groundfish industry. Brewer indicates that a scientific understanding of this interaction between social realities and environmental conditions is lacking. There is a need for a greater understanding of how fishermen adapt to regulations, how accurately regulations reflect the environmental realities, and how compliance or non-compliance (usually fueled by growing disillusionment on the part of fishing communities) affects the efficacy of the regulations set in place. Sutinen & Upton connect this idea to the problem of acute *short-sightedness*, stating that current management techniques abandon the long-term view for the short-term perspective. Finally, given the

day-to-day interaction of fishermen with the environment and their ability to track local changes in fish populations, it is surprising that some form of a real-time data entry/share system does *not* exist (Brewer). Currently, fishermen do not have a direct opportunity to insert their observations into the stream of data later used to construct policy decisions. This is a disconnect that ought to be reconciled for the benefit of the New England fishery and the well-being of New England's historic fishing communities.

Given the undercurrent of mistrust between New England's fishermen and the regulatory bodies that govern management and conservation of the groundfish resource, a real-time data sharing system could help calm troubled waters under the bridge (Conathan, 30). A report by the Center for American Progress describes how a lack of communication between regulators, scientists and fishermen continues to breed distrust and undermines the overall conservation effort (Conathan, 31). Thus, a system that incorporates and utilizes the day-to-day observations of fishermen while also making scientific understandings of the environment accessible and transparent could be of remarkable use in mending overall relations. This should, therefore, be among the critical considerations visited moving forward.

This section intentionally left blank.

MITIGATION IMPLICATIONS FOR FISHERMEN

"Even if Congress appropriates $100 million in aid for the New England groundfish fishery, the forecasted cuts would undoubtedly deal ***a devastating economic blow*** *to New Bedford and permanently eliminate hundreds ... of jobs."*

(Mitchell Letter, para. 5)

Despite the prospect of government handouts, the fishermen are not satisfied. There is widespread fear that the industry will not be able to survive this type of economic hardship and this fear is not wholly unfounded. While a government aid bundle will likely be given to New England fishermen, other facets of the fishing industry — e.g. ice suppliers — will not receive government aid. If these tangential industries capsize within the next year, there is a high likelihood that the shockwaves from such losses could seriously harm the overall fishing industry.

Thus, it is important to consider alternative relief models that might work to strengthen the fishing industry as well as aligned industries involved in fish processing. Rather than viewing the fishing industry in a vacuum, policy-makers should consider the industry as a sum-of-many-parts operation. Here, a glance back at the historic practices of local fishermen could provide some direction forward. As discussed by Brewer, fishermen historically diversified their activities to support their livelihoods in the event of poor catch totals. Directing relief funds towards the development of alternative or supplemental economic activities could provide better long-term support for fishermen and other industries implicated in the overall fish processing market.

And while a focus on the collection of environmental data to better direct conservation efforts is certainly warranted, there should also be an attendant focus on the collection of data surrounding the socio-economic deficits sustained by fishing communities. By developing a better understanding of the needs of local fishermen and those involved in related industries, funds can be more effectively appropriated. To specifically achieve this understanding, individuals should be placed directly in the field to increase the transparency of regulatory bodies and to foster long-term interactions between fishing communities and conservation representatives. Much like the placement of active observers aboard fishing vessels to ensure the implementation of conservation measures, observers should be sent to fishing communities to facilitate clearer lines of dialogue between those areas affected the most by the recent disaster declaration and those who will be shaping the future policies.

This section intentionally left blank.

RECOMMENDATIONS FOR FURTHER INQUIRY

The need to conserve our precious groundfish resource and to support our local fishermen are not mutually exclusive. This paper contends that it is not necessary to throw out all current scientific understandings of the New England fishery. However, we have found that recent understandings of the environment, ongoing conservation mechanisms, and currently employed mitigation strategies could be adjusted to better align with the needs of fishing communities and those target fish stocks believed to be at-risk.

In particular, we recommend that overall trends in climate change be considered in drafting causality claims. While overfishing certainly plays a role in exacerbating declines in fish stocks, it certainly is *not the sole cause*. Taking a second look at backdrop environmental changes could better inform policy-makers especially as they weigh in on conservation needs and the economic livelihoods of local fisherman. Clearer lines of communication and data-sharing ought to be established so as to minimize the growing (if only perceived) gap between local day-to-day observations and scientific findings. A focus should be placed on rebuilding trust between fishing communities and regulatory bodies. Trust is a crucial medium in the long-term effort to sustain resources and maintain environmental quality. Finally, mitigation strategies should turn away from the inclination to throw lump-sums of cash at fishing communities. Rather, a focus on developing alternative economic activities for fishing communities during periods of environmental duress should take precedent. Thus, this report has highlighted a few questions for further inquiry:

- How are overall trends in **climate change** differentially affecting different species of groundfish?
- What push/pull factors exist to lose fishermen **compliance**?
- If **disillusionment** still characterizes how fishermen relate to regulatory bodies, what steps can be made to amend this dynamic?
- What steps can be taken to develop **real-time data systems**?
- When do fishermen have the **opportunity to directly interact** with the scientists conducting population assessments?
- What **alternative economic sectors** could be developed to further support fishing communities?

WORKS CITED

Barton, B. A. "Stress in Fishes: A Diversity of Responses with Particular Reference to Changes in Circulating Corticosteroids." *Integrative and Comparative Biology.* 42.39(2002): 517-525. Web. 09 Dec 2012.

Brander, K. "Impacts of climate change on fisheries. *Journal of Marine Systems,* 79.3–4(2012): 389-402. Web. 10 Oct 2012.

Brewer, Jennifer F. "Paper Fish and Policy Conflict: Catch Shares and Ecosystem-Based Management in Maine's Groundfishery." *Ecology and Society*. 16.1(2011):15. Web. 11 Oct 2012.

Cheung, W. W. L. et. al. "Shrinking of fishes exacerbates impacts of global ocean changes on marine ecosystems." *Nature Climate Change*. (2012). Web. 10 Dec 2012.

"Climate change will have strong impact on fisheries." *Food and Agriculture of Organization of the United Nations*. 2008. Web. 11 Dec 2012.

Conathan, Michael. "The Future of America's First Fishery: Improving Management of the New England Groundfishery." Center for American Progress. May 2012. Web. 17 Dec 2012.

Crestin, David S. "Federal Regulation of New England Fisheries: A Different Point of View." *Northeastern Naturalist.* 7.4(2000): 337-350. Web. 12 Oct 2012.

Deutsch, C., Brix, H., Ito, T., Frenzel, H., & Thompson, L. A. "Climate-forced variability of ocean hypoxia." *Science,* 333.6040(2011):336-339. Web. 11 Dec 2012.

"Fishing: A Day at Sea." *The Economist*. 323.7759(1992):29. Web. 12 Oct 2012.

Levitus, S., Antonov, J. I., Boyer, T. P., & Stephens, C. "Warming of the world ocean." *Science,* 287.5461(2000), 2225-2229. Web. 16 Dec 2012.

Lindsay, Jay. "Feds Consider Opening New England Fishing." *Associated Press.* 15 Dec 2012. Web. 17 Dec 2012.

Metzger, Andy & Norton, Michael. "Disaster Declaration Issued for New England's Groundfish Industry." *State House News Service.* 13 Sept 2012. Web. 14 Sept 2012.

Mirarchi, Frank. "Thirty-Five Years on the Waterfront: A Fisherman's Perspective". *Northeastern*

Naturalist.7.4(2000): 373-378. Web. 12 Oct 2012.

Mitchell, Jonathan F. "New England Fisheries Management Council." Letter to Members of the New England Fisheries Management Council. 26 September 2012. TS

Moyle, P. B., & Cech, J. *An introduction to ichthyology*. Englewood Cliffs, New Jersey: Prentice Hall, 1988. Print.

Palmer, T., & Räisänen, J. "Quantifying the risk of extreme seasonal precipitation events in a changing climate." *Nature,* 415.6871(2002): 512-514. Web. 11 Dec 2012.

Roessig, J., Woodley, C., Cech, J., Jr., & Hansen, L. "Effects of global climate change on marine and estuarine fishes and fisheries." *Reviews in Fish Biology and Fisheries,* 14.2(2004): Web. 12 Dec 2012.

Schrope, Mark. "What's the Catch". *Nature*. 465(2010): 540-542

Sutinen, Jon G. & Upton, Harold F. Economic Perspectives on New England Fisheries Management. Northeastern Naturalist. 7.4 (2000): 361-372. Web. 15 Oct 2012.

Trenberth, K. E. "The use and abuse of climate models". *Nature,* 386.6621(1997):131-133. Web. 15 Oct 2012.

United States. Dept. of Commerce. National Oceanic and Atmospheric Association. *Magnuson - Stevens Fishery Conservation and Management Act.* Washington: GPO, 2007. Web. 10 Oct 2012.