

## CORRESPONDENCE

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**NORTHEAST HOOK  
FISHERMAN'S ASSOCIATION**

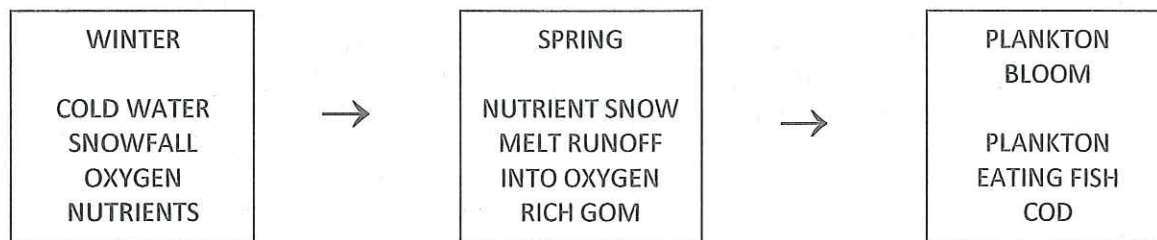
August 24, 2014  
New England Fishery Management Council  
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116  
Thomas A. Nies, *Executive Director*



Dear NEFMC & NMFS:

We represent a small group of Commercial Fishermen with the Limited Access Handgear HA Permits, employing the use rod and reel, handlines or tub trawls to catch Cod, Haddock and Pollock along with small quantities of other regulated and non-regulated marine fish.

We are very concerned with the latest GOM cod stock assessment. We propose the reason for the "surveyed" drop in GOM cod stocks was directly attributed to the record high climate temperatures and associated GOM record warm water temperatures for the winter 2012 & 2013 year. The normal cyclic ecology of the GOM, shown below, was disrupted.



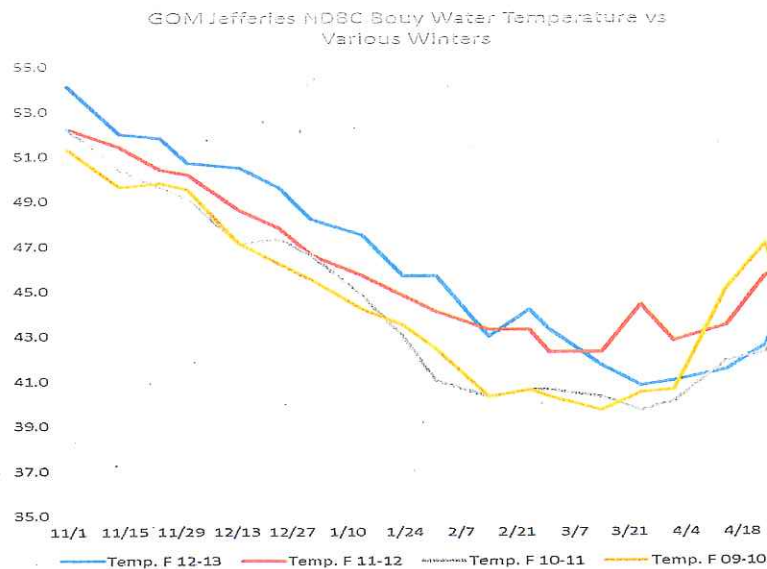
*"In 2012, the contiguous United States (CONUS) average annual temperature of 55.3°F was 3.2°F above the 20th century average, and was the warmest year in the 1895-2012 period of record for the nation. ... Precipitation totals in 2012 ranked as the 15th driest year on record."*  
<http://www.ncdc.noaa.gov/sotc/national/2012/13#cei>

*"But when temperature sensitive historically native to the GOM fish disappear we don't necessarily know where they specifically went to find cooler water."* Fisherman's Voice August 2013, Volume 18, No. 8  
<http://www.fishermensvoice.com/201308MarineHeatWaveResearchAtGMRI.html>

*"Water temperature impacts on Atlantic cod biology and ecology are well documented (Drinkwater 2005). For example, shifts in the distribution of cod to cooler, deeper water have been identified on Georges Bank when bottom temperatures exceed 10°C (Serchuk 1994)." "Cod are a subarctic species, and the stocks in the Gulf of Maine and on Georges Bank are at the southern limit of their range." The Future of Cod in the Gulf of Maine, Gulf of Maine Research Institute, June 2013*

je/jp

The data shows how warm the GOM was from 2012-2013.



All indications are that the winter of 2012 and 2013 severely disrupted the ecology of the GOM. The GOM water was at a record high. There was less oxygen & nutrients present for the seasonal plankton bloom in the GOM. This caused the forage fish (herring & mackerel) to change their migration patterns. We believe the GOM cod shifted their migration or dispersed from seasonal aggregations due to the weather anomaly that occurred during winter of 2012 and 2013. **Stock assessments that include this weather anomaly is not an accurate assessment of the GOM cod since the cod were not present, in their normal abundance to count.**

Questions:

1. What was the plankton counts for the winter 2012-2013 compared to previous years?
2. What was the abundance of herring, mackerel & silver hake for the winter 2012-2013?
3. If the data from the winter 2012 & 2013 was discarded, as an ecological anomaly, what would the status of the GOM cod stock be?
4. What does the data from the 2014 fishing year for GOM cod stocks show?

For all the forgoing scientific data and unanswered questions we are requesting that the latest stock assessment for GOM cod be held in abeyance and not used to change the ACL for the 2015 fishing year.

Respectfully,  
Marc Stettner /s/

NEHFA MEMBERS: Marc Stettner, Timothy Rider, AJ Orlando, Hilary Dombrowski, Paul Hoffman, Christopher DiPilato, Ed Snell, Scott Rice, Roger Bryson, Brian McDevitt, Anthony Gross, Doug Amorello

# The Future of Cod in the Gulf of Maine

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JUNE 2013

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**Gulf of Maine  
Research Institute**

Science. Education. Community.



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*Abstract: Abundant cod have supported a commercial fishery in the Gulf of Maine for more than 400 years. In 2008, after decades of overfishing, the Gulf of Maine cod stock appeared poised for recovery as the industry began the transition to a catch share-based management system known as sectors. However, a subsequent assessment in 2011 found that the stock was still overfished. Beginning with the 2013 fishing year, quotas of Gulf of Maine cod will be reduced by 78%, dealing a sharp blow to an already struggling industry. Here, we review potential causes for the lack of recovery of the stock and suggest strategies to build the sustainability of the stock and the industry. We highlight the value of understanding the impact of environmental changes, including rising temperatures and changes in forage fish abundance, and the need to develop a comprehensive picture of stock structure and life history variability. Including environmental conditions and more realistic stock structure in assessment models is necessary to accurately monitor the stock and to design new management strategies. Finally, the steep cut in cod quotas creates a strong incentive for fishermen to reduce their catch of cod while targeting more abundant species such as pollock. Innovations in fishing gear and business planning could help the industry be more profitable by reducing fuel costs and maximizing the value of their catch. The steep challenges facing cod and the cod fishery are shared by many other fisheries, and strategies to understand and rebuild this stock and its fishery should be transferrable to other fisheries struggling to adapt to climate and economic changes.*



Since the first Europeans came to New England to catch cod over 400 years ago, the cod fishery has been an important part of the social and economic fabric of communities around the Gulf of Maine (Figure 1). Now, the viability of the cod fishery in the Gulf of Maine is threatened by an unexpected decline in abundance. Several factors, including environmental changes and fishing, have likely contributed to the reduced abundance of cod, and efforts to stem this decline over recent decades have been largely unsuccessful.

Ensuring that the Gulf of Maine cod fishery is both ecologically and economically sustainable will require improved understanding of this species and new management strategies. Although our discussion will focus on cod, the issues we present are equally relevant to other fish species in the Gulf of Maine, including haddock, pollock, and flounder, many of which are

caught and managed together with cod as part of the groundfish fishery. The challenges facing cod, such as those from changing economics and climate, are shared by species and fisheries around the world.

## History of the Gulf of Maine Cod Fishery through 2008

At the turn of the twentieth century, fishermen in the Gulf of Maine targeted cod, haddock, and other groundfish on sail-powered vessels using hook and line gear. The fishing grounds extended between Cape Cod and the Grand Banks, and over 800 dory schooners landed around 30,000 metric tons (mt) of cod annually (Murawski et al., 1998). At this time, Gulf of Maine cod represented around 40% of these annual landings (Figure 2). Over the next few decades, a suite of key technological developments

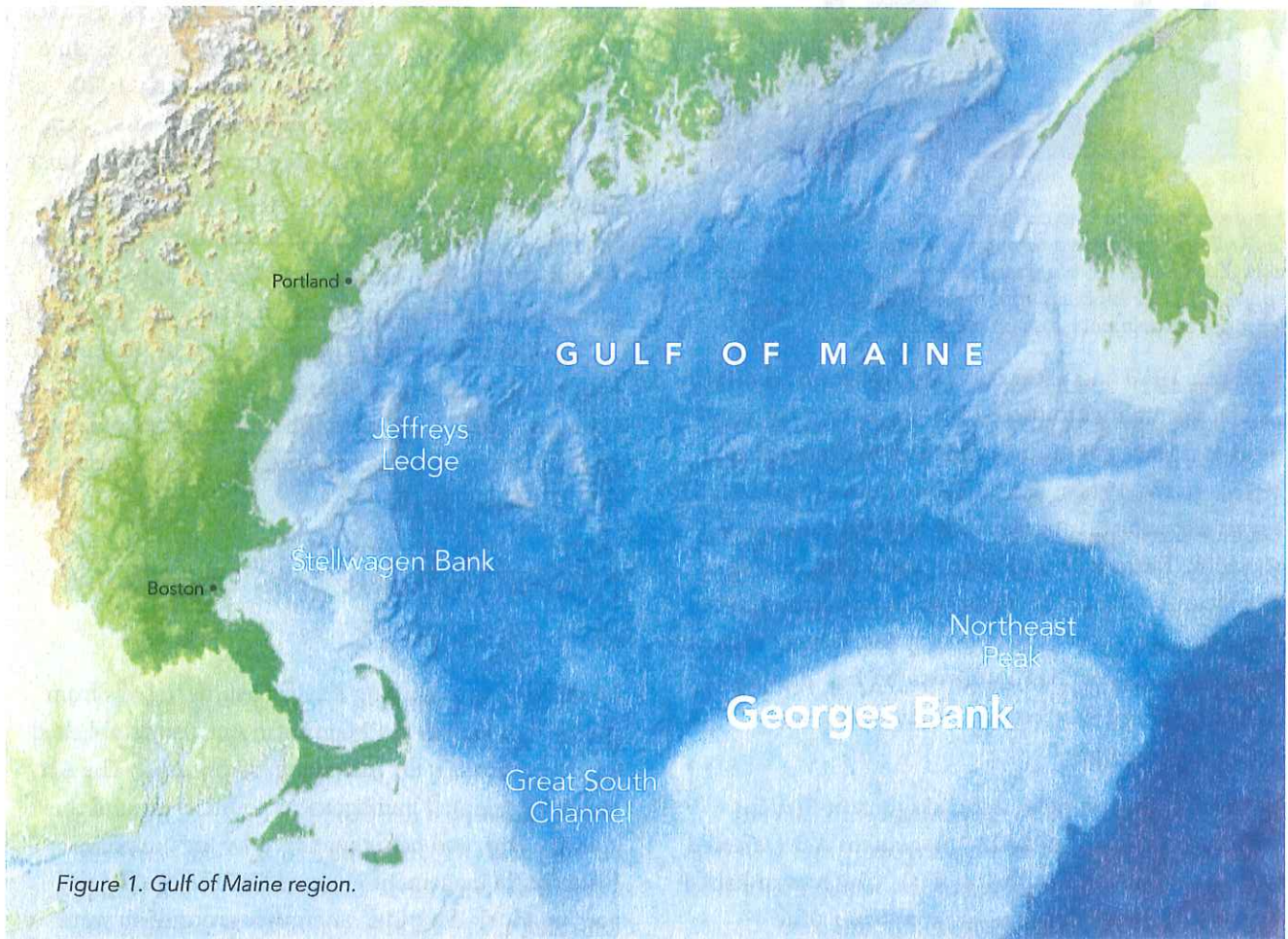


Figure 1. Gulf of Maine region.



were introduced that had a profound impact on cod stocks. By 1910 steam-powered trawlers were common (Murawski et al., 1998). These trawlers could pull larger nets through the water at higher and more consistent towing speeds and could quickly move between fishing grounds to maintain high catch rates. The modern otter trawl was introduced at this time, and this gear swept larger swathes of the seabed during a single tow. Along with improvements in ice-making and onshore transportation, these developments permitted significantly larger volumes of high quality fish to be landed, processed, and delivered quickly to distant consumers.

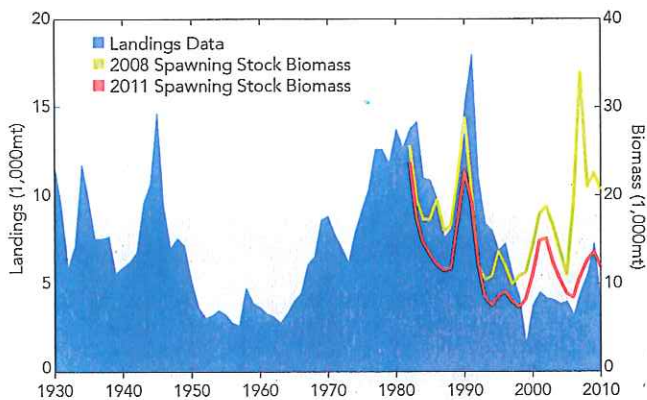


Figure 2. History of the cod fishery and cod population in the Gulf of Maine depicted through landings of Gulf of Maine cod (NAFO Area 5Y, blue bars, axis on left) and estimated spawning stock biomass from the 2008 (green) and 2011 (orange) assessments (axis on right).

Between 1910 and 1950 cod landings were relatively stable, averaging around 8,000–10,000 mt per year despite significant annual variation (Murawski et al., 1998). In the 1960s, fishing fleets from outside the US began expanding into the Gulf, and landings of cod, haddock, flounders, and other groundfish increased significantly (Figure 2). These fleets had large factory trawlers with onboard processing and freezer capacity, larger fishing gear, and sophisticated fish finding technology, and they could remain at sea in the heaviest of weather.

In 1976, Congress passed the Magnuson-Stevens Fishery Conservation and Management Act (referred to hereafter as the Magnuson Act), which established the US's claim to an exclusive economic zone



extending to 200 miles offshore. The exclusion of the foreign fleet prompted a resurgence of local interest in groundfish, and New England fishermen constructed or purchased large, steel trawlers that could exploit the offshore groundfish stocks. In the early 1980s, an increasing number of trawlers and gillnetters, using ever more sophisticated fishing gear and wheelhouse electronics, significantly increased annual landings of cod to around 14,000 mt per year, peaking at over 17,000 mt in 1991. As the next decade approached, groundfish landings declined, and between 1995 and 2008, total cod landings from the Gulf of Maine and Georges Bank hovered around 4,000 mt annually (NEFMC, 2013). By 2008 the total number of boats landing groundfish had declined by 50% to around 700 (NEFMC, 2013).

## Management and Stock Assessments

In addition to excluding foreign fishing vessels from the Gulf of Maine, the Magnuson Act also established a new framework for managing US fisheries. The Act created 8 regional management councils around the country with cod being managed by the Northeast Fisheries Management Council (NEFMC). Initially, cod, haddock, flounder, and other groundfish were



managed separately, but in 1985, all groundfish were brought under a single management plan. Although a variety of controls, including gear restrictions and area closures, have been used to limit the catch of groundfish, the most enduring strategy involved limiting the number of days a vessel could fish each year. By the mid-2000s, managing the fishery through “days-at-sea” effort controls required an increasingly complex series of area closures (to protect spawning fish and limit mortality), limits on the number of fish landed per trip, and differential days-at-sea counting (where, for example, one day at actual fishing counted as two days in certain areas).

The Magnuson Act, refined in the 1996 Sustainable Fisheries Act and then reauthorized in 2006, established the goal of managing fisheries at their optimal yield. This requires an estimate of how many fish are in a stock and how quickly new fish are being produced. Monitoring the number and weight of fish landed provides a rough indicator of the status of the stock. This knowledge can be enhanced by systematic surveys such as the bottom-trawl surveys conducted in the Gulf of Maine by National Marine Fisheries Service (NMFS), Maine, and Massachusetts. To get a more accurate estimate of the abundance and the population rates, fisheries scientists use statistical models to blend information from multiple sources, a procedure known as a stock assessment. The mathematical models at the heart of a stock assessment relate the number of fish in one year to the number in the next year using general biological information such as age, growth, size or age at maturity. Observations of the number of fish from research surveys and from the commercial and recreational catch are then used to constrain the model. The resulting model provides estimates of parameters of interest such as stock size (both numbers and weight), fishing mortality rate, and recruitment to the commercial fishery. If the data are sufficient, the models can be used to predict future stock sizes given various alternative scenarios of catch, recruitment, or growth. Most current stock assessment models do not incorporate information about how ecosystem conditions (for example, temperature or the

abundance of predators and prey) influence vital rates or, ultimately, stock size.

Stock assessments estimate the current state of the population, typically described by the total biomass of fish ( $B$ ), and important rates including recruitment and the rate at which fish are being caught ( $F$ ). Assessments also allow scientists to estimate the biomass and fishing mortality rates that produce the maximum sustainable yield ( $B_{MSY}$  and  $F_{MSY}$ , respectively). These variables describe the status of the fishery. If the biomass is less than half of MSY ( $B < 0.5B_{MSY}$ ), then the stock is considered to be overfished. This is distinct from overfishing, which is defined based on the rates. Technically, overfishing is occurring if  $F > F_{MSY}$ .

The 2008 stock assessment used a Virtual Population Analysis (VPA) model for Gulf of Maine cod and data through 2007 (NEFSC 2008). Beginning in 1982, the first year in the assessment, the stock was considered to be overfished (low biomass) with overfishing occurring (catch rates too high). The assessment found that biomass in 2007 was increasing and that the stock was no longer overfished, although overfishing was still occurring. More importantly, the assessment estimated that the population would be rebuilt by 2014. The picture from the assessment was that Gulf of Maine cod were recovering and that the fishery was one of the success stories in fisheries management. In 2008, as revolutionary changes in management were being considered for the fishery, the real picture of the stock was, in fact, much bleaker.

## 2008-2012: Changing Fishery, Changing Fish

With the reauthorization of the Magnuson Act in 2006, managers had a new set of federal mandates, most notably requirements to implement annual catch limits (ACLs) and accountability measures. Annual harvests could no longer exceed the limit set by the best available science, and regulations had to be in place to ensure the harvest stayed within those limits. The days-at-sea management system would require in-season adjustments to meet these standards. These adjustments



had the potential to create a dangerous “race-to-fish” in which fishermen would try to catch fish early in the season, regardless of weather, before any adjustments were imposed.

As an alternative to effort controls, the NEFMC introduced sector management at the beginning of the 2010 fishing year. Sectors are cooperatives of groundfish permit holders that receive an annual allocation of groundfish stocks. Under sector management, the total allowable catch for each groundfish stock is divided among sectors according to the catch history of each sector’s membership from 1996 to 2006. Thus, a sector’s allocation of Gulf of Maine cod reflects the historical proportion of the commercial harvest that its members landed during that time period—if they collectively accounted for 10% of the cod landings from 1996 to 2006, then the sector is allocated 10% of the commercial catch limit. Permit holders who do not wish to join a sector can remain under days-at-sea management and fish within the common pool, which shares any allocation not represented under sectors. The switch to sectors was met with strong reservations, but many fishermen were also optimistic that the new flexibility in when, how, and where to fish would allow for improved profitability.

The optimism in the fishery was shattered by the 2011 cod stock assessment. The 2011 assessment used both a new model and new data (NEFSC, 2012). The model made improvements in three key areas: (1) it allowed for full accounting of fishery removals, including commercial and recreational discards and direct estimation of commercial discards-at-age; (2) it allowed for a better representation of Gulf of Maine cod biology, including a revised length-weight relationship; and (3) it better accounted for the uncertainty in the underlying data (e.g. recruitment indices) and allowed for more thorough exploration of alternate model formulations. Several new data sets were incorporated into the 2011 assessment. These data were collected prior to the 2008 assessment, but further analysis was needed before they could be used. The new assessment concluded that the stock was in fact overfished and likely was also much lower in 2007 than previously estimated.

So why was there such a large difference between the 2008 and 2011 assessment results? After extensive analysis, fisheries scientists concluded that the revision to the 2007 estimates was not due to the new model: using the original VPA model would have led to the same conclusions about the stock. The reevaluation of the assessment concluded that most of the new data produced only minor changes to the stock status. The exception was the more explicit treatment of discards-at-age in 2011. The 2008 assessment assumed the size composition of discards was identical to the landings when in fact many of the discards were below the minimum fish sizes allowed. The change in the data meant that biomass was, in fact, lower than estimated. Additionally, high (but variable) indices of abundance from the NEFSC spring survey led to overly optimistic estimates of the 2003 and 2005 year classes which contributed to the view of a rebuilding cod stock.

Indicators from fishery-independent data support the conclusion that the stock was not healthy. Research survey indices for 2009–2012 were at or near historical lows, and the number of tows that caught cod declined region wide (NEFSC, 2012). There was also a large decrease in the abundance of juveniles in the 2009–2011 trawl surveys, and poor recruitment was evident over the past five years. The distribution of fish is now concentrated in the western Gulf of Maine which may indicate a contraction in range or depletion of unique subpopulations in the eastern Gulf of Maine. Although the fishery was able to maintain a relatively high catch-per-unit-effort by following the fish westward, landings declined in concert with abundance. Today, the Gulf of Maine cod stock remains at very low levels, and the picture is not merely of a stock that has been overfished, but one that is performing poorly, threatening the viability of the fishery.

## The Future of Cod in the Gulf of Maine

As of 2013, it is clear that the Gulf of Maine cod stock is in a state of low abundance and the cod fishery is in crisis. Some of the trends in the stock appear similar



to the situation that unfolded in Newfoundland two decades ago (see sidebar). The stock is faring poorly, and fishing alone cannot account for its reduced performance. Successfully weathering the current storm and emerging with a healthy stock and sustainable fishery will require a concerted effort to understand the factors driving the poor stock performance and to evaluate options for enhancing the management and profitability of the fishery. We have organized these efforts around four assertions:

1. **Understanding Environmental Change:** Shifts in the Gulf of Maine ecosystem have impacted cod and the cod fishery. Understanding these past events is necessary to sustain this population in a changing climate.
2. **Diagnosing Stock Structure and Movement:** Cod stock structure, behavior, and diet are more complex than previously appreciated. Building knowledge about these topics will support more effective fishery management in an ecosystem context.
3. **Improving Stock Assessments and Management:** Advances in stock assessment and innovation in fishery management are necessary to sustain the Gulf of Maine cod population.
4. **Increasing Profitability:** The limited availability of cod will challenge the industry. Novel marketing strategies and innovative application of gear and information technology will support an economically and ecologically sustainable fishery.

Although our discussion is restricted to cod, the challenges and solutions we outline are relevant to most fisheries as they struggle to adapt to a world of increasing climate and economic changes.

## 1. Understanding Environmental Change

Cod, like other fish species, are affected by and respond to environmental conditions they experience throughout their life. Larval survival is strongly influenced by environmental conditions such as

## Lessons from Newfoundland

Changing ocean conditions. Changing centers of distribution. Overfishing. Declining cod. Have we not seen these challenges before elsewhere? In the Gulf of Maine, cod have gone through a rocky couple of decades. Overfishing led to declines in Gulf of Maine groundfish abundance in the 1990s, including cod, which set off a series of management actions aimed at curbing effort and mortality. These restrictions appeared to be working up until 2008, when the cod assessment indicated that rebuilding was underway. However, due to problems with the 2008 assessment (identified in the 2011 assessment), it is now known that the Gulf of Maine cod stock was not in as good shape as was previously believed.

Newfoundland endured similar experiences with its cod fishery in the early 1990s. What can we learn from the experience in Newfoundland that will help us understand and adapt to the current Gulf of Maine cod decline? First of all, the initial overcapitalization and then high exploitation of Gulf of Maine cod, following establishment of a 200-mile EEZ, mirrors the pattern observed for the northern cod stock in Newfoundland. At the same time that the northern cod were being heavily exploited, capelin, the primary prey of the northern cod, moved southward during an unusually cold period. This prey range shift, in combination with declining abundance, led to northern cod being much more aggregated near the southern end of the stock range and more vulnerable to further overfishing by the highly efficient offshore fleet.

Has a similar "hyper-aggregation" (Rose et al. 2002) occurred in the Gulf of Maine? Comparable to the case in Newfoundland, Gulf of Maine cod appear to have shifted their distribution from throughout the Gulf of Maine to primarily the western Gulf of Maine (Figure 1). Hyper-aggregation assumes a single population (within the stock) and a range contraction due to declining abundance and other environmental shifts. On the other hand, Ames (2004) described distinct sub-populations within the Gulf of Maine which, if real, would argue against hyper-aggregation and rather support the idea of local depletion of cod within sub-regions (i.e., eastern Maine). And while the Gulf of Maine is warming, the eastern portion remains the coolest and therefore would likely serve as a thermal refuge, not an abandoned habitat, with all else being equal. As such, there is perhaps cause for even greater concern, given the possibility that the only

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winds and currents (Churchill et al. 2011), along with plankton abundance (Mountain and Kane 2010). Food availability, especially the abundance of lipid-rich forage fish, is also an important external driver of cod production (Sherwood et al. 2007). A combination of these factors, along with a recent warming trend, could explain the poor performance of the stock in recent years.

Temperature has a strong influence on fish throughout their life, affecting growth, reproduction, distribution, migration, and recruitment (Drinkwater 2005). Cod is a subpolar species and the Gulf of Maine is near the southern limit of its range in the western Atlantic. Any increase in temperature can be expected to adversely impact this stock (Drinkwater 2005, Fogarty et al. 2008), and examining how the population has responded to past changes in temperature can provide some insight into where the stock may be headed.

The Gulf of Maine is now warmer than it has ever been; however, temperatures only recently exceeded those experienced during the late 1940s and early 1950s (Figure 3). In 1950, the northwest Atlantic was 0.5-1°C warmer than the 1982-2011 average. However, the rest of the global ocean was, on average,

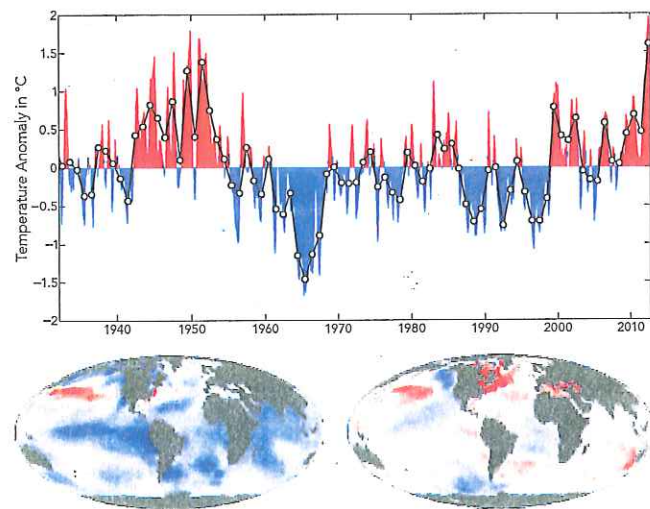


Figure 3. Monthly (shaded region) and yearly (circles) sea surface temperature anomalies for the Gulf of Maine. The anomalies were computed using ERSST data referenced to the 1982-2011 climatology. The maps are the global anomalies for the years 1950 (left) and 2012 (right), with red and blue colors indicating above and below normal temperatures, respectively.

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remaining sub-population in the Gulf of Maine coincides with the area of highest temperature.

Another valuable lesson from the Newfoundland experience is that, despite an all-out moratorium on cod fishing, it took nearly two decades for a recovery to take hold in the northern stock. Initial estimates following the establishment of the moratorium put the rebuilding time frame at just a few years. Clearly other factors were at play that held the northern cod at low abundance for many years and then allowed a sudden recovery in 2006 (DFO 2011). This recent recovery of northern cod is likely related to an increase in the abundance of capelin. Without capelin, Newfoundland cod grow poorly, lack energy reserves and spawn less frequently (Sherwood et al. 2007). What does this mean for Gulf of Maine cod? Perhaps cod in eastern Maine are also limited by a shortage of forage fish such as river herring and inshore Atlantic herring (Ames 2004). It remains to be seen whether dam removals, which are likely to lead to reestablishment of river herring runs, and restrictions on nearshore mid-water trawling for Atlantic herring will result in greater forage fish availability and a recovery of cod in eastern Maine, which has been inexplicably devoid of cod for nearly two decades.

0.5-1°C cooler. The abrupt decline in landings in 1950 (Figure 2) coincided with this warming period, although it is unclear whether the decline was due to reduced abundance, changes in the fishery, or to under-reporting of landings.

The recent warming began in 1999 and accelerated in 2010, reaching record levels in 2012. Although annual mean temperatures have only recently exceeded the mid-century values, the recent warming has a different character than the earlier period. During the 1945-55 period, the warming was strongest during the winter, leading to increased annual minimum temperatures. With the exception of the very warm 2011/2012 winter, recent winter temperatures have been normal, and the observed warming is due to elevated summer temperatures (Friedland and Hare, 2007). This means that species in the Gulf of Maine are encountering maximum temperatures outside their historical experience.

Water temperature impacts on Atlantic cod biology and ecology are well documented (Drinkwater 2005). For example, shifts in the distribution of cod to cooler, deeper water have been identified on Georges Bank when bottom temperatures exceed 10°C (Serchuk 1994). Temperature is also an important factor determining growth rates of cod across life stages, with maximum growth rates for juvenile and adult cod occurring between 10-15°C (Drinkwater 2005). Additionally, cod age-at-maturity has been shown to decrease with increasing water temperature (Brander 1995). Fogarty et al. (2008) explored the potential impacts of increasing water temperature associated with climate change on cod in US waters. Modeling revealed that increasing temperature reduced the survival of young cod but increased their growth rates, with the combined impact of reduced cod production in the Gulf of Maine (Fogarty et al. 2008). Warming in the Gulf of Maine is also altering the composition of the entire groundfish community as southerly species move northward (Nye et al. 2009; Lucey and Nye 2010). The influence of these potential prey, competitors, and predators of cod is unknown.

Body size has important implications for marine fish populations and ecosystems, and changes in size have the potential to impact both the performance of the stock and the assessment. For example, larger fish require less food to maintain each gram of tissue (Brown et al. 2004) and larger females produce more and higher quality eggs (Berkeley et al. 2004). Thus, populations with many large individuals can withstand poor environmental conditions and recover more rapidly when conditions improve (Chesson and Warner 1981, Field and Francis 2000). Substantial declines in the mean body size of several fish species have been reported for the Newfoundland-Labrador Shelf, Scotian Shelf, and Gulf of Maine-Georges Bank region of the Northeast Shelf during the late 1980s and early 1990s (Fisher et al. 2010, Mills 2010, Shackell et al. 2010), suggesting that large-scale environmental changes are likely driving the declines in size.

Declines in cod body size in the Gulf of Maine may be related to a change in growth at the stock level. Generally, fish in colder waters, such as the eastern Gulf of Maine, grow more slowly but reach larger body sizes at older ages than fish in warmer waters, such as the western Gulf of Maine and Georges Bank (Tallack et al. 2009). As cod abundance has declined in the eastern Gulf of Maine, faster growing but smaller western Gulf of Maine fish represent a larger contingent of the population. However, changing environmental conditions may also play a role, as the timing of the declines in cod size coincides with major shifts in physical conditions and community composition in the Gulf of Maine ecosystem that may affect feeding opportunities for cod (Greene and Pershing, 2007; Lucey and Nye 2010). The shift towards smaller body sizes could have important implications for cod and for their management within an ecosystem context. The 2011 stock assessment found that the age at maturity has not changed, which suggests that cod are maturing at smaller sizes, and as such, may be producing fewer or lower quality eggs. A decline in fecundity and recruitment potential may constrain recovery of the cod population.

While temperature can influence growth and fecundity in fish, it is only one side of the equation. Robust growth and high fecundity require abundant food, and there is growing evidence that changes in food availability can constrain cod. Cod have been described as ecological generalists (Garrison 2000), but the relative importance of different prey changes as cod grow. By the time cod reach reproductive age, they likely target high-lipid forage fish such as sand lance and herring, including Atlantic herring and river herring (Ames 2004, Sherwood et al. 2007). For example, in Newfoundland, in the absence of capelin, medium-sized cod grow slowly and are less likely to spawn (Sherwood et al. 2007). Older, larger cod, which have a disproportionate impact on egg production (Martinsdottir and Steinarsson 1998), seem to thrive on being top predators and even cannibals. That is, they may have moved beyond needing forage fish.



However, without forage fish to provide the “stepping stone” to top predator status, cod can get caught in an energetic bottleneck and never reach large sizes and their full reproductive potential, or even reproduce at all (Sherwood et al. 2007).

Although Atlantic herring, the primary forage fish in the region, are currently abundant in the Gulf of Maine (TRAC 2009), forage fish limitation may still be negatively affecting Gulf of Maine cod. In the past, spawning aggregations of cod were found all along the coast of Maine in locations and seasons corresponding to runs of river herring (Ames 2004). Declines in river herring in Maine rivers due to habitat alterations (i.e., dams; Moring 2005) and possibly bycatch in the Atlantic herring fishery (Cournane et al. 2013), may be making it harder for cod to grow and reproduce, particularly in eastern Maine (Ames 2004).

Developing relationships between environmental drivers, including changes in prey abundance and distribution, and aspects of cod biology, such as recruitment and growth, will provide a mechanistic understanding of cod population dynamics. These mechanistic relationships will be critical to forecast the response of cod to environmental variability as well as climate change.

## RECOMMENDATIONS

- 1a. *Develop a deeper knowledge of how temperature impacts the distribution, growth, and fecundity of cod*
- 1b. *Understand the influence of age and size structure on population resiliency*
- 1c. *Quantify the impact of herring and other forage fish on cod growth and reproduction.*

## 2. Understanding Stock Structure and Movement

For assessment and management, cod in US waters are divided into Gulf of Maine and a Georges Bank management units. This distinction was based on based upon traditional fishing areas and early studies

of movement, growth, and spawning from the 1960s. Since then, a range of studies using tagging, genetics, and circulation modeling indicate that stock structure may be different and more complex. Modeling exercises have shown that management units that are composed of multiple biological populations can be difficult to assess with accuracy (Frank and Brickman 2000, Fu and Fanning 2004, Kerr et al. 2010). This is an area that requires further research to determine the most appropriate management units for cod.

Recent genetic analysis of Atlantic cod (Lage et al. 2004, Wirgen et al. 2007, Kovach et al 2010) revealed stock complexity at both spatial and temporal scales that raised questions about the appropriateness of the current distinction between Gulf of Maine and Georges Bank cod. Using genetic markers, Kovach et al. (2010) identified significant (statistically and biologically) genetic differentiation among three spawning complexes (Figure 4):

1. A northern spawning complex, which spawns in inshore Gulf of Maine waters (off western Maine to Massachusetts Bay) in the spring;
2. A southern spawning complex, which primarily spawns in inshore Gulf of Maine waters (from Ipswich Bay to southern New England, including the Great South Channel) in the winter; and
3. A population that spawns offshore on the northeast peak of Georges Bank in the early spring.

Interestingly, the strongest genetic differentiation was identified between spawning groups in the Gulf of Maine that overlap spatially but spawn in different seasons (Kovach et al. 2010). This distinction is important to understanding recruitment patterns in the Gulf of Maine stock. Both spawning groups share nursery habitat in Massachusetts Bay. However, recruitment to the northern spawning complex, centered in Ipswich Bay, depends on winds and plankton availability in May-June, whereas the southern spawning complex depends on the winds and plankton availability in December-February; hence they utilize the nursery habitat in different



seasons. In addition, because low winter temperatures increase the time that winter spawning cod spend in the plankton, winter storms may potentially disperse cod eggs and larvae widely. An implication of these seasonal differences is that changes in the environment influence recruitment to these stock complexes in different ways (Runge et al. 2010; Churchill et al. 2011).

A major gap in our understanding of cod stock structure is a lack of biological data from the eastern Gulf of Maine. Historical evidence suggests that cod in this region were not only vastly more abundant but also had a more complex population structure (Ames 2004). It is currently unknown whether the scarcity of cod in the eastern Gulf of Maine is a result of stock contraction into the western Gulf of Maine, where cod are relatively more abundant, or whether distinct

spawning populations have been greatly reduced in eastern Gulf of Maine.

Information on cod movement patterns obtained from a large-scale tagging effort in the Gulf of Maine support the picture of stock structure informed by genetics (Figure 4). The distribution of recaptures of fish released on Georges Bank suggested that Georges Bank fish are a self-sustaining offshore population. Cod tagged in the western Gulf of Maine were predominantly recaptured within this area, suggesting this is a distinct population. Cod tagged in the Great South Channel were recaptured within this region as well as to the northwest in the western Gulf of Maine. This agrees with the view of a complex of inshore winter spawners distributed from Ipswich Bay to southern New England, including the Great South Channel. Information from more traditional

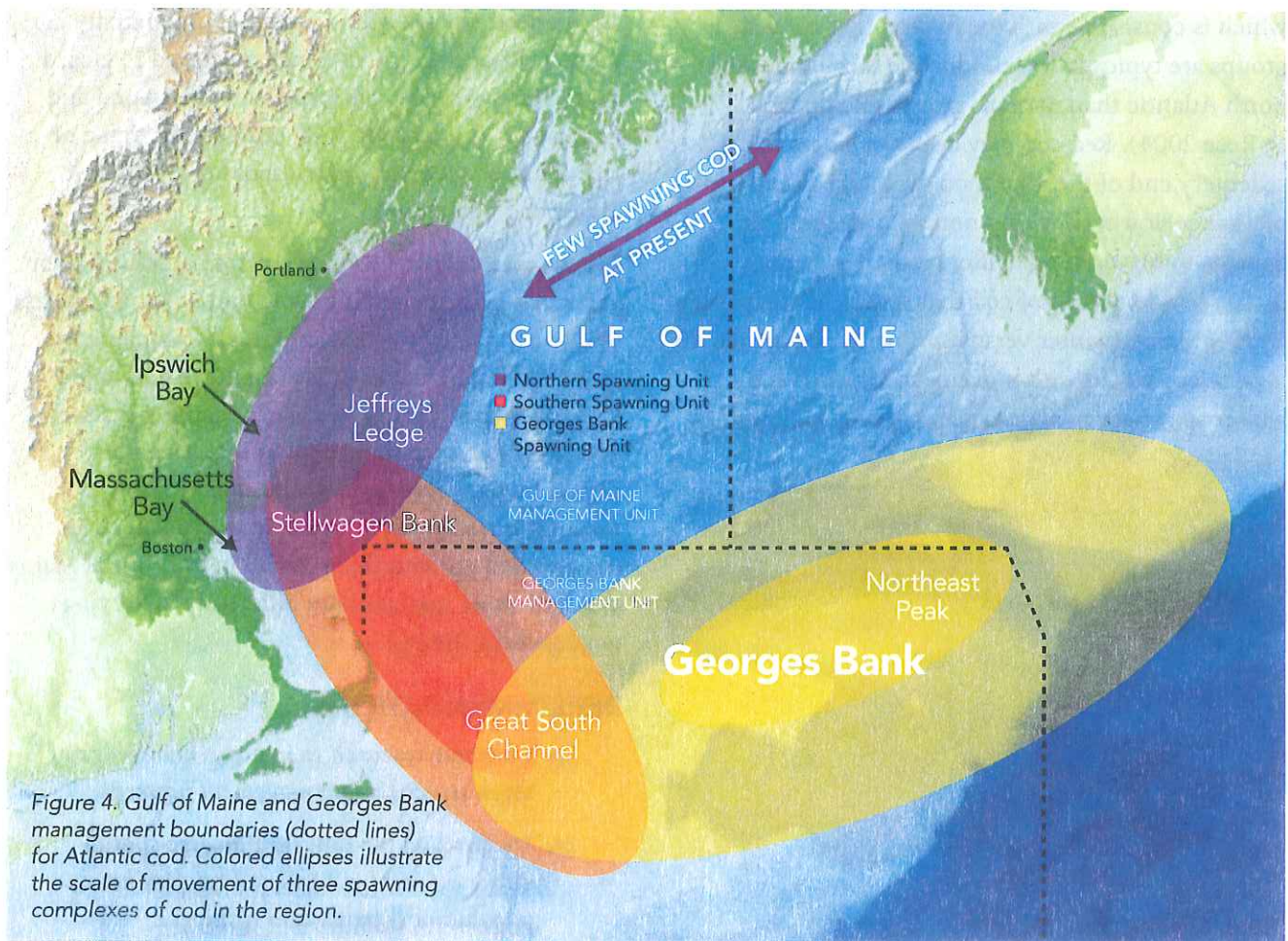


Figure 4. Gulf of Maine and Georges Bank management boundaries (dotted lines) for Atlantic cod. Colored ellipses illustrate the scale of movement of three spawning complexes of cod in the region.



stock identification techniques also generally supports the genetic perspective on stock structure, including additional tagging work (Hunt et al. 1999, Groger et al., 2007, Howell et al. 2008) and examinations of life history parameters (Begg et al 1999, Tallack 2009), larval dispersal (Lough et al. 2005, Huret et al. 2007, Churchill et al. 2011), and body morphology (Sherwood and Grabowski 2010, 2012).

Even within these stocks, there is considerable variability in life history that has implications for the productivity and spatial management of the fishery. Sherwood and Grabowski (2010) described the ecological characteristics of “red” cod that appear to be a highly resident form of cod (*Figure 5*). Red cod tend to use shallow kelp habitats (mostly inshore but also at Cashes Ledge in the center of the Gulf of Maine), whereas “normal” cod roam over larger, deeper areas. Furthermore, red cod are smaller at age which is consistent with the finding that resident groups are typically less productive throughout the north Atlantic than migrant groups (Robichaud & Rose 2004). Red cod may be at the extremely sedentary end of the migration spectrum in the Gulf of Maine. However, within normal cod, there also appears to be variation. Differences in spawning season of two groups of cod that spawn in the western Gulf of Maine (winter versus spring, discussed above) may be correlated with movement behavior (i.e., winter spawners as migrants and spring spawners as residents).



Figure 5. Normal and “red” cod.

Given the variability in migratory behavior that exists both among and within cod stocks, is it possible that fishing and fishery management practices have favored the proliferation of residents over migrants? In the Gulf of Maine and Georges Bank, five year-round closed areas may be favoring “stay-at-home” individuals (i.e., cod that reside within the safe confines of areas protected from bottom trawling, which collectively represent 22,000 km<sup>2</sup> of habitat) (Sherwood and Grabowski, in prep). In addition, under the previous days-at-sea management system, a day of fishing in the western Gulf of Maine counted as two days under the management rules. This may have created a de-facto closed area that favored resident cod (i.e., spring spawners, Runge et al. 2010) over cod that presumably only migrated there to spawn (i.e., winter spawners, Runge et al. 2010). Thus, past conservation measures may be inadvertently favoring non-migratory cod, possibly to the detriment of the stock’s productivity. These potential productivity costs must be balanced against benefits accrued in closed areas, such as robust age structures (Sherwood and Grabowski, in prep.), to fully evaluate the value of closed areas as a management tool for the Gulf of Maine cod population.

While some of the links between migratory behavior and stock performance are uncertain, it is nonetheless of interest that many historical migratory pathways in the Gulf of Maine have broken down and failed to recover (particularly in eastern Maine, i.e. Ames 2004). At the same time, Gulf of Maine cod are experiencing record lows in abundance. Further research is warranted to examine the existence of migrant and resident types of cod in the Gulf of Maine and how these may respond differently to varying management strategies.

## RECOMMENDATIONS

- 2a. Continue research to improve knowledge of stock structure and movement patterns
- 2b. Understand the influence diverse spatial structure and life history strategies have on population stability and resilience



### 3. Stock Assessments and Management

The discussion above presents a range of processes that could explain poor performance of Gulf of Maine cod, or, in the case of complex stock structure, could complicate the assessment and management of the stock. Accounting for these processes in assessment and management efforts is essential to establish the long-term viability of the stock.

The need for accurate stock assessments is now even stronger due to the mandate to assign annual catch limits (i.e. quotas) under sector management. As discussed above, the stock boundaries used in the assessments are uncertain. Changing the boundaries to more accurately reflect the true biological stock boundaries of this species may improve the assessment and subsequent management decisions. Although easy in principle, such a change would not be simple and would require considerable work to construct and parameterize the assessment models.

The impact of physical conditions on cod has important implications for sustainable management of this species, particularly in the context of climate change. While these ecological interactions are widely recognized, it remains challenging to incorporate them formally into fishery management processes. Implementing standards of the Magnuson Act often relies on historical stock conditions as baselines against which current biological reference points are assessed. Although there are provisions in the Act to change reference points in response to short-term and long-term environmental conditions, it is difficult to use these provisions effectively due to limitations in our ability to predict how physical changes will affect individual stocks. Incorporating environmental influences into stock assessment models and coupling stock perspectives with broader ecosystem changes that will affect species' distributions and productivity are critical advances for successfully managing cod in the context of environmental variability and climate change.

Sector management offers fishermen the flexibility to define when and where they target a particular species. However, in the absence of other management

tools such as time or area closures, sector management does not protect some of the unique aspects of cod biology, including spawning behavior, spatial structure, and age-specific reproductive value, that are important to the sustainability of the resource. The spawning behavior of Atlantic cod is complex and occurs in discrete space and time, requiring dense aggregations of fish for maximum recruitment success (Dean et al. 2012). The aggregation of fish for spawning makes them susceptible to intense fishing pressure and even complete removal from an area when protective provisions are not in place (e.g., spawning closures to fishing activity). Spatial structure can have a stabilizing influence on recruitment variability, and failure to protect stock structure may result in a resource that is less resilient to perturbation (Berkeley et al. 2004). Together these biological features are important to maintaining a healthy cod stock, and when the stock is depleted to very low levels, these biological attributes can be critical to stock recovery.

Closed areas have been identified as one of the most effective approaches to protect age structure, spatial structure, and the spawning behavior of cod (Berkeley et al. 2004, Dean et al. 2012). Closed areas in the Gulf of Maine were established primarily to reduce mortality of groundfish including cod and haddock (Murawski et al. 2005), and recent work has shown that they are indeed effective at protecting older, larger cod (Sherwood and Grabowski, in prep). From the outset of sector management, many industry members called for opening areas previously closed to fishing, arguing that under a quota-based system, closed areas were no longer necessary to control catch levels. With the severe cuts to cod catch limits, calls for opening closed areas have grown even louder as fishermen fear the cod reductions will severely limit their ability to harvest other, more abundant, stocks. However, catch limits do not conserve age structure and life history diversity, both potentially crucial to population resiliency and long term productivity. Thus, the use of closed areas as a management tool still has value under sector management, if for no other reason than to provide a



backstop for over-optimistic assessments and subsequent quota determinations (e.g., as was the case following the 2008 assessment).

## RECOMMENDATIONS

- 3a. *Develop stock assessment models that incorporate environmental influences, including changes in temperature and prey*
- 3b. *Conduct an interdisciplinary evaluation of population structure for definition of appropriate fishery management units*
- 3c. *Incorporate knowledge of life history and age structure when modifying closed areas.*

## 4. Improving Profitability

New England's groundfish fishery is facing a steep challenge of how to make do with less cod. Cod typically accounts for 30-40% of the annual groundfish landings (Sun, 2013a). The reduction in cod quota will have a direct impact on the bottom-line of the industry, but the complexities associated with the mixed fishery will amplify the loss. Even at the current low abundance, it is difficult to avoid cod altogether. It is likely that many fishermen will reach their limit of cod well before they reach their limit for other groundfish. When a fisherman reaches his quota of cod, he must buy quota from someone else or stop fishing to avoid the steep penalties associated with exceeding the quota. The challenge for the industry is how to maximize profits from more limited fishing opportunities. Innovations in fishing gear, fishing operations, and marketing can each help either reduce costs or increase revenue.

## Will cod survive in a warmer Gulf of Maine?

Cod are a subarctic species, and the stocks in the Gulf of Maine and on Georges Bank are at the southern limit of their range. While cod are found in the mid-Atlantic region, their abundance is low and the species is not commercially important. Given the strong consensus among climate scientists that global temperatures will rise, an obvious question is whether cod will persist in the Gulf of Maine through the coming century.

Two studies have attempted to answer that question. Drinkwater (2005) analyzed how temperature changes have impacted cod stocks from around the North Atlantic. For stocks in cold water, such as those off of Newfoundland and Norway, an increase in temperature increased the productivity of the stock. For stocks in warm water, such as those in the Irish Sea, warming resulted in fewer cod. The Gulf of Maine is in the middle. He then used these relationships to project how increases of 1-4°C would impact each stock. These projections indicate that warming of 3°C or more would lead to a reduction in cod production in the Gulf of Maine but would not lead to a collapse. In contrast, any warming is expected to lead to a collapse of cod in the Irish Sea, but increased abundance off of Newfoundland.

Drinkwater's analysis shows the range of possible outcomes, but he did not attempt to determine which outcome (1° vs. 4°C) is more likely. Fogarty et al. (2008) used the output from several global climate models to estimate the changes in bottom temperature on Georges Bank and in the Gulf of Maine. Their work suggests that the Gulf of Maine will warm by 2°C by the end of the 21st century and that Georges Bank will warm by more than 3°C. Based on Drinkwater's calculations and their own, Fogarty et al. (2008) suggest that the Georges Bank stock will decline, but the Gulf of Maine stock should remain productive. One important caveat with these simple forecasts is that it is difficult to estimate the confidence interval around them. For example, if we assume that the 2°C forecast for the Gulf of Maine has a 1° margin of error, then there is a 16% chance that the mean temperature will actually exceed 3°C, severely challenging the viability of the stock (of course, there is also a 16% chance of an increase of less than 1°C).

The stock predicted to be less productive and will not be able to support the same level of fishing effort. Even if the change in mean temperatures is not enough to threaten cod, we can expect to see an increase in the frequency of years with temperatures warm enough to stress the population. For example, the mean temperature in 2012 was 3° warmer than normal and was likely very stressful for cod. In order for cod and the fishery to survive, managers will need to be able to rapidly respond to these events in order to avoid overfishing. Understanding the impact of extreme years in addition to the impact of the long-term warming trend is important for devising effective management approaches to sustain fisheries under changing climate patterns.





The type of fishing gear and how it is deployed influences the composition of the catch and the cost of fishing. The GEARNET program, funded by NOAA's Cooperative Research Program, is currently working with the fishing industry to develop gear that is more selective. The eliminator trawl, for example, is designed with large mesh netting in the lower belly and has demonstrated an excellent ability to allow cod to escape while retaining haddock and pollock (Beutel et al., 2008). Reducing the netting on the top of the trawl could successfully avoid catching cod while maintaining catches of yellowtail flounder (Tallack, unpublished). Presently, diesel fuel is a fisherman's largest operating cost. In recent tests, a new net with 7 inch mesh and smaller diameter twine reduced drag and yielded a 22% fuel savings with no loss of commercial catch (S. Eayrs, pers. obs.). The use of semi-pelagic doors is another fuel saving option. Designed to operate clear of the seabed, these doors are more hydrodynamically efficient than traditional trawl doors and can reduce fuel consumption by at least 10% while also reducing seabed impacts.

Where and when a fisherman chooses to fish also influences the volume, composition, and quality of his catch. Most fishermen have a good understanding of fish behavior, including preferred habitats, timing of movements into particular fishing grounds, and response to fishing gear; however, there is always a high degree of uncertainty about what will come up in the net. Sharing knowledge, experience, and real-time observations within a sector or across the industry would allow fishermen to avoid areas where cod are currently aggregating and target areas where other species are abundant. Since each of the individual groundfish sectors is too small to have an impact in

the marketplace, a coordination across sectors would be needed to develop generic marketing strategies to increase the value of the catch. For example, coordination could allow the industry to optimize the timing of their landings to take advantage of periods when price is high or to smooth out their landings to build up a consistent supply of better quality fish. Eventually, such planning could extend to more sophisticated arrangements between fishermen and dealers, possibly including forward contracts (Sun, 2013a; Sun, 2013b).

One of the steep barriers facing the industry is the relative inelasticity in the price of groundfish. Basic economics suggests that the price of a product should go up if supply decreases. Although there is some increase in groundfish prices when supplies are limited, the increase is unlikely to be large enough to compensate for the reduction in quota. This is due to the fact that cod and most of the other groundfish in New England are part of a global market for generic whitefish. Thus, one solution is to aggressively market Gulf of Maine cod and other groundfish to distinguish them from other whitefish. Consumers are becoming more sophisticated about where their food comes from, creating opportunities for local sourcing of seafood. Local sourcing has the potential to raise prices but likely only for high quality fish. This would require building markets for under-appreciated and more abundant Gulf of Maine species by connecting local fishermen, restaurants, and food service providers.

## RECOMMENDATIONS

- 4a. *Encourage the development and use of fishing gear that avoids cod and reduces fuel consumption*
- 4b. *Explore business planning and marketing strategies to maximize value of each fish caught*

## Conclusions

Cod remains an iconic species in the waters of the Gulf of Maine, not only for its historic prevalence in

the ecosystem but also for the cultural significance of its fishery. However, recent developments highlight the challenges facing cod. The unexpectedly low abundance revealed by the last stock assessment is compounded by apparent biological, distribution, and ecosystem changes that may constrain cod recovery. Further, the effects of rising water temperature and food web shifts will be exacerbated as climate change progresses.

Sustaining cod in the Gulf of Maine will require focused efforts to understand the ecological factors that are impacting cod as well as innovative approaches to enhance management and profitability of the fishery. Building the scientific information base from which assessment and management approaches can be refined is a key step, as are efforts to encourage data sharing among fishermen, increase fishing selectivity, reduce fuel use, and broaden markets.

The challenges facing Gulf of Maine cod are not unique. Fisheries around the world are struggling to avoid overfishing and to develop management structures that ensure their long-term sustainability.

This struggle is taking place against the backdrop of economic changes due to globalization and high fuel prices and an increasingly unpredictable physical environment. Although the challenges for the Gulf of Maine cod population and fishery are steep, they present an opportunity to develop and test strategies that will allow fisheries to adapt to climate and economic changes.

## Acknowledgments

This paper is a joint effort between the Research and Community Programs at the Gulf of Maine Research Institute. This is our attempt to characterize the state of knowledge of Gulf of Maine cod and to begin a process to develop solutions to the severe challenges facing the fishery. We recognize the valuable contributions of our partners in the federal, state, academic, and NGO communities and in the fishing industry to understanding this species and its fishery. We look forward to continued collaborations and believe that moving forward will require the engagement of the entire community.



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- Deselect all
- Gulf of Maine
- Long Island Sound
- CDIP Buoys
- MARS
- Bourdon Buoy
- NOAA Buoys
- NOS Tides
- Environmental
- Inactive Buoys
- NERRS Stations
- NOAA CRAN
- Acadia National Park
- Acadia Bay Buoys

Cornell Whale Area  
Recent deflections  
Stellwagen Bank National Marine Sanctuary

# 2012 - the most anomalously warm year observed by the NERACCOOS Gulf of Maine buoy array since deployment in 2001

Latest Observation: 10/17 12:50 PM EDT

Variable	Value
Wave height	2.6 ft (0.8 m)
Wave period	3.6 sec
Air temp	57 °F (14.1 °C)
Visibility	1.6 nm (1.8 miles, 3.0 km)
Air pressure	1002.68 mb
Water temp	55 °F (12.9 °C)
Salinity	34.83 psu

12.30h 6.30h 12.30p



Owned/Operated by:  
UNIVERSITY OF MAINE  
Pettigrew University of Maine

## Ru Morrison, Neal Pettigrew, Jim O'Donnell, Jeff Runge





Multipurpose Buoys  
Part of an integrated regional modeling-  
observing information system  
"One system, many uses"





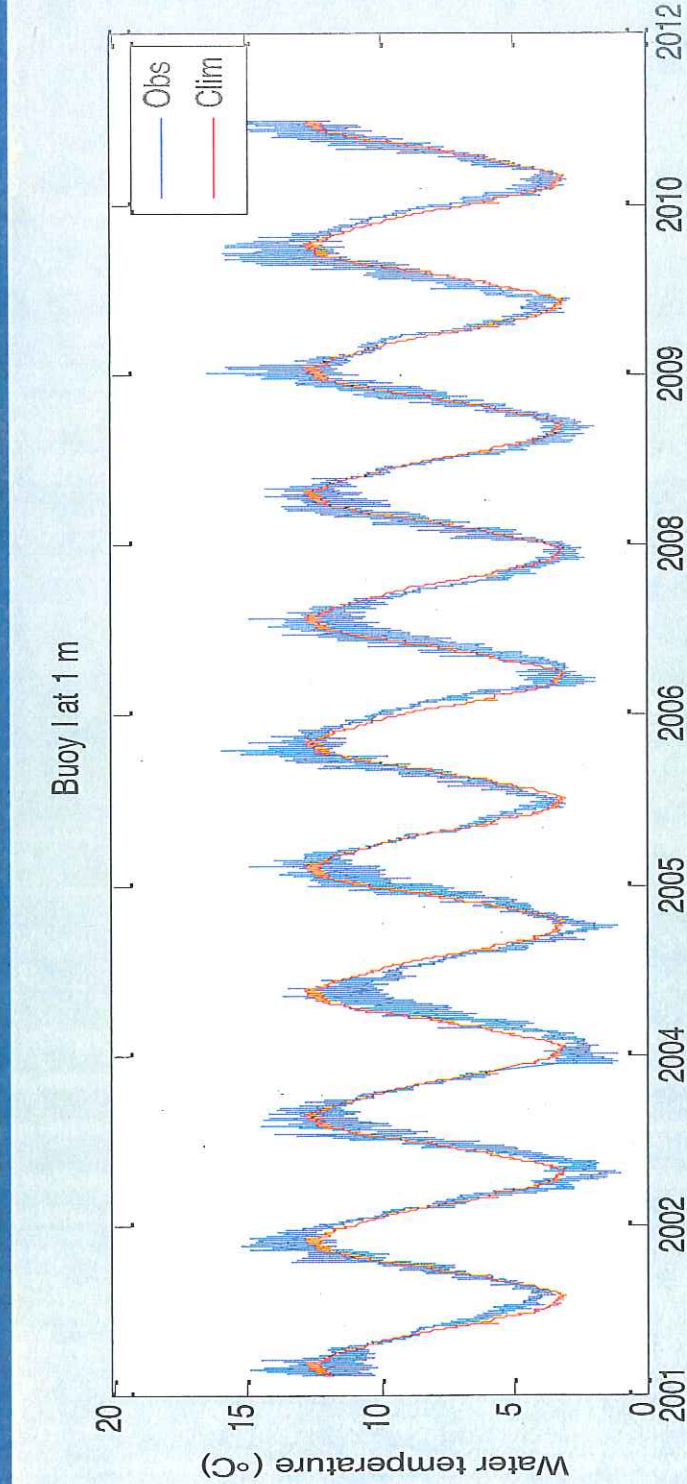
## Operational Systems

Over 10 years of observations  
Data returns in excess of 90%

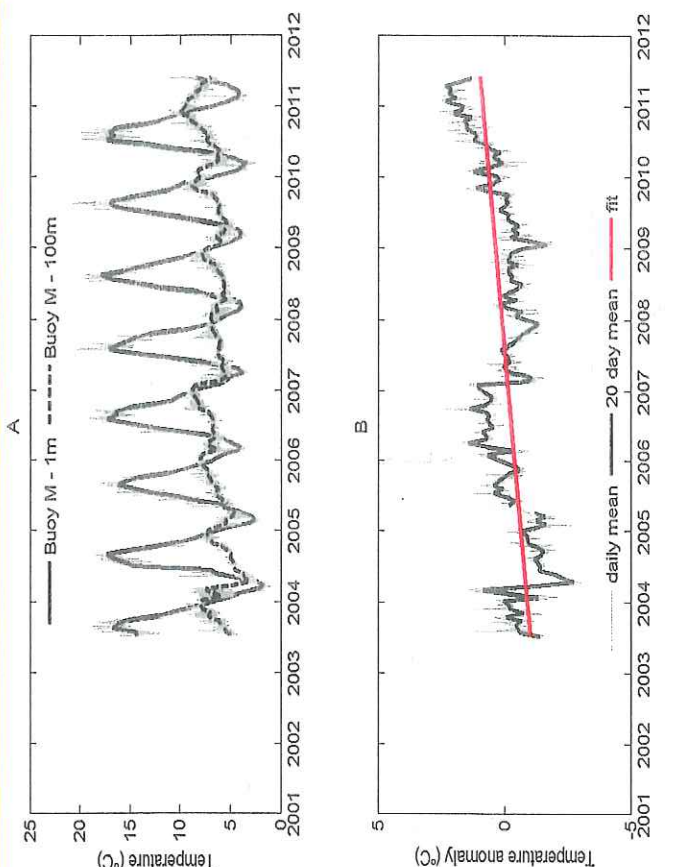
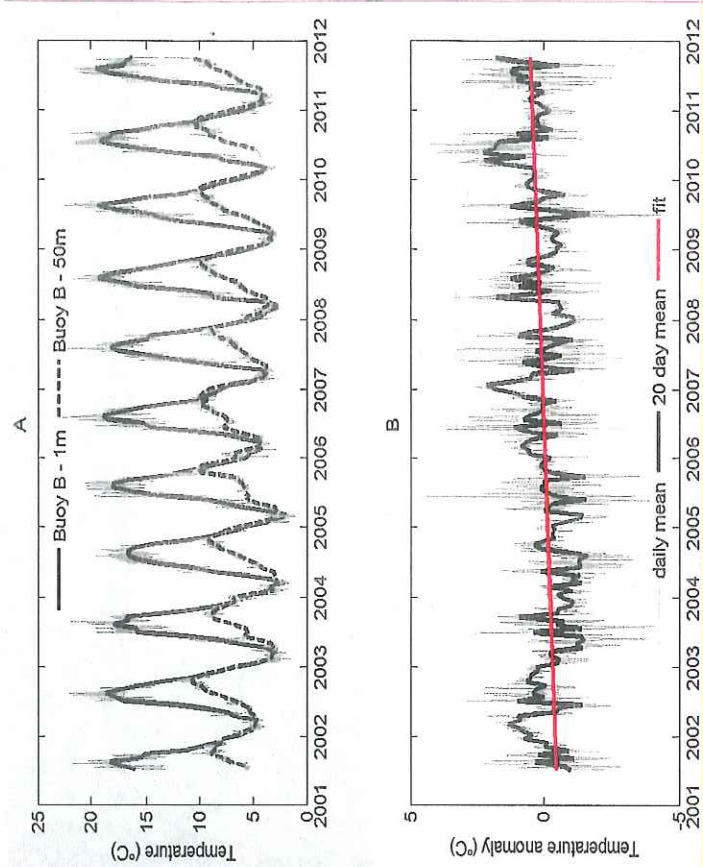
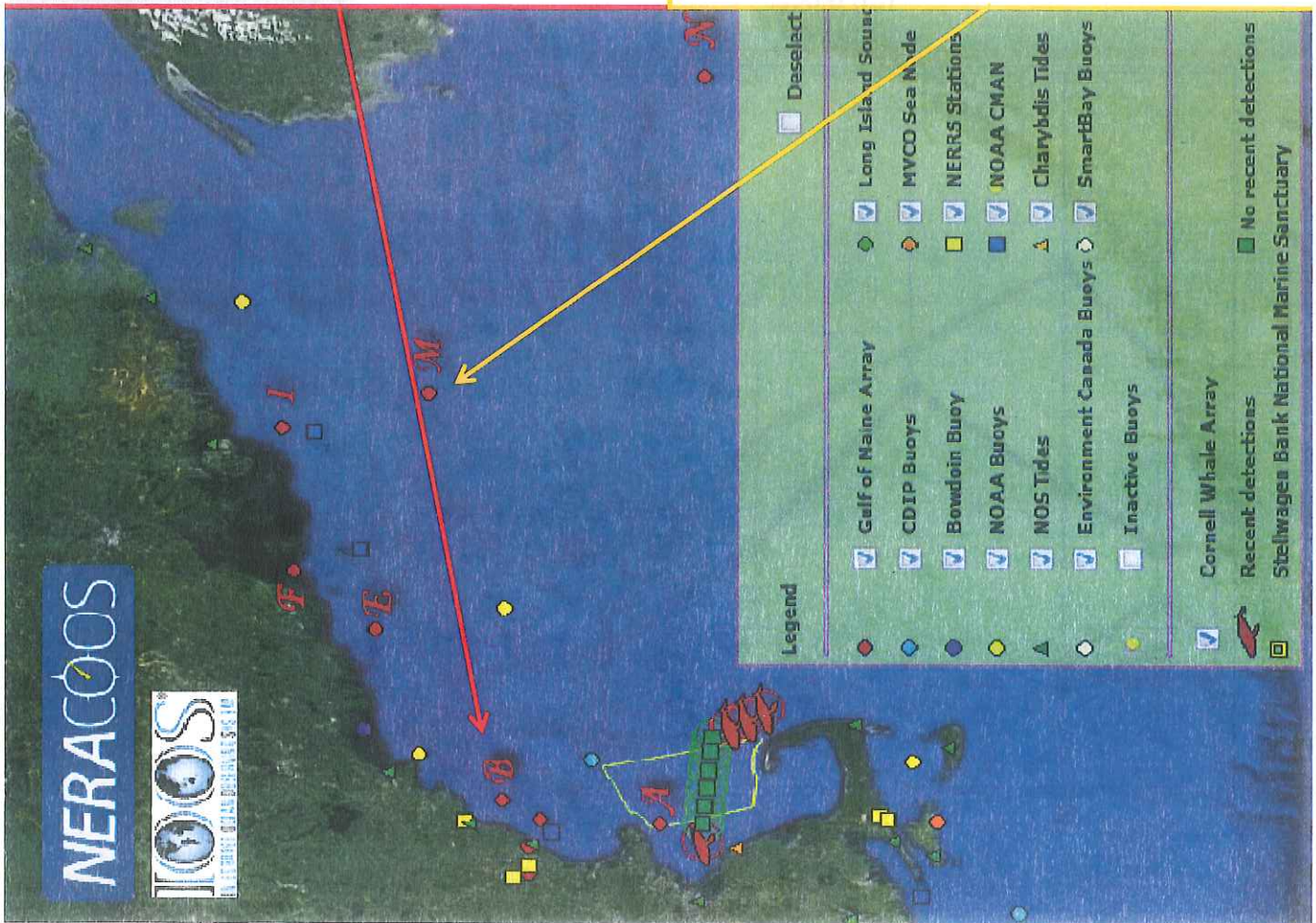


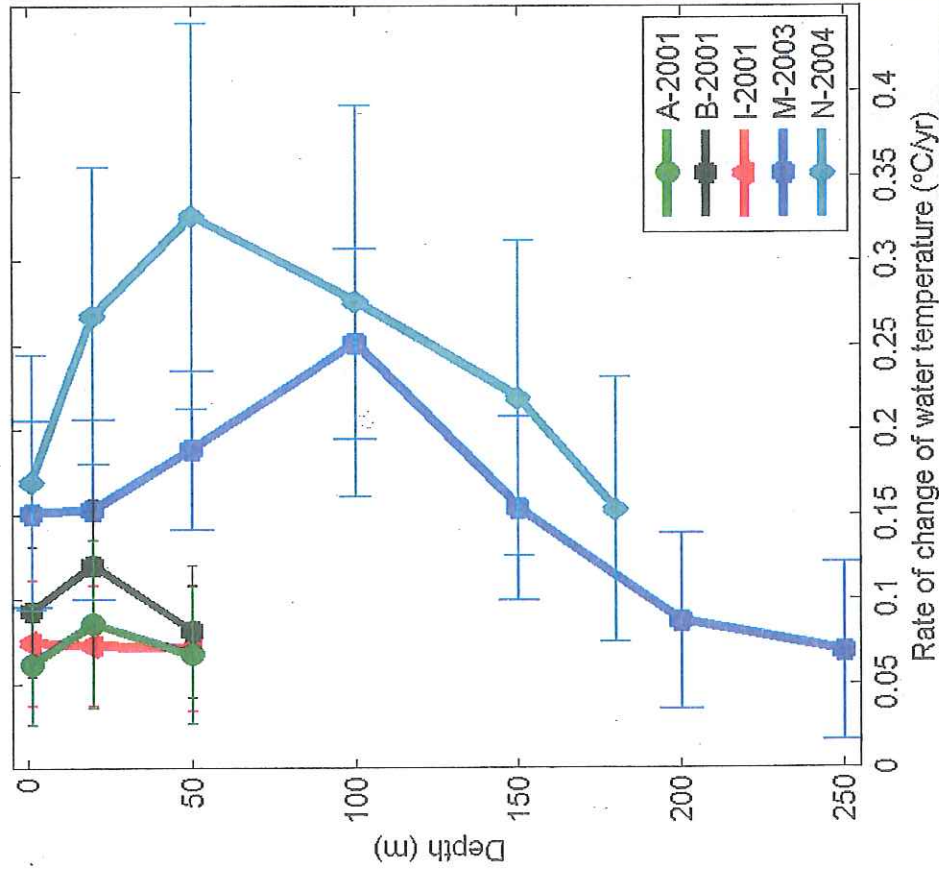


# Climate Variability and Change Over 10 Years of NERACOOS Buoys

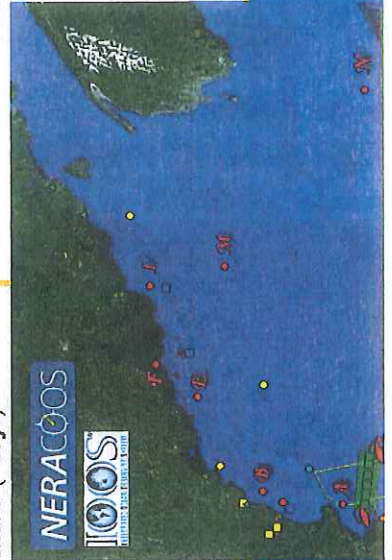
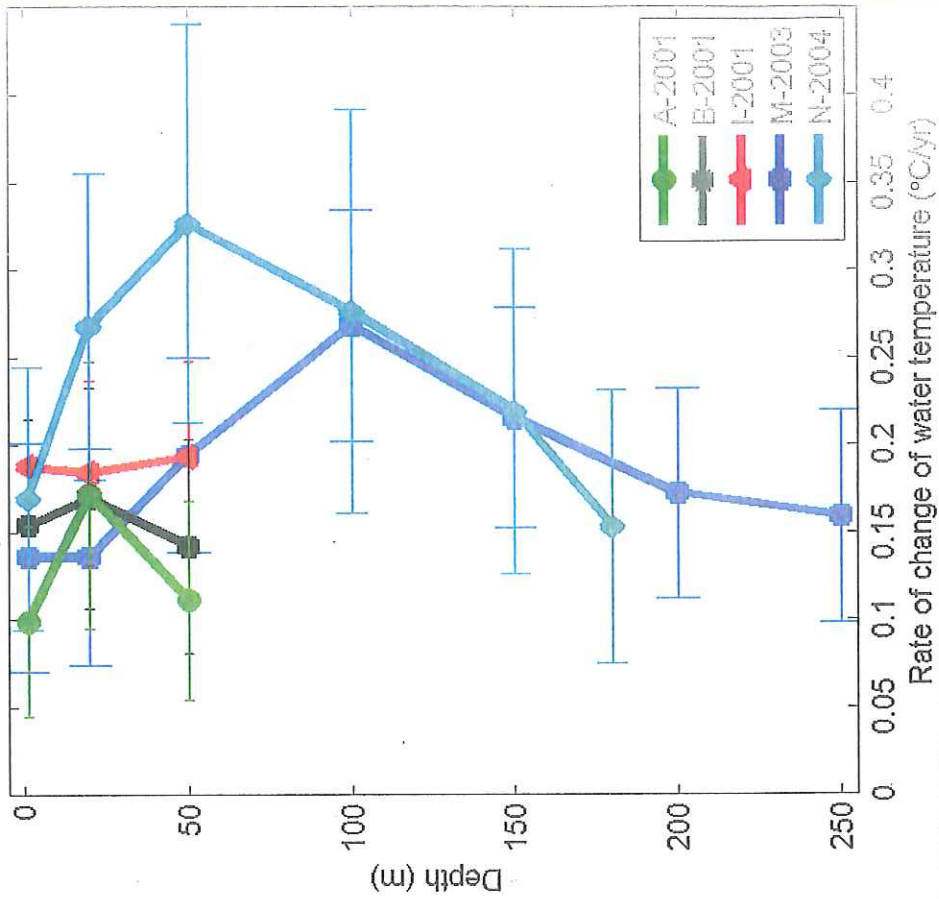








All Data





# Compared to historical trends (Sherman & Lentz, 2010)

SHEARMAN AND LENTZ

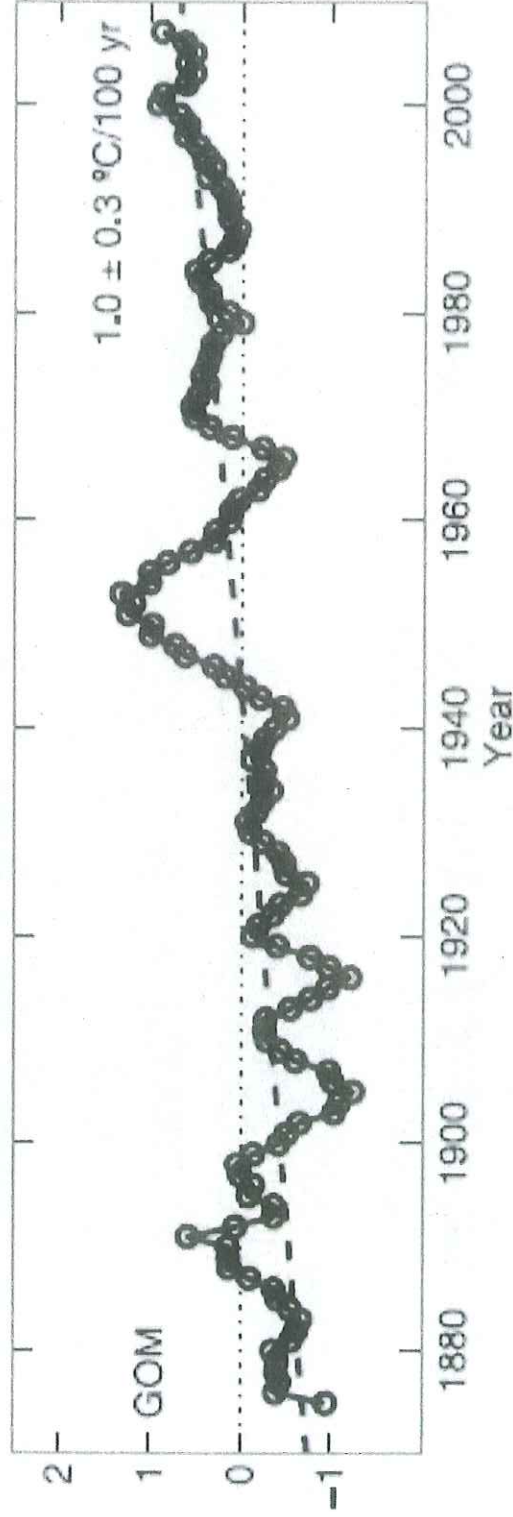


FIG. 8. Composite average SST anomalies (black) for GOM, MAB, SAB, and FL, smoothed with a 5-yr running mean, plus regional surface air temperature anomalies (gray) for the northeast United States, southeast United States, and Labrador. Best linear fits are plotted (thick dashed lines), and trends with 95% confidence intervals are noted.



# Potential Ecosystem Impacts

- **Physical forcing** – alterations to primary production cycles, timing of prey availability, predator-prey interactions and composition of species assemblages (*MERCINA 2001, Greene and Pershing 2007, Nye 2010, Ji et al. 2010, Lucey and Nye 2010*)
- **Cod** – >2-3°C, Gulf of Maine stocks decline or collapse (*Drinkwater 2005, Fogarty et al. 2008*)
- **Northern Shrimp** – hatching dates in winter in advance of the phytoplankton blooms (*Koeller et al. 2009*)
- **Lobster** – timing of summer molt and increased susceptibility to shell disease (*Steneck et al. 2011*)
- **Calanus finmarchicus** – key prey for forage species such as herring, sand lance, mackerel, as well as for the northern right whale. Projected to disappear from GoM (*Reygondeau and Beaugrand 2011*)

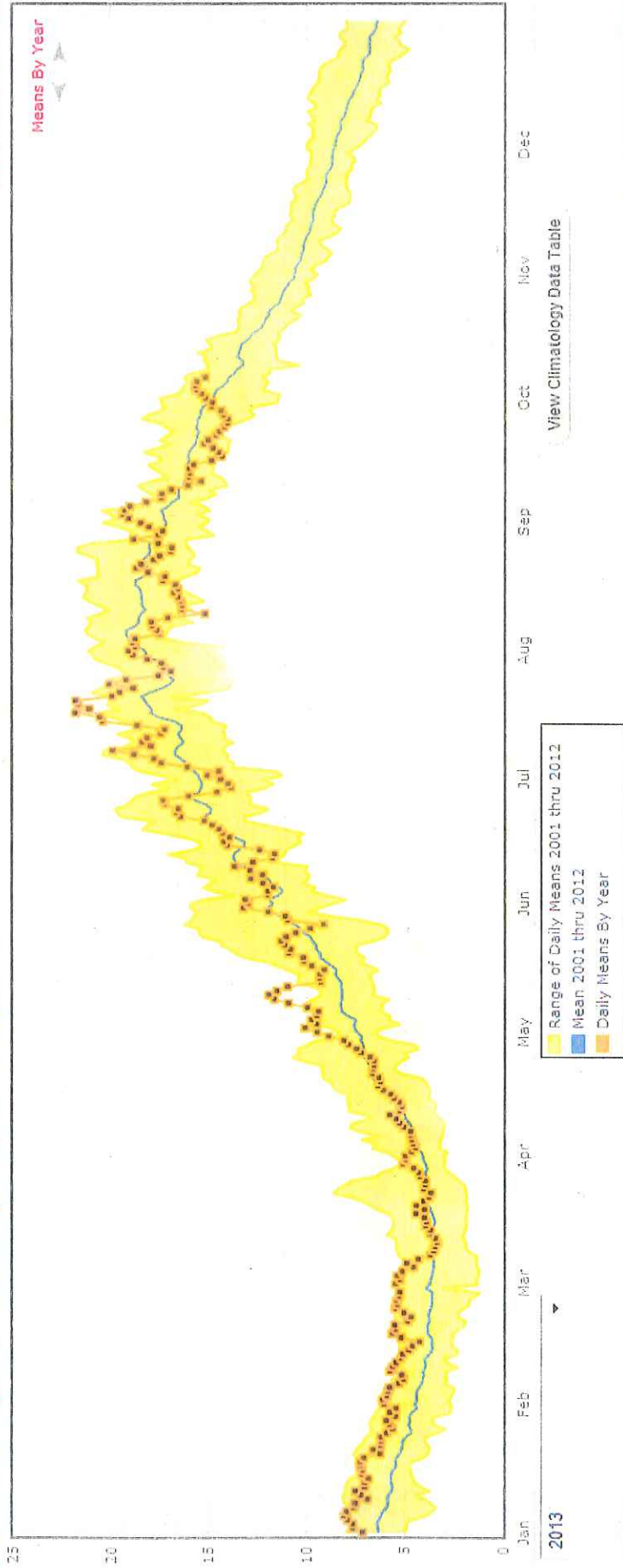


# Climatologies

<http://www.neracoos.org/datatools/climatologies>

Mean Water Temperature 1 meter depth at B01 for 2001 thru 2013

Daily Means for 2013

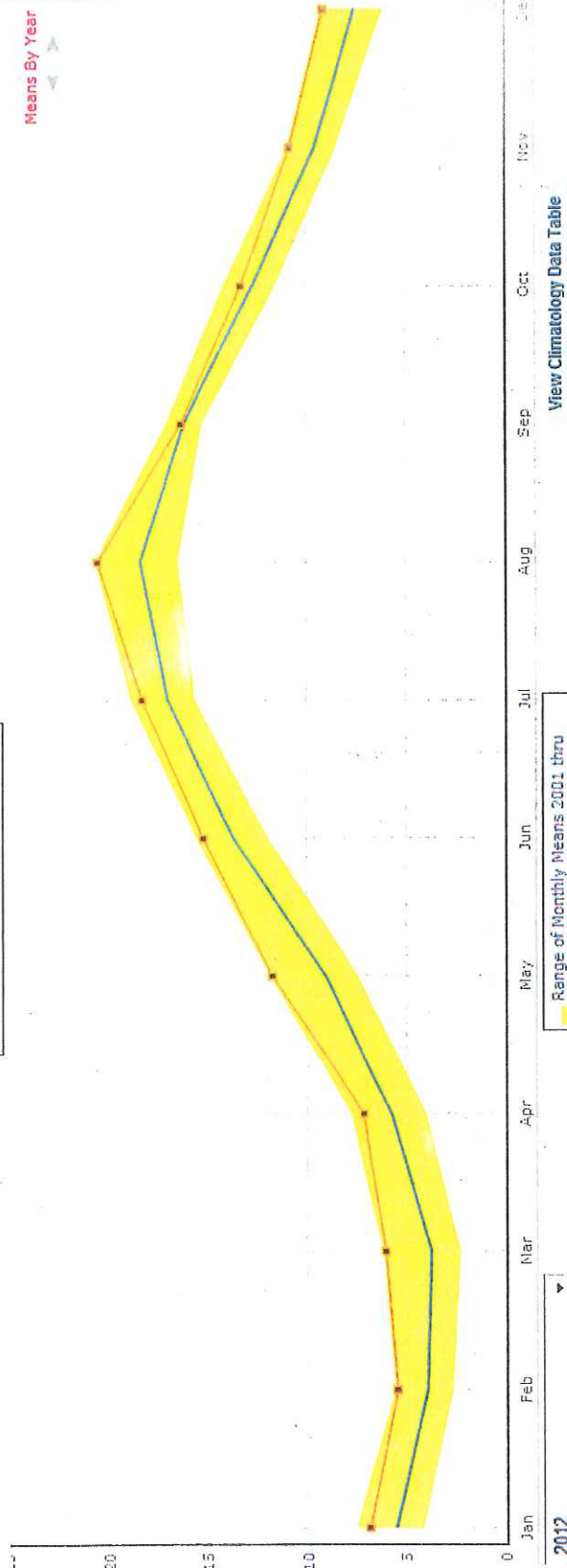
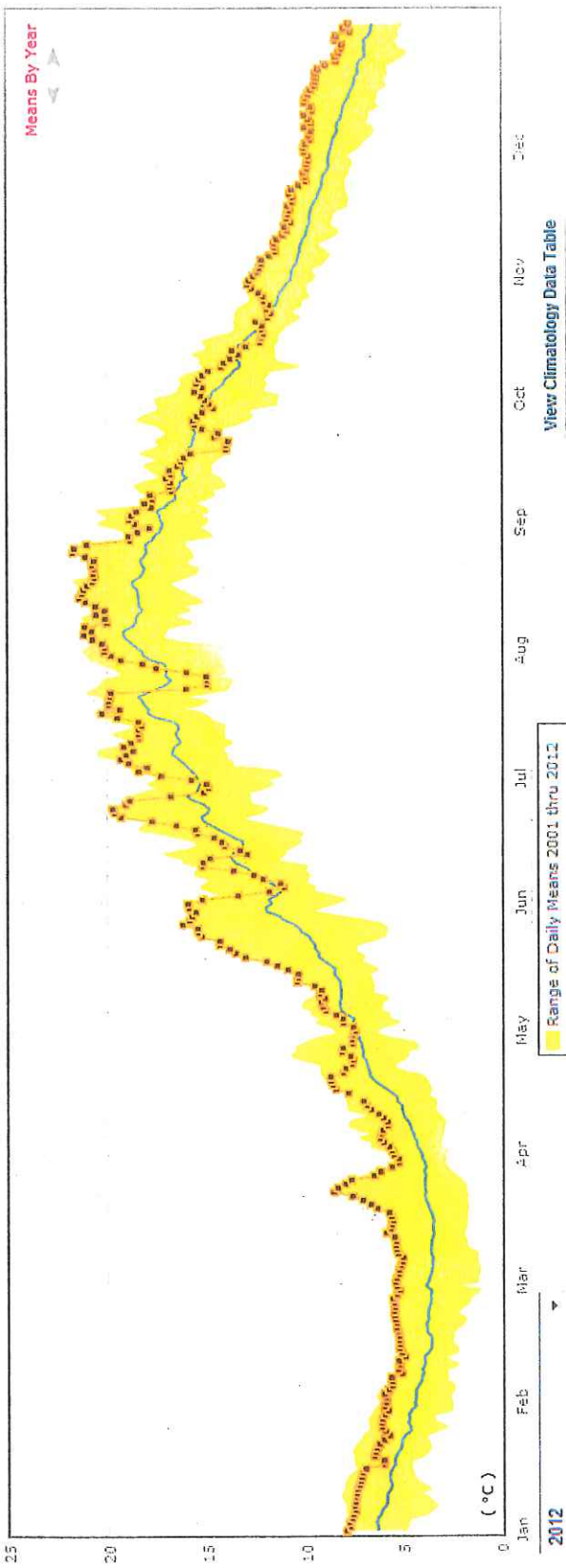


NERACOOS



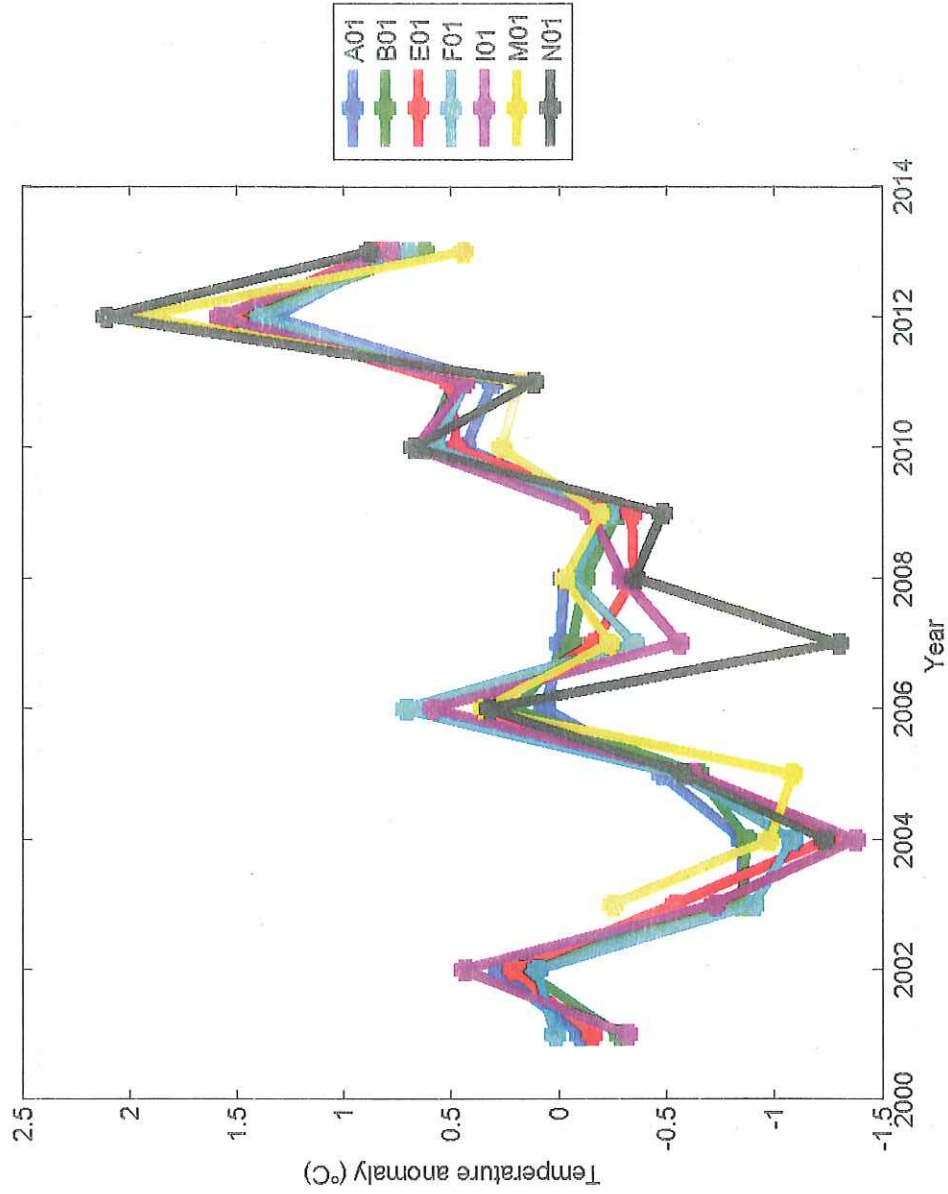
Mean Water Temperature 1 meter depth at B01 for 2001 thru 2013

Daily Means for 2012



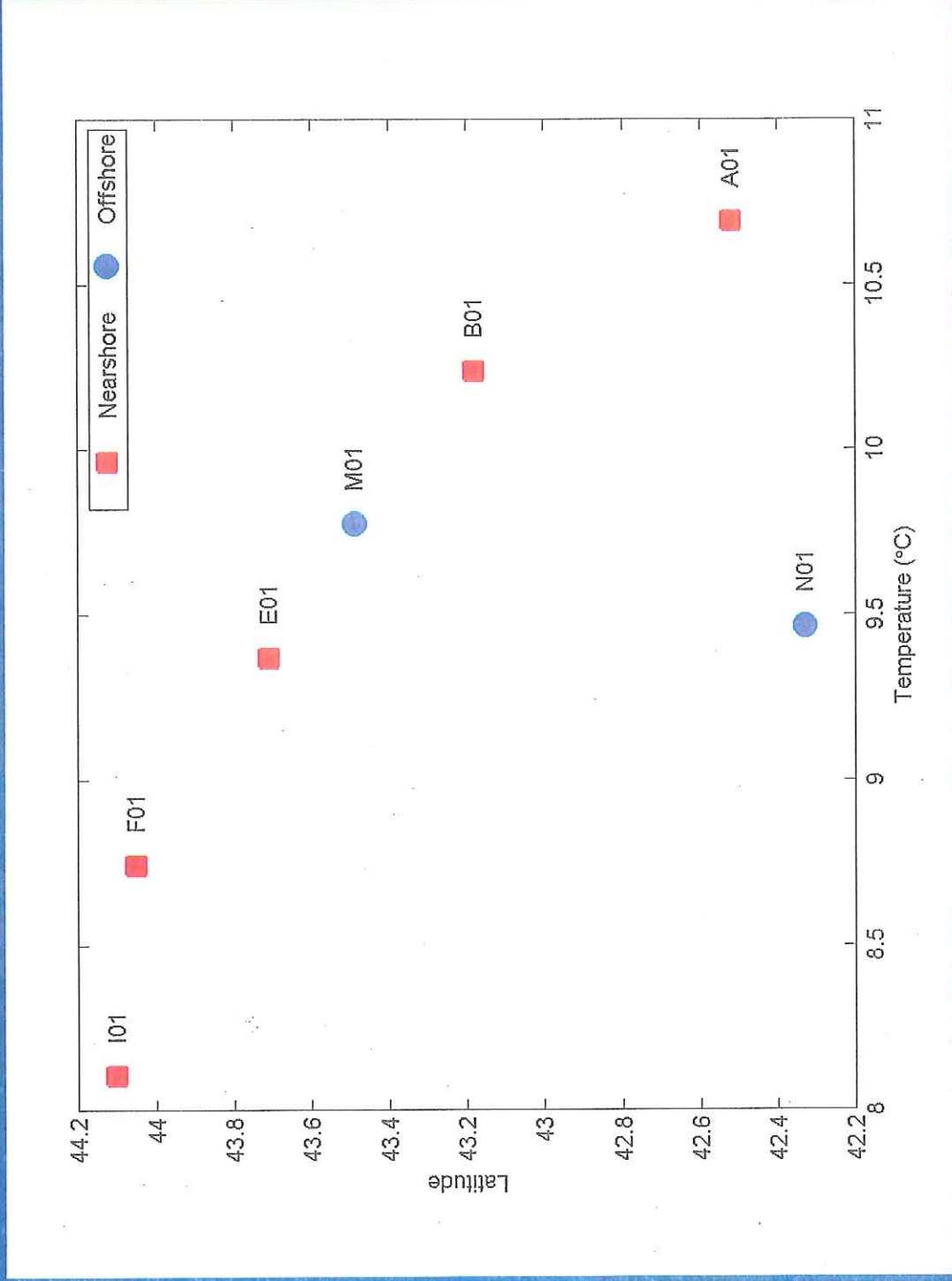


# Temperature Anomaly at 1 m



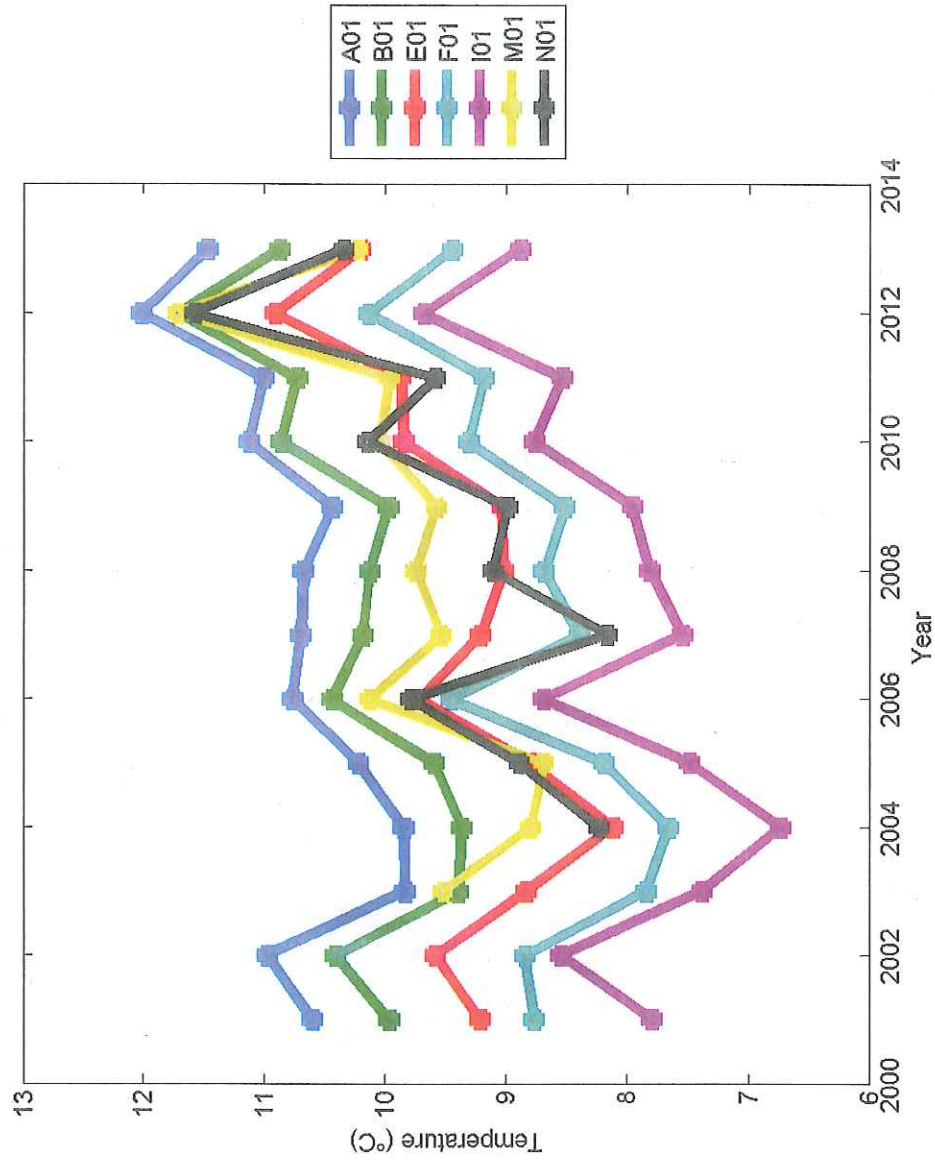


# Mean Temperature at 1m with latitude



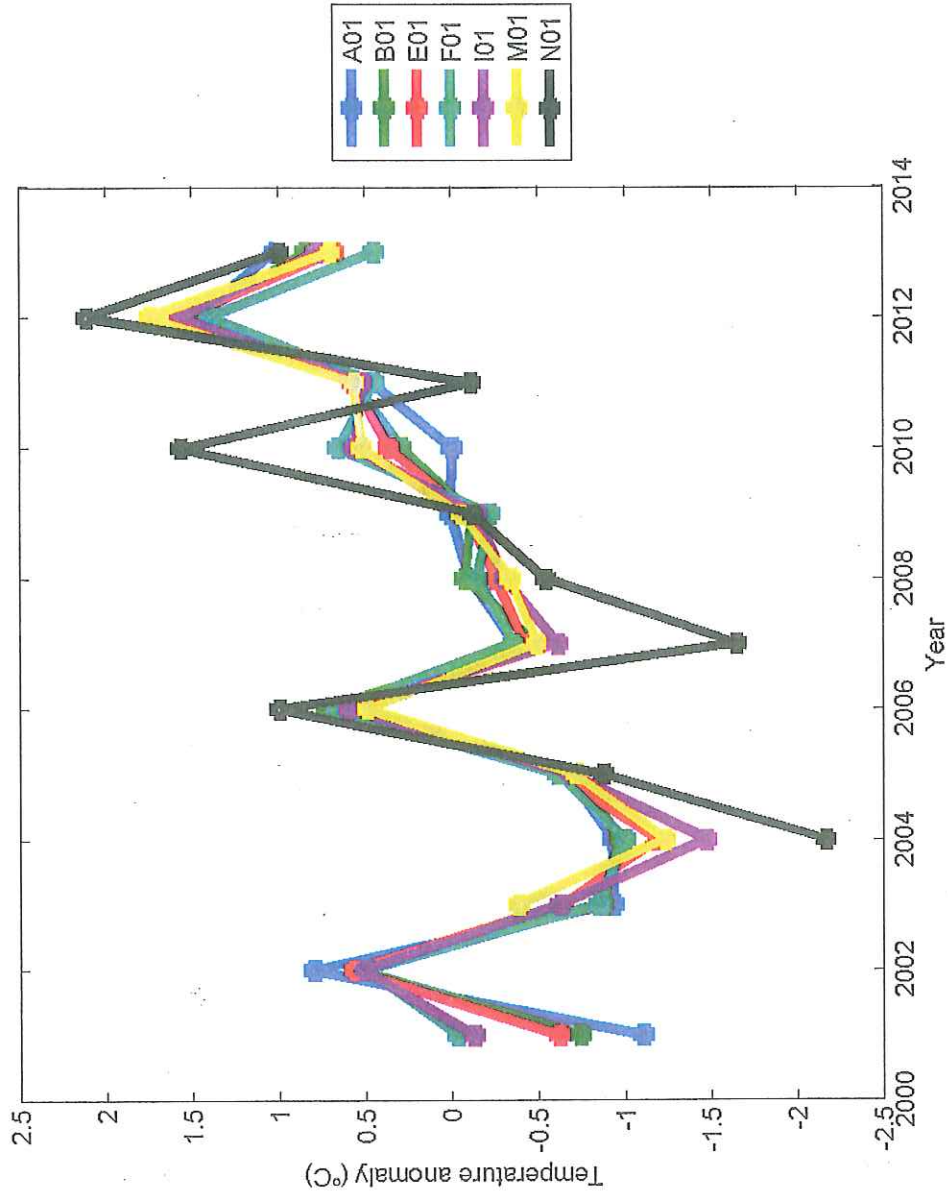


# Annual Average Temperatures at 1m





# Temperature Anomaly at 50 m





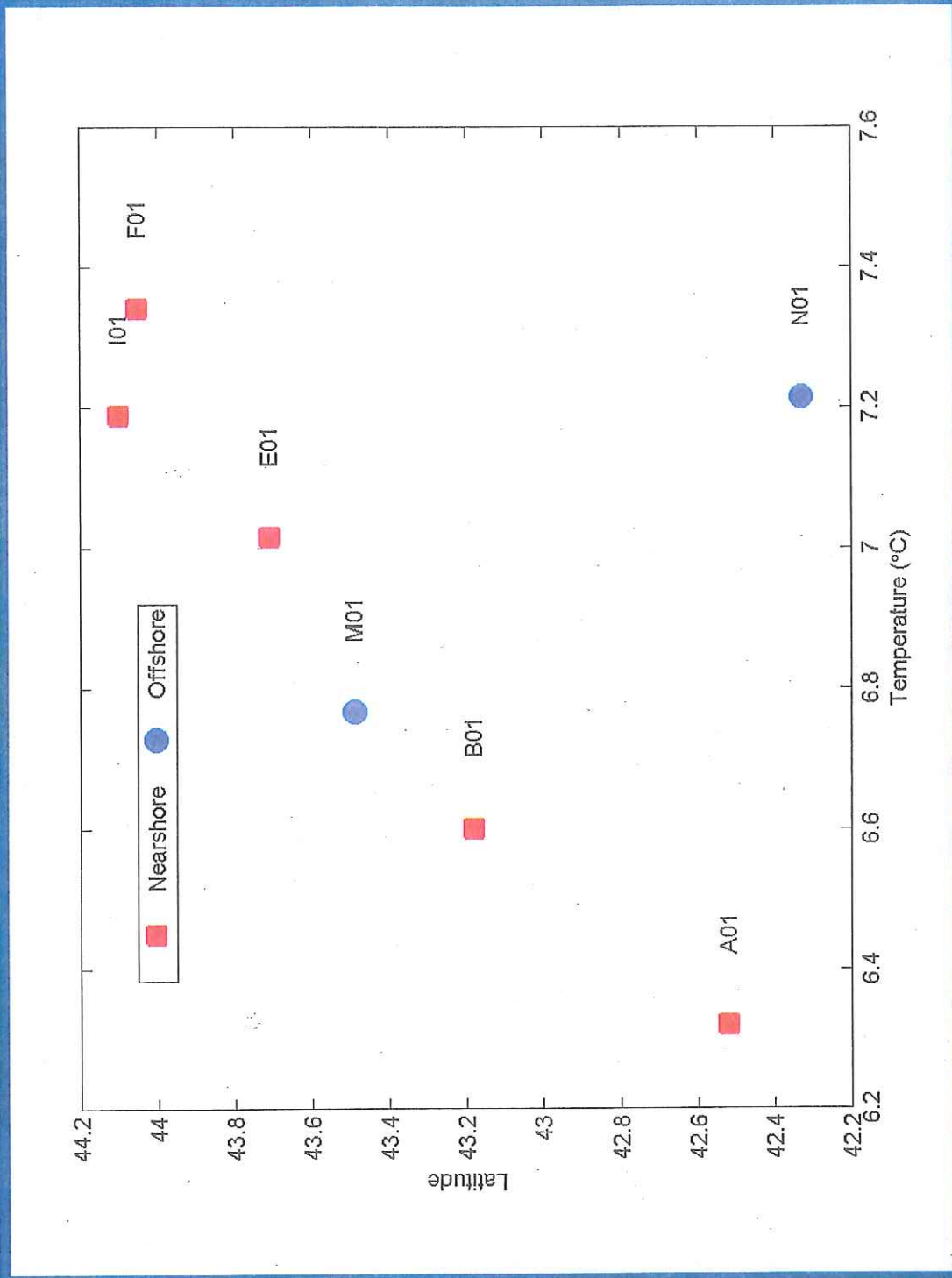
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INTEGRATED OCEAN OBSERVING SYSTEM



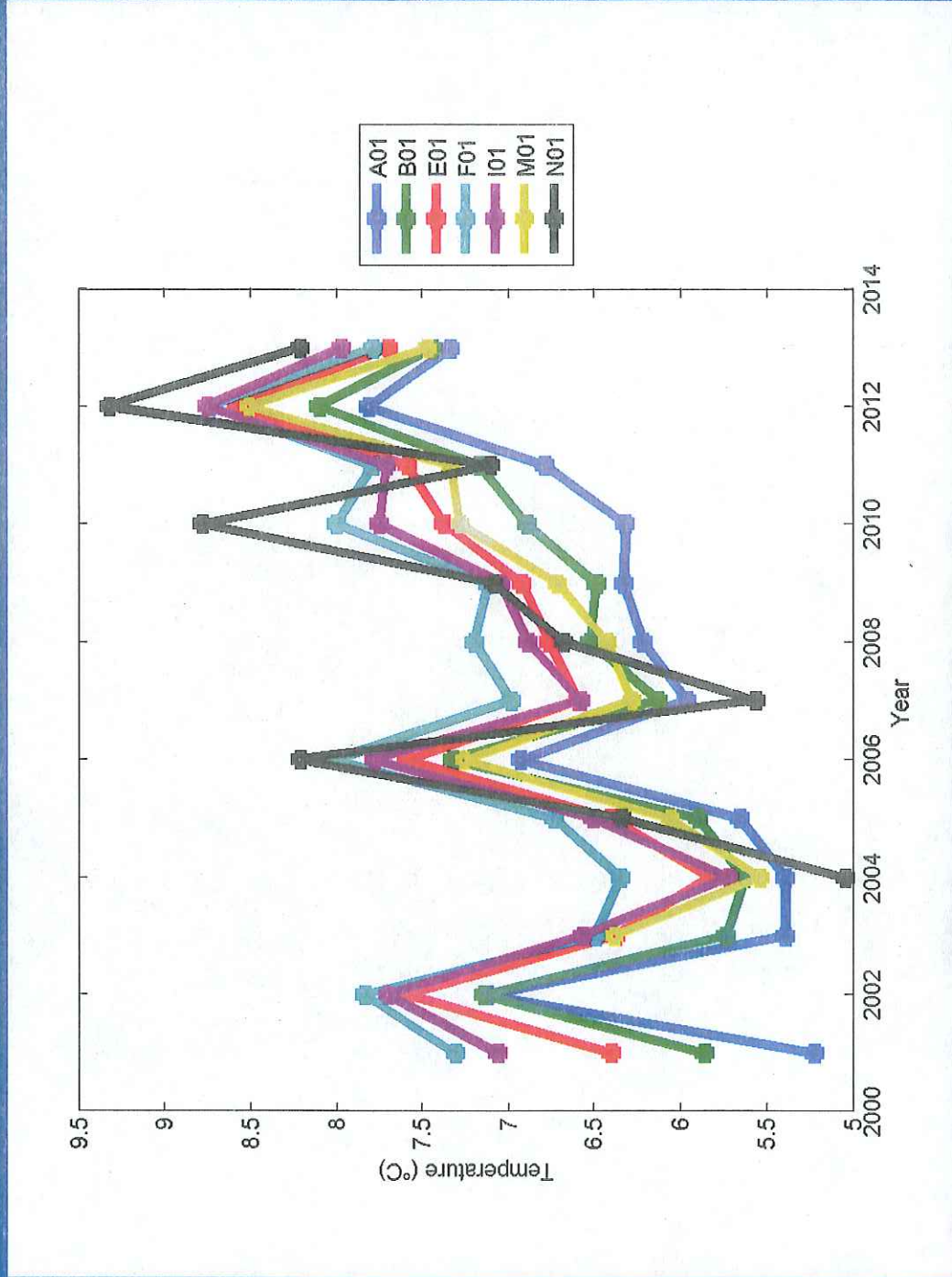


# Mean Temperature at 50m with latitude





# Annual Average Temperatures at 50m





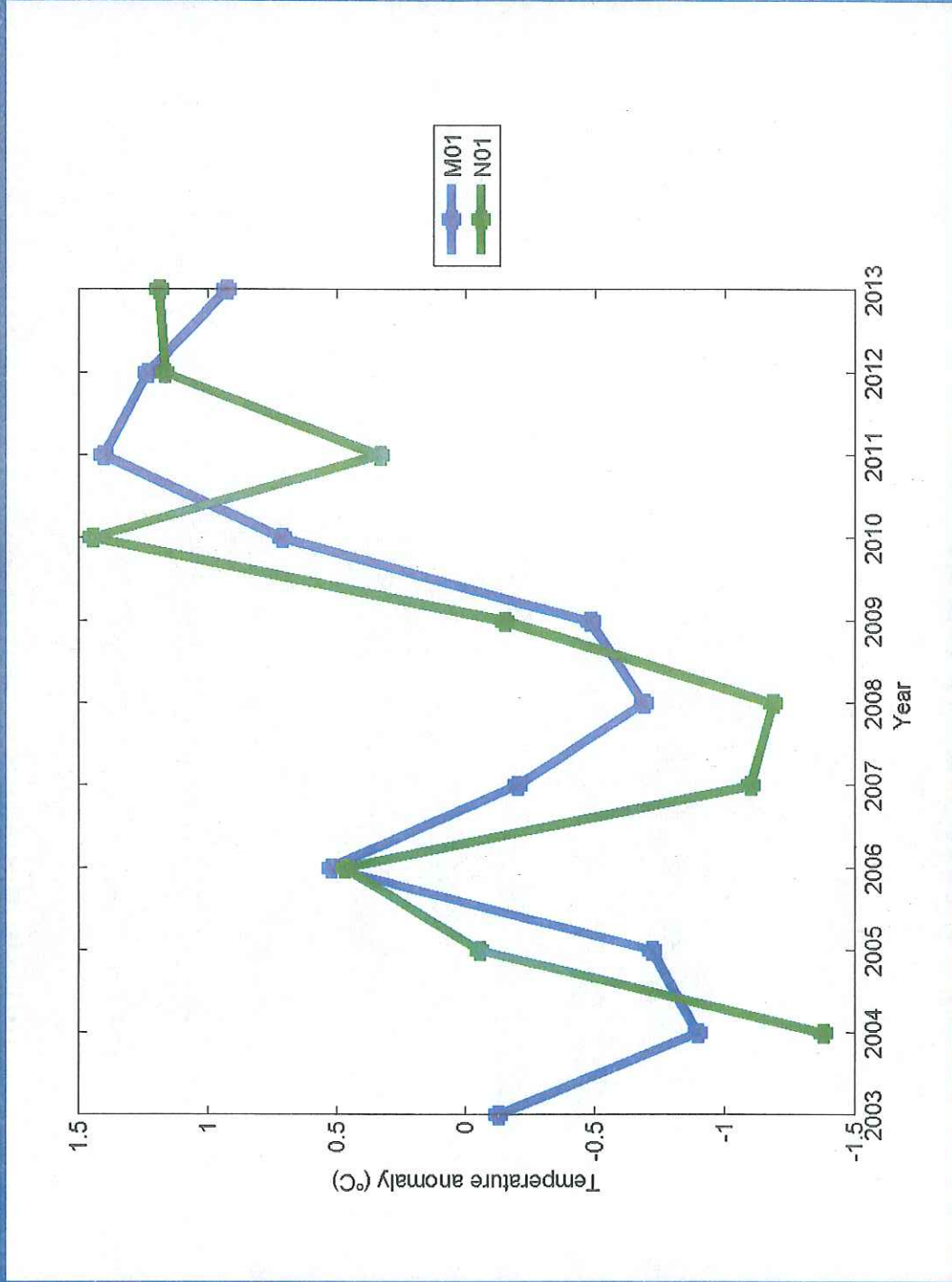
**But!**

INTEGRATED OCEAN OBSERVING SYSTEM






# Temperature Anomaly at 150 m







NERACOOS measures 52% of the continuous real-time surface variables in the region and 96% of the subsurface variables.

Sustained high temporal frequency, fixed location time series are critical to detection of physical variability in as short a timeframe as possible.

Without comparable sampling of **ecological variability**, we will not have the capacity for timely detection of ecosystem responses.



August 2013 Volume 18, No. 8

# FISHERMEN'S VOICE

News and Comment for and by the Fishermen of Maine

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## Marine Heat Wave Research at GMRI

The Gulf of Maine Research Institute (GMRI) has published a paper on the abrupt change in water temperatures seen in the Gulf of Maine in 2012. Kathy Mills a scientist at GMRI said the higher than average temperatures from Cape Hatteras to Iceland in 2012 demanded that scientists look at the scale – in both area and magnitude – and their effects on fisheries.

Temperatures were higher in 2012 but they had also developed three weeks ahead of schedule. This change effected inshore lobster migration, spawning and shedding. The timing of lobster landings was off as well which disrupted processors who were unable to handle the unexpected surge in product volumes.

Mills noted two objectives. First, while the 2012 temperature spike was one event it is very likely to be part of future weather patterns. Scientists work from models but they have not been studying how the effects of what their models tell them are impacting environmental systems and people. Second, addressing how management may have to adapt in order to be better prepared for future weather pattern impacts on fisheries.

Andrew Pershing and Janet Nye are scientists at GMRI and authors of papers on long range temperature changes in the Gulf of Maine (GOM).

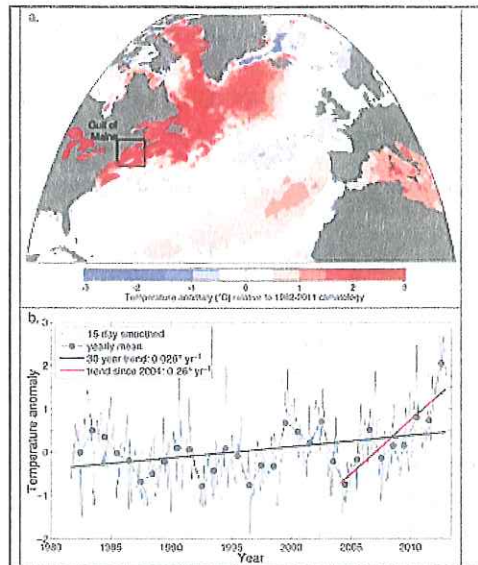
There are two proposals in the pipeline looking at the water temperature problem said Pershing.

1. A project to look at the impact of warming events like 2012 and the general global warming trend on lobsters and the lobster fishery. This one is likely to start this fall, but until it's official, it's probably best to characterize it as something we hope to start.

2. A project to develop models to predict the timing of the peak lobster season and the composition of the catch (hard vs. soft shells) based on buoy temperatures. The idea is that these forecasts would be issued in the spring and updated as the season develops. Pershings initial stab at this is at:

[http://www.seascapemodeling.org/seascape\\_projects/2013/06/predicting-temperature-and-lobster-phenology.html](http://www.seascapemodeling.org/seascape_projects/2013/06/predicting-temperature-and-lobster-phenology.html)

There is more information and graphs at Pershings website: [seascapemodeling.org](http://seascapemodeling.org)



Note the lower panel and 30 year temperature trend line (gray) compared to the 9 year trend line (red). Also the yearly mean for 2012. GMRI Chart

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## B.C. Fish Heating Up

Evidence of more southerly fish being found in the GOM is an indication of more sensitive fish on the move. When southern fish are seen in the GOM we know where they came from. A species of hake previously known to inhabit the continental shelf off New York is now in the GOM and Georges Bank. But when temperature sensitive historically native to the GOM fish disappear we don't necessarily know where they specifically went to find cooler water.

Research Institutes at Boothbay Harbor and the Woods Hole Oceanographic Institute have ocean temperature records back 100 years. The records that scientists in the GOM use begin in 1981. That was when the first satellites were launched to record sea surface temperatures. It was in the late 1990's that rising temperatures were seen to be impacting marine ecosystems.

Within the long-term trend of rising water temperatures there are decade long periods of more dramatic temperature changes both rising and falling. The water temperature event of 2012 is believed to be a part of a decadal period of change. Pershing noted that in the period from 1981 to 2012 sea surface temperatures rose .026 degrees C per year. Sea surface temperatures have risen .26 degrees C per year from 2004 - 2012. This translates to 0.05°F and 0.5°F. A 1/4 of a degree per year or a 10% rate of increase since 1981.

A similar figure to the one in the paper is in a blog post on potential impacts of warming on cod:

[http://www.seascapemodeling.org/seascape\\_projects/2013/02/cod-in-the-gulf-of-maine.html](http://www.seascapemodeling.org/seascape_projects/2013/02/cod-in-the-gulf-of-maine.html)

Pershing said it is very difficult to predict how temperatures will change. Predicting 5 days out or 20 years out is less difficult than making predictions for next year.

Temperatures on land that are 10 degrees above normal and last 3 to 5 days qualify as a heat wave. These temperatures can suddenly drop back to normal and things go back to normal. However, a one or two degree increase in sea temperature is a big deal. The higher temperature lingers longer. Water heats up and cools down more slowly than land.

The water temperatures in the GOM are affected by a more complicated natural system than the land areas. The normal seasonal melting of part of the ice cap sends cold fresh water into the GOM. That cold water flow has established stable patterns, currents, salinity changes, comfort and discomfort levels for marine life that rely on them.

How fisheries will be more broadly effected by sea water temperature changes and what kind of changes are needed on the management side to more effectively respond to these changes is what the GMRI proposals aim to study and draw conclusions.

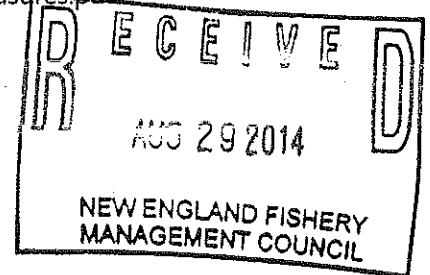
Kathy Mills and Andrew Pershing have joint appointments with the University of Maine and the Gulf of Maine Research Institute.



*J. Bullard  
sent to Recreational IPs in  
response to emails rec'd.*

③

**From:** Tom Nies  
**Sent:** Friday, August 29, 2014 2:12 PM  
**To:** Joan O'Leary  
**Subject:** FW: Haddock  
**Attachments:** 140827\_Bullard to Nies re GOM haddock rec measures.pdf



**From:** John Bullard - NOAA Federal [mailto:john.bullard@noaa.gov]  
**Sent:** Friday, August 29, 2014 1:29 PM  
**To:** charlie wade  
**Cc:** Tom Nies; Paul Diodati; David Pierce; Barry Gibson; Michael Pierdinock  
**Subject:** Re: Haddock

Charlie,

I have received many emails, letters and phone calls similar to your's requesting that we modify the Gulf of Maine (GOM) haddock catch limit for FY 2014 and allow an in-season adjustment to the GOM haddock recreational catch limits to prevent the scheduled September 1 start to the recreational closed season.

At the June Council meeting, the Council voted to request that we modify the Gulf of Maine haddock fishing year 2014 catch limits if the stock assessment indicated the stock could support higher catches. I assure you that we are taking this request very seriously and are carefully considering the results of the stock assessment final report, issued on August 21, 2014 (<http://nefsc.noaa.gov/publications/crd/crd1407/parta.pdf>).

As my August 27 letter to Tom Nies summarizes, while the Gulf of Maine haddock stock assessment did conclude that stock health had improved, we believe additional assessment findings do not support an emergency action to allow additional haddock recreational fishing this fall. The stock assessment revised the proportion of discarded haddock that are presumed to die after being discarded, changing this "discard mortality" value from zero to 50 percent. Preliminary catch information from May and June indicate strong haddock catches, including a substantial increase in haddock discards. Assuming recreational landings remained high through the summer, and applying the 50% discard mortality rate, analysis of projected catch leads us to believe that the recreational fishery could exceed even a substantially higher haddock recreational catch allocation under the current minimum size, per angler possession limits, and fishing seasons. Additionally, knowing that GOM cod are taken in recreational haddock fisheries, we are hesitant to relax recreational fishing measures prior to learning the results of the peer review of the the recent GOM cod stock assessment.

Based on these findings, at this time we cannot support a change to the recreational management measures, including the September 1 closed season start date. We are still analyzing a potential increase in haddock catch limits, including for the recreational fishery. However, as previously stated, the current haddock recreational management measures are expected to produce total mortality (catch and dead discards) that would be reached even under an increased catch limit.



The Council, my staff, and I continue to look for opportunities to make more abundant fish stocks available to fishermen while catch limits are kept low on key stocks that are not rebuilding quickly. However we cannot relax measures necessary to allow rebuilding to continue on those stocks that appear to be recovering. We realize that both commercial and recreational northeast groundfish fishermen and associated businesses are facing tough economic times due to low catch limits for many key stocks, including cod and haddock. As you may know, state directors and I reserved 33 percent of the northeast groundfish disaster funds to address varied needs of fishing communities within each state. I encourage you to contact your state to ensure your needs are considered as the states develop plans to distribute these funds. State specific contact information can be found on our website, at: [https://www.nero.noaa.gov/stories/2014/18\\_noaa\\_awards\\_first\\_portion\\_of\\_direct\\_assistance\\_funding\\_to\\_states.html](https://www.nero.noaa.gov/stories/2014/18_noaa_awards_first_portion_of_direct_assistance_funding_to_states.html)

As noted above, and in my letter to Tom Nies (attached), we will continue to assess GOM haddock stocks to determine whether any changes to GOM haddock recreational management measures are warranted.

Sincerely,

John

On Fri, Aug 29, 2014 at 9:50 AM, charlie wade <[cwade440@yahoo.com](mailto:cwade440@yahoo.com)> wrote:

John/Tom,

What a mess. I've had some of the most heart-wrenching conversations this past week with charter captains who are asking the rhetorical question: "How can I survive with a four-month season"? And to watch his happen when the groundfishing, especially for haddock, is as good as it's been in recent years is especially difficult.

Thank you Tom for the Council's efforts to address the haddock ACL and extend the season. Given the recent assessment results, I believe that was the right path to pursue. John, I understand your reluctance to extend the haddock season through October and appreciate the difficult position you're in. A 50 percent dead discard assumption seems to be on the high side though, and the fisheries biologists I've talked to agree.

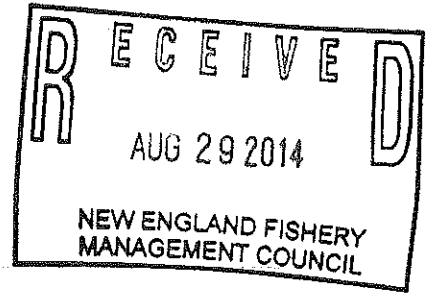
If haddock closes Sept. 1, the financial hardship will be devastating to the charter fleet. For the second year in a row, the rec tuna are staying well offshore. I still have not yet figured out a way to sell a pollack and redfish trip. I urge you to consider keeping haddock open for an additional 60 days.

Thank you.

Charlie Wade  
President, Stellwagen Bank Charter Boat Association

**Joan O'Leary**

**From:** Tom Nies  
**Sent:** Friday, August 29, 2014 11:51 AM  
**To:** Joan O'Leary  
**Subject:** FW: GOM Recreational Haddock Request



**From:** Dave Waldrip [mailto:dkwaldrip@comcast.net]  
**Sent:** Friday, August 29, 2014 11:31 AM  
**To:** John Bullard  
**Cc:** Paul Diodati; David Pierce; Tom Nies; Barry Gibson; Michael Pierdinock; 'charlie wade'; 'bernard f thomas'  
**Subject:** GOM Recreational Haddock Request

Dear John:

I am writing to you as a charter boat owner requesting you please use your authority as the Administrator to allow recreational anglers fishing on both private and charter/party boats to continue to fish for GOM haddock based on the latest stock analysis. The council recently passed the following motion at the June Council meeting: "To send a letter now urging NMFS to modify the Gulf of Maine haddock ACL for FY 2014 and to request an in-season adjustment to the recreational fishery accountability measures for Gulf of Maine haddock based on the final results of the assessment (SARC 59) that would result in a quota increase." The motion carried on a show of hands (15/1/0). This will allow an economic boost to the industry at a time when there have been few school bluefin tuna in the GOM along with reduced catches of striped bass due to colder water temperatures. You stated earlier in the year "the landing data resulting in significant overages for the recreational sector was not accurate but the best numbers the service had". With the bad data, knowing we did not land that many fish last season and the current stock analysis of GOM haddock it only makes sense to allow these boats to fish and increase the daily bag limit to attract customers along reducing the size limit back to 18" minimum length.

If you have any questions please feel free to contact me anytime.

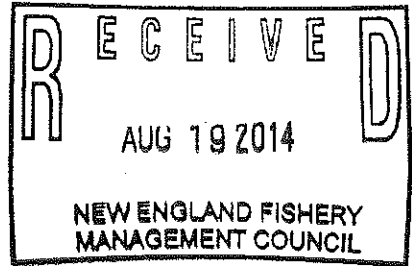
Respectfully,

Captain Dave Waldrip  
Charter Boat Relentless  
Quincy, MA

*Jc/jp/af - 9/9/14*



**From:** Rich Antonino  
**Sent:** Monday, August 18, 2014 7:50 AM  
**To:** Tom Nies; Barry Gibson  
**Subject:** RE: copy of letter I sent to Paul Diodati and John Bullard



Here is the first letter that I sent to them, without reply...

Dear Paul and John,

Right now we as charter captains are fighting for our life and the executioner is ready to drop the guillotine. On Sept 1, we will lose our livelihood in the Gulf of Maine. We will no longer be able to possess cod or haddock on our charters. In the past few weeks, the cod and haddock catches have been fantastic and the customers responded quickly. People are happy to catch cod and haddock. There have been trips in which the catching has been non-stop for hours with bent rods on every drop. Amongst the many keeper cod and haddock, there are tons of smaller fish. These are the keepers for the charter and recreational fleet next year! However, they are the target of commercial fishing over the winter and we can't let this happen on the scale dictated by the Catch Shares Program!

The bait on Stellwagen Bank is incredible. How much bait? Massive schools of whiting and mackerel are everywhere. I've seen schools of 3# mackerel busting on the surface as if they were bluefish. There are no predators to eat them. The tuna have not arrived. There are no striped bass on Stellwagen Bank. There are very few bluefish. I have not seen sharks as I have in the past. However, the bait is insane. Adult sandeels for miles. The herring are gorging themselves on sandeels! Yes, they are stuffed full of small sandeels. Yesterday I found schools of bait on top of Stellwagen Bank in 100' of water with shoals of baby haddock, cod, and Pollock feeding on them. We were catching 8" haddock on sabiki rigs! This is a great sign.

These baby sandeels are the same ones that will be on Stellwagen Bank this winter and spring, but will be much larger then. What will be feeding on them? Those same 19-21" cod and haddock that we are releasing right now. They are the target of the commercial fleet. As soon as those fish congregate on the great sandbar known as Stellwagen Bank...an area perfect for dragging.....no snags, rockpiles, and plenty of concentrated cod and haddock....the draggers will once again wipe them out as they did in the winter of 2011.

**IF YOU ALLOW THE CATCH SHARES PROGRAM TO DRAG STELLWAGEN BANK THIS WINTER AND SPRING AS YOU HAVE DONE IN THE PAST, YOU SHOULD LOSE YOUR JOBS!!!!!!**

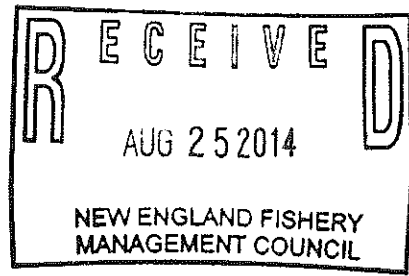
This fishery CAN NOT SUPPORT MASSIVE DRAGGING ANY LONGER! When those fish congregate, they will be overfished. Allowing draggers to fish these inshore areas with no daily limit is the worst idea in the history of conservation!

How do you see the winter of 2014/2015 unfolding? As I mentioned above, I see the boats selling/leasing their rights to catch groundfish to large draggers and those draggers wiping the fish off of the planet this winter. As you said before, "highly concentrated localized populations of a depleted fishery is why charter boats have been having good fishing success" -2010. I see the same thing happening this winter if you do nothing to stop it. It will be worse this time. Can you give me your opinion of what is going to happen this winter?

jc/jp - 8/25/14

Joan O'Leary

**From:** John Bullard - NOAA Federal <john.bullard@noaa.gov>  
**Sent:** Friday, August 22, 2014 4:52 PM  
**To:** Rich Antonino; Paul Diodati; Michael Pierdinock; Melanie Griffin; cwade440@yahoo.com  
**Cc:** Joan O'Leary; Tom Nies; Terry Stockwell  
**Subject:** Winter of 2014+



Captain Antonino;

Thank you for your email requesting that we prevent groundfish trawlers from fishing on Stellwagen Bank this winter and spring. You ask us to predict the behavior of trawlers this winter. You believe that larger vessels will be acquiring allocations from smaller vessels and then will be able to fish harder and cause localized depletion. Given your recent observations of large patches of bait fish on the bank, you're concerned that this will particularly impact the cod and haddock that would otherwise be available for the recreational fleet next year.

We have been working with the Council on Amendment 18 to the Northeast Multispecies Fishery Management Plan to ensure that concerns raised by the public regarding potential effects of the expanded 2010 catch share program (i.e., sectors) on consolidation and lack of diversity in the northeast multispecies fleet are addressed. In support of this amendment, the Council is analyzing temporal trends in fishing effort by vessel size class, and measures that could address possible concentration of effort in the inshore Gulf of Maine. They are also considering alternatives that would limit the amount of allocation that a business or individual could control.

As you know, the regulatory process, although democratic, is not very agile. I realize that this can be very frustrating to you when you believe that there is an obvious solution, and that the solution would prevent harm to your livelihood. Adding to feelings of urgency, the recent expedited assessment conducted by the Northeast Fisheries Science Center indicates the Gulf of Maine cod stocks continued to decline in 2013. A peer review of this assessment will be conducted Thursday (August 28) and Friday (August 29 - see <http://nefmc.org/tech/index.html>). If the peer review upholds the findings of the new assessment, we will work with the Council to determine an appropriate management response, which could impact the current year, as well as the next fishing year.

With this response to you, I am forwarding our correspondence to the New England Council Chairman and Executive Director to ensure that your observations and concerns are part of this ongoing deliberation. I encourage you to send in a request to be on the Council's mail list (contact: [webmaster@nefmc.org](mailto:webmaster@nefmc.org), [joleary@nefmc.org](mailto:joleary@nefmc.org)) so you can stay updated on Council meetings and actions, and know of opportunities to provide further input into the northeast multispecies management process.

Thank you,

John

*JOL/jp ~ 8/22/14*

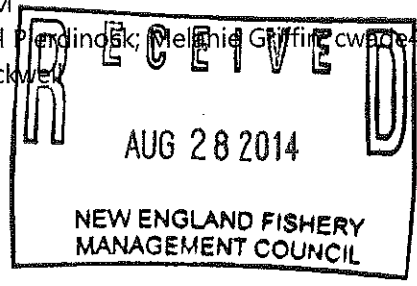


John K. Bullard  
Regional Administrator  
National Marine Fisheries Service  
Greater Atlantic Regional Fisheries Office  
*(formerly, Northeast Regional Office)*  
Gloucester, Massachusetts  
Phone: (978) 281-9250  
[john.bullard@noaa.gov](mailto:john.bullard@noaa.gov)



Joan O'Leary

**From:** Rich Antonino <captain@blackrosefishing.com>  
**Sent:** Thursday, August 28, 2014 5:00 PM  
**To:** John Bullard; Paul Diodati; Michael Pierdinock; Melanie Griffin; cwade440@yahoo.com  
**Cc:** Joan O'Leary; Tom Nies; Terry Stockwell  
**Subject:** RE: Winter of 2014+



Dear John et al,

Hello. Thank you for getting back to me. As August is ending and my season is being forced out of business (without cod and haddock, there is not much reason for people to drop \$1,000+ tip and expenses to fish out of Green Harbor), I want you to know that the groundfishing is as good as it has been in three years.. We are seeing more haddock than in many years.. I do not see a reason to close down the haddock on Sept. 1! This effectively puts us out of business. There are no school tuna this year. There are no striped bass in our waters now. The great white sharks are being seen on nearly every shark trip...and they scare away every other shark from an area immediately. People don't eat bluefish. People don't want Pollock because they are caught in 400' of water and you can't fish those waters except on the very calmest days (plus, those areas are prohibitively far away)...Cod and haddock.. the backbone of our fishing businesses. Taken off of the table. Haddock are all over right now. Cod fishing is showing great signs of promise.

I have spoken below to your points. I hope that your email server doesn't homogenize the fonts and colors, but my responses are below. Please, keep the haddock season open. If you close the cod season because you feel the species is at risk, back that up with an emergency closure of ALL INSHORE DRAGGING THIS FALL, WINTER, AND SPRING WHEN THOSE REMAINING COD ARE AGGREGATING ON STELLWAGEN BANK IN SHALLOW WATER.

Sincerely,

Capt. Rich Antonino  
 Black Rose Fishing Charters  
 Green Harbor, Mass.

**From:** John Bullard - NOAA Federal [mailto:john.bullard@noaa.gov]  
**Sent:** Friday, August 22, 2014 4:52 PM  
**To:** Rich Antonino; Paul J. Diodati; Michael Pierdinock; Griffin, Melanie (FWE); cwade440@yahoo.com  
**Cc:** Joan OLeary; Tom Nies; Terry Stockwell  
**Subject:** Winter of 2014+

Captain Antonino;

*jc/jprf*



Thank you for your email requesting that we prevent groundfish trawlers from fishing on Stellwagen Bank this winter and spring. You ask us to predict the behavior of trawlers this winter. You believe that larger vessels will be acquiring allocations from smaller vessels and then will be able to fish harder and cause localized depletion. Given your recent observations of large patches of bait fish on the bank, you're concerned that this will particularly impact the cod and haddock that would otherwise be available for the recreational fleet next year.

**In two parts you are correct. With the large concentrations of bait on Stellwagen AND THE LARGE NUMBERS OF COD AND HADDOCK there as well...YES, THE DRAGGERS WILL WAIT UNTIL THE FISH ARE IN SHALLOW WATER THIS FALL/WINTER AND WILL DRAG THEM MERCILESSLY, UNTIL THEIR QUOTA IS FULL. Your point that those are the fish that would be available for the recreational fleet is correct, but....YOU ARE TELLING US THAT THE OVERALL POPULATION IS DEVASTATED...THUS, THE FISH THAT WE'RE SEEING NOW ARE THE FINAL REMNANTS (IN YOUR OPINIONS) OF A ONCE GREAT POPULATION OF COD AND HADDOCK. ALLOWING DRAGGERS TO HIT THEM HARD THIS WINTER WHEN THEY ARE EVEN MORE CONCENTRATED IS THE WORST ENVIRONMENTAL MANAGEMENT POLICY IN HISTORY! I COULD NOT STATE THAT ANY MORE CLEARLY.**

We have been working with the Council on Amendment 18 to the Northeast Multispecies Fishery Management Plan to ensure that concerns raised by the public regarding potential effects of the expanded 2010 catch share program (i.e., sectors) on consolidation and lack of diversity in the northeast multispecies fleet are addressed. In support of this amendment, the Council is analyzing temporal trends in fishing effort by vessel size class, and measures that could address possible concentration of effort in the inshore Gulf of Maine. They are also considering alternatives that would limit the amount of allocation that a business or individual could control.

Let's talk about "temporal trends in fishing effort"..when it comes to recreational fishing.....In the letter explaining why there was an emergency closure of haddock season along with a reduction in bag limit from unlimited to 3 and an increase in size from 19" to 21".....the explanation was that the recreational fleet caught too many haddock in 2013...BUT...that it won't affect most anglers because the average person caught less than one fish per trip. THAT IS COMPLETE STATISTICAL HOGWASH! Let's use the Capt. John Boats out of Plymouth...running two ½ day trips each day with 50 people each time... They do that 100 times....That is 10,000 "angler days" at sea in which they will never ever catch a haddock. They are groundfishing 7 miles from Plymouth Harbor... But their effort counts against the statistical average. HOWEVER, THE CHARTER FLEET, TRYING TO ATTRACT CUSTOMERS FROM PENNSYLVANIA, NEW YORK, NEW JERSEY, AND OTHER LOCALES CAN'T CONVINCe THEM TO PART WITH THEIR MONEY TO FISH FOR THREE HADDOCK...SO, YOU ARE CORRECT WHEN YOU SAY THAT IT WON'T EFFECT MOST ANGLERS, BUT YOU'RE NOT BEING HONEST. IT WILL EITHER NOT AFFECT THE ANGLER OR IT WILL DEVASTATE THEM. IT WILL DEVASTATE THE ANGLERS WHO TARGET HADDOCK...AND THE BUSINESSES THAT FISH FOR THEM RECREATIONALLY (CHARTER/HEAD BOATS). WE ARE SEEING TONS OF HADDOCK OUT THERE NOW.. IN FACT, IT'S THE BEST FISHING THAT I HAVE SEEN SOUTH OF 42 25 NORTH IN A LONG TIME.

As you know, the regulatory process, although democratic, is not very agile. I realize that this can be very frustrating to you when you believe that there is an obvious solution, and that the solution would prevent harm to your livelihood. Adding to feelings of urgency, the recent expedited assessment conducted by the Northeast Fisheries Science Center indicates the Gulf of Maine cod stocks continued to decline in 2013. A peer review of this assessment will be conducted Thursday (August 28) and Friday (August 29 -

see <http://nefmc.org/tech/index.html>). If the peer review upholds the findings of the new assessment, we will work with the Council to determine an appropriate management response, which could impact the current year, as well as the next fishing year.

I DISAGREE.. I JUST GOT A NOTICE THAT GEORGE'S BANK WAS CLOSED IMMEDIATELY ON AUGUST 18...IMMEDIATELY IS VERY AGILE TO ME.

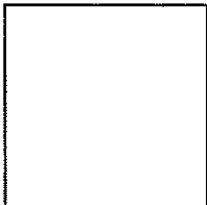
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Thank you,

John

--

**John K. Bullard**  
**Regional Administrator**  
National Marine Fisheries Service  
Greater Atlantic Regional Fisheries Office  
*(formerly, Northeast Regional Office)*  
Gloucester, Massachusetts  
Phone: (978) 281-9250  
[john.bullard@noaa.gov](mailto:john.bullard@noaa.gov)



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Paul J. Diodati  
Director

# Commonwealth of Massachusetts

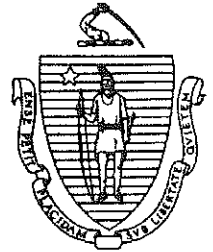
## Division of Marine Fisheries

251 Causeway Street, Suite 400

Boston, Massachusetts 02114

(617) 626-1520

fax (617) 626-1509



Deval Patrick  
Governor

Maeve Vallely Bartlett

Secretary

Mary B. Griffin

Commissioner

### MEMORANDUM

**TO:** New England Fishery Management Council  
**FROM:** David Pierce, Ph.D., Deputy Director  
**DATE:** September 11, 2014  
**RE:** GULF OF MAINE COD STOCK STATUS & NEEDED ACTION

#### Background: Serious Trouble

At our August 1 Groundfish Committee meeting we received from the NEFSC a brief yet extremely alarming, preliminary account of the status GOM cod after considering 2012 and 2013 data (and spring 2014). Until now, we've been guided by 3-year-old 2011 information and assumptions about what might have happened in 2012 and 2013. ACLs were set accordingly, and we projected ahead to 2014, 2015, and 2016.

To the Center's credit it has given the Council a very early indication of serious trouble with GOM cod, i.e., 3-4% of our target SSB with little recent recruitment and uncertain yet pessimistic future expectations. This bodes very poorly for the short and long-term futures of our groundfish fishery already experiencing a disaster and fishery failure.

Yet, contrary to this failure and the sentiments of many groundfish fishermen, at least one experienced fisherman (Council member Terry Alexander) previously has said: "*Cod are everywhere and in areas where they have been absent in recent years.*" At least one charter boat captain (Capt. Rich Antonino) has reported:

*"Right now we as charter captains are fighting for our life and the executioner is ready to drop the guillotine. On Sept 1, we will lose our livelihood in the Gulf of Maine. We will no longer be able to possess cod or haddock on our charters. In the past few weeks, the cod and haddock catches have been fantastic and the customers responded quickly. People are happy to catch cod and haddock. There have been trips in which the catching has been non-stop for hours with bent rods on every drop. Amongst the many keeper cod and haddock, there are tons of smaller fish. These are the keepers for the charter and recreational fleet next year! However, they are the target of commercial fishing over the winter and we can't let this happen on the scale dictated by the Catch Shares Program!"*

These views will be expressed again as fishermen contrast their observations with the NEFSC perspective elaborated at the Center-requested peer review held on August 28 & 29.

## Proactive NEFSC

The Center was asked at the last Groundfish Committee meeting why it focused its attention and resources on GOM cod and not on other stocks. That question was answered in the NEFSC Draft GOM Cod 2014 Assessment Update Report (August 2014) and repeated at the peer review.

I suggest that 2011 with the assessment redo in 2012 sensitized the Center to the special significance of GOM cod. The Center rightly has focused its attention on the stock responsible for GOM fleet diversity and the fleet's well being.

Moreover, consider the needed special attention paid to where and when GOM cod landings have occurred (few statistical areas). The Center has highlighted that CPUE gives a false picture of resource status.

We also should remind ourselves (as noted at the peer review) that fishermen's behavior has had to change under catch shares, low ACLs for most groundfish, and many low to extremely low PSCs (especially for GOM cod) all tending to influence when and where fishermen fish, i.e., closer to shore and on aggregations.

We're fortunate the Center has been proactive on this assessment and announced their preliminary findings now and not later, e.g., just before Christmas. Note that in the Draft Update Report the Center stated: *"This report is part of a larger effort to provide more timely information on stock status for all stocks in the Greater Atlantic Region...The assessment report represents a hybrid between a standardized assessment update and a full benchmark assessment."*

## Key Findings

Key findings in the Draft Update were:

- Spawning stock biomass in 2013 is estimated to be below 2,500 mt under both the  $M = 0.2$  and  $M$ -ramp ( $0.2 \rightarrow 0.4$ ) model scenarios. These levels are the lowest ever (my emphasis) estimated and are at 4% or 3% of the  $SSB_{MSY}$  proxy (47,184 mt or 69,621 mt).
- 2013 fully selected fishing mortality is greater than 1.24 under both models – more than six (6) times greater than the  $F_{MSY}$  proxy (0.18 for both models).
- $F$  is near all time highs despite the fact that fishery catches are at the lowest levels in the time series (since 1982).
- GOM cod state and federal survey indices are at time series lows.
- Age structure is truncated. Recruitment over the last five years (2009-2013) has been well below the long-term recruitment levels. Recruitment at age 1 (millions of fish) in 2013 was from 0.7-1.1, depending on the model [see below].
- Model past results overestimated SSB and underestimated  $F$ , and past performance should be accounted for when determining the level of scientific uncertainty to 2014 assessment results.
- If recent weak recruitment continues, GOM cod productivity and rebuilding of the stock will be less than projected.
- The GOM cod stock is in poor condition, according to the Draft Report [Note: "Poor" seems to be an understatement. "Collapsed" may be a more appropriate term.].



Most alarming for the commercial and recreational groundfish fishing industry are the projections (Report Table 3) the PDT, SSC, and Council will have to consider. To meet our rebuilding target (rebuild to  $SSB_{MSY}$  by 2024), 2015 catches must be considerably reduced, according to the Report. Of great importance, projections in Table 3 assume 1982-2011 median recruitment (4.6-9.1 million fish depending on model).

However, note that in 2013 recruitment was 0.7-1.1 million fish. In 2012 it was 2.6-4.4 million fish; in 2011 it was 1.5-2.8 million fish, once again, depending on the model. Therefore, projections appear very optimistic and unrealistic.

Consider that even with optimistic recruitment assumptions (I suggest we should reject), stock rebuilding is well-nigh impossible. For example, with higher assumed natural mortality of 0.4 (most of us believe  $M$  is higher than 0.2) and with the 2014 ABC of 1,550 mt likely being caught, we cannot rebuild even if  $F$  is set at zero.

If we assume  $M$  is 0.2, then in the M-ramp model with  $F$  set to 0.14 in 2015, the ABC should be just **465 mt** with a perilously slow creep upwards in SSB from 3,022 mt in 2014 to 4,484 in 2015. Let's remember that: (1)  $F$  in 2013 was estimated to be 1.24 – a far and distant cry from 0.14; (2) our SSB target is 54,743 (lower value); and (3) we are using in the projections a very optimistic and unrealistic recruitment assumption.

Report Table 1.37 (p. 53) uses more realistic recruitment assumptions. With the M-ramp model and  $M$  equals 0.4 (since 2004), we cannot rebuild with  $F$  set at zero. SSB would be just 3,093 mt in 2015. If  $M$  equals 0.2, SSB in 2015 would be just 4,047 mt, and the ABC (not ACL) should be a miniscule 203 mt.

Moreover  $F$  is beyond our control.  $F$  was 1.24 (65% annual removal due to fishing) in 2013 despite a “hard” quota (ACL). I suspect  $F$  was as high or higher in 2014. It could be over 2.00 (81% annual removal due to fishing) if any retrospective pattern is considered, according to the Center.

### **Peer Review**

The Peer Review had no unexpected results and/or conclusions. Catch (ABC, not ACL) in 2015 (at  $F_{rebuild}$ ) ranges from 0 to 530 mt with other projection options being 74, 176, or 203 mt depending on the model ( $M = 0.2$  or M-ramp). The highest catch at 75%  $F_{MSY}$  is 756 mt (other catches: 199, 332, 332, 399, or 460 mt).

2014 spawning stock biomass ranged from 1,588 – 2,990 mt. At  $F_{rebuild}$  2015 SSB will range from 1,749 – 4,047 mt all depending on the model and whether there is a retrospective adjustment. At 75%  $F_{MSY}$  2015 SSB will range from 1,713 – 3,997 mt.

### **Stock Collapse**

It seems quite clear that what many of us have feared finally has occurred – a collapse or near-collapse of the GOM cod stock. Some might not want to use “collapse” because of its implications for management and the fishery. I suggest collapse, rather than “depleted,” is appropriate especially because recruitment has been well below the median for at least the last four years; there is no age structure offering any realistic hope for rebuilding; and stock structure is even more disrupted (i.e., continued diminishment and loss of spawning aggregations). Adding to this more alarming descriptor is the likely impact of warming waters and their effects on productivity.

I refer the Council to the 2010 paper “Stock collapses and their recovery: mechanisms that establish and maintain life-cycle closure in space and time” by Petitgas

et al. in ICES Journal of Marine Science 67: 1841-1848. They argue, and I suggest their conclusions are especially relevant to GOM cod:

*"The collapse of a stock's biomass is accompanied by the loss of key structural and behavioral elements that affect the life cycle patterns existing within the stock, resulting in a long recovery time."*

They conclude: "...recovery plans should include spatial measures to rebuild contingent structure when a stock has collapsed. For example, continued fishing at low levels jeopardizes the expansion of a remaining resident contingent, consequently retarding or preventing the emergence of others, as well as the reuse of abandoned habitats, if new colonizers are instantly fished out. From a precautionary point of view, spatial measures could proactively protect contingent diversity and prevent their disruption in the first place..."

### **Next Steps**

I offer the following way forward, and it's not an attractive option for many, especially sector fishermen who fish the inshore, southwestern portion of the Gulf of Maine from mid-fall to mid-winter. I broached the idea at the last Council meeting regarding a seasonal closure of the inshore Gulf of Maine (west of 70°15' or thereabouts) to deal with the coupled issues of fleet diversity and spawning cod protection. Now, this updated assessment with peer review forces another look at this closure.

Whatever is left of the GOM cod stock remnant must be protected, especially the remaining pre-spawning and spawning aggregations that likely now may be very few in number and size. There is no choice for us but to dramatically reduce effort and mortality in ways giving us a greater chance of success, i.e., closures that can be enforced rather than dependence on a far lower, difficult to monitor and enforce ACL. A much-reduced ACL will not prevent focused fishing on aggregated cod frequenting near-shore grounds, including sector fishermen acquiring GOM cod through leasing from fishermen with a catch history from other GOM regions, i.e., not the southwestern portion of GOM.

Pressure should be removed from the GOM cod stock, and that removal must recognize when and where cod aggregate for pre-spawning and then spawning. Expecting fishermen to find, report, and then avoid spawning concentrations through "adaptive" management by sector fishermen is unrealistic and untimely. It requires too much of fishermen.

There is no choice but to re-establish and consider anew that which many groundfish fishermen will not support, i.e., seasonal area closures and more gear restrictions. In the face of our groundfish disaster/fishery failure it certainly will be difficult to remove current fishing opportunities that many fishermen will not want to relinquish, especially since some of those opportunities occurred through sector management and exemptions to closures. Nevertheless, disaster for the GOM cod stock – is upon us as evidenced by the assessment update and peer review providing very little room for doubt.

### **Emergency Action**

Protective steps cannot wait. Emergency action is warranted especially because the beginning of GOM cod spawning from late October through mid- to late-January is less than a few months away.



The “no choice” option is warranted from a fishing mortality reduction perspective as well. With an ABC of about 400 mt (one likely SSC-recommended ABC, I assume) representing another substantial cut (74%), fishermen will have to avoid places and times when cod aggregate to reduce catch by 74% and F from 1.24 to 0.14 (or more dramatically from 2.00 to 0.14).

I suggest we ready ourselves for consideration of an emergency request to be developed through the Groundfish Committee meeting mid-September (17<sup>th</sup>) and then the Council meeting September 20-October 2. The RAP and GAP that meets on the 16<sup>th</sup> should be briefed and prepared to assist.

Our challenge will be to allow fishing on GOM haddock and other non-groundfish stocks, such as whiting, in the area(s) I argue we now have no choice but to close for cod protection. The RAP/GAP must help us meet that challenge. I assume groundfish sectors will step up and try to offer suggestions from their members.

I also assume the Regional Office will support emergency action (in whatever form it takes) to address this new assessment information and the unexpected results, e.g., GOM cod fishing mortality being extremely high despite the low ACL for the current fishing year.

Furthermore, along with the Regional Office, we should reflect on FW 51 (Final Rule May 1, 2014). Our “Rebuilding Plan Review Analyses” allows for *“necessary adjustments to be made [new catch advice] if either GOM cod or plaice falls below its rebuilding trajectory.”* For GOM cod that would be to rebuild by 2024 (recently revised deadline), and now we are informed we cannot.

We will find that  $F_{\text{rebuild}}$  is less than 75%  $F_{\text{MSY}}$ ; therefore, new catch advice is needed, and it will be provided by the SSC. As I indicated above, the ABC likely will drop from 1,550 mt to no more than 530 mt, but only with acceptance of a new  $\text{SSB}_{\text{MSY}}$  of 14,000 mt and new  $F_{\text{MSY}}$  of 0.45 associated with that ABC (see peer review results). Otherwise, using the  $\text{SSB}_{\text{MSY}}$  proxies (47,184 or 69,621 mt, depending on the model), the ABC can be no more than 203 mt. I suggest decreasing the  $\text{SSB}_{\text{MSY}}$  to 14,000 mt and increasing  $F_{\text{MSY}}$  to 0.45 will be very difficult to explain and justify.

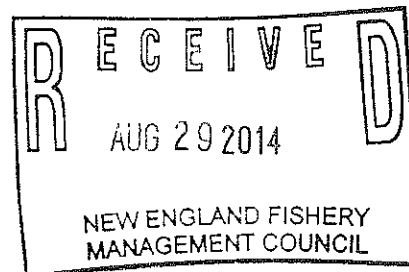
Note: The commercial fishery ACL in FY 2014 is 812 mt (sectors) and 18 mt (common pool). The Recreational Harvest Limit for GOM cod is 486 mt. The severity of the likely cuts for 2015 is striking and would represent two years in a row of precipitous declines giving the industry no way to adapt.



3  
UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
GREATER ATLANTIC REGIONAL FISHERIES OFFICE  
55 Great Republic Drive  
Gloucester, MA 01930-2276

AUG 27 2014

Thomas A. Nies  
Executive Director  
New England Fishery Management Council  
50 Water Street, Mill 2  
Newburyport, MA 01950



Dear Tom:

In your July 9, 2014, letter, the Council requested that we evaluate the results of the Gulf of Maine (GOM) haddock stock assessment and consider taking emergency action to increase the fishing year 2014 catch limits and modify recreational management measures if the assessment results support such changes.

The final report of the 59<sup>th</sup> Stock Assessment Review Committee (SARC), which was issued August 21, 2014, concludes that GOM haddock stock health has improved since the last assessment. However, an emergency action regarding recreational GOM haddock management measures is not justified at this time based on the following findings:

- GOM haddock landings and discards from the start of the fishing year (Wave 3, May-June 2014) are strong. Marine Recreational Information Program data indicate that catch from Wave 3 is higher than we originally projected.
- The change in recreational discard mortality for haddock from zero to 50 percent that was adopted in SARC 59 has a substantial impact on recreational mortality for the fishing year. Preliminary catch model results incorporating information from the new assessment suggest the recreational fishery could utilize its entire allocation under the current management measures.
- Knowing that GOM cod and haddock are taken concurrently in recreational fisheries, we are hesitant to modify any recreational haddock fishing measures prior to a peer review and Council consideration of the recent GOM cod stock assessment update.

We will continue to assess this situation to determine whether changes in GOM haddock recreational measures may be warranted in the future. If you have further questions about our determination, please contact Susan Murphy in the Sustainable Fisheries Division at 978-281-9252.

Sincerely,

John K. Bullard  
Regional Administrator

for

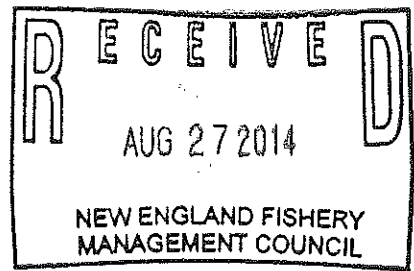


jd/rfb/p/pmf



cc: Terry Stockwell, Chair, New England Fishery Management Council  
Frank Blount, Chair, Groundfish Oversight Committee  
Barry Gibson, Chair, Recreational Advisory Panel

From: Michael Colleary  
Sent: Wednesday, August 27, 2014 1:37 PM  
To: John Bullard  
Cc: Tom Nies; Paul Diodati; David Pierce  
Subject: Haddock Fishery Closure Sept 1



3

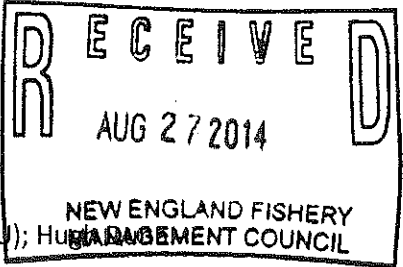
Hello,

I am Writing as a recreational fishermen who employ the services of charter and head boats from the ports of South Eastern Massachusetts. Please do not shut down the Haddock fishery on September 1.

Thank you

Michael Colleary





From: Michael Pierdinock  
Sent: Wednesday, August 27, 2014 12:22 PM  
To: John Bullard; Tom Nies  
Cc: Paul Diodati; David Pierce; Valanzola Jared (SEN); Thomas Benjamin (HOU); Hugh  
Subject: Charter/Recreational Haddock Closure Sept 1st.

John & Tom:

The recent release of the status of the haddock fishery is great news indicating that there is approximately 5 times as much haddock as originally estimated. As you know both the cod & haddock fishery will be shut down Sept 1st. Why is the haddock fishery being shut down Sept 1st when there are 5 times as much haddock as originally estimated? The shut down will put charter/fore hire fleet out of business and have a detrimental impact on the economy.

When the haddock fishery was in trouble we were permitted to continue to fish for cod that resulted in a haddock bycatch even though haddock are less hardy then cod. Cod are more hardy then haddock resulting in fewer dead discards. This seems to contradict the previous mgt approach. If the concern is that continued landing of haddock will result in cod bycatch then the same bycatch will occur when fishing for pollock, redfish etc.

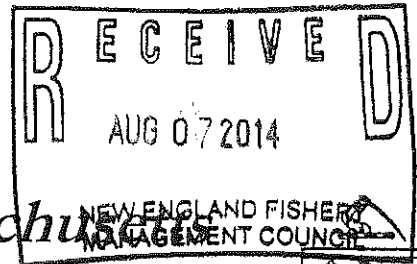
Without cod, the haddock fishery is our only hope concurrently with pollock and redfish to continue to book our clients for trips in September and October without it many will not economically survive after Sept 1st.

I look forward to hearing from you.

Thanks

Capt. Mike Pierdinock  
CPF Charters "Perseverance"  
Recreational Fishing Alliance - Massachusetts Chairman  
Stellwagen Bank Charter Boat Association - Board of Directors  
Stellwagen Bank National Marine Sanctuary Advisory Council - Recreational Seat  
New England Fishery Management Council - Enforcement Advisory Panel  
(617) 291-8914  
cpfcharters@yahoo.com

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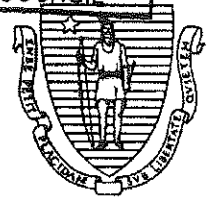
Paul J. Diodati  
Director

# Commonwealth of Massachusetts

## Division of Marine Fisheries

251 Causeway Street, Suite 400  
Boston, Massachusetts 02114

(617) 626-1520  
fax (617) 626-1509



Deval Patrick  
Governor  
Maeve Vallely  
Bartlett  
Secretary  
Mary B. Griffin  
Commissioner

August 4, 2014

Mr. David Leveille  
Sector Manager  
II Northeast Fishery Sector, Inc.  
10 Witham Street  
Gloucester, MA 01930

Dear Mr. Leveille:

Commissioner Griffin and Director Diodati have asked me to respond to your letter of concern about my two memoranda I prepared for the New England Fishery Management Council pertaining to improved protection of inshore groundfish, especially Gulf of Maine cod when spawning. As you and Sector II fishermen probably are aware, prospects for GOM cod rebuilding are not good. Just in the past few days the Northeast Fisheries Science Center has released a stock assessment update for GOM cod and have stated that "fishery resource survey indices and spawning stock biomass are at all time lows." We're certain Sector II fishermen share our concerns about cod because as goes GOM cod, so goes the fishery and fishermen's welfare.

We all appreciate the stress fishermen are experiencing as a result of the groundfish fishery disaster/failure that shows no sign of abating. Governor Patrick's and DMF's unrelenting efforts to provide groundfish disaster relief to the Northeast groundfish industry, and specifically \$14.5 million to groundfishermen in Massachusetts, in partnership with our Congressional delegation and Massachusetts Legislators give evidence of how we understand the seriousness of the situation for fishermen, boat owners, crew, and shore-side support structure.

I agree there is a need for better communication and understanding of our respective views and concerns. For example, you mistakenly believe DMF is promoting an inshore/offshore division of the GOM cod annual catch limit (ACL). You also think DMF was firm on 70 degrees west as the line designating inshore/offshore. In fact, DMF agreed with industry spokesmen that 70°15' west was better. Furthermore, all the comments were made for further analyses and then public comment. We are a long way from Amendment 18 completion, hearings, final decisions, and then implementation.

cc: .jc/rfl/ip - 8/8/14



I spoke with Joe Orlando at a meeting of the Buyout/Buyback Working Group on July 29 in Gloucester, and I asked to attend a Sector II meeting to talk and hear these fishermen's opinions about an inshore/offshore GOM boundary, i.e., its location, purpose, and what should and should not be considered as management measures for the area, if eventually divided. I'll be contacting Joe soon to get a meeting time.

I'm pleased to learn NEFS 2 is "*actively engaged in communications with fishermen in other sectors in order to identify problems and viable solutions for measures to consider for the Gulf of Maine.*" Sector fishermen are individual fishermen with individual and often very inequitable allocations, perhaps creating a pecking order of sorts with some fishermen being more powerful and influential than others by virtue of those allocations. Some may be struggling far more than others. I appreciate how sectors must labor to get consensus on how members are to share their allocations when in sectors for the benefit of the whole.

I sincerely hope your members can remain active in the groundfish fishery. I agree a proactive approach on our part for collaboration with your sector to promote that continued activity is important. However, when there is disagreement within and between sectors as to what is the best approach, then collaboration is very difficult, especially when some sectors seem to be working at cross purposes and don't believe enough is being done for groundfish conservation and/or to prevent localized depletion of groundfish, thereby giving some sectors' fishermen a great advantage over others.

I look forward to my meeting with Sector II members and working together on these issues facing the industry. Please make this letter available to all your members. Thank you.

Sincerely yours,

A handwritten signature in cursive script that reads "David Pierce".

David Pierce, Ph.D.  
Deputy Director

cc

Mary Griffin  
Paul Diodati  
Melanie Griffin  
Joseph Orlando  
Terry Stockwell  
Thomas Nies  
Honorable Carolyn Kirk  
State Representative Ann-Margaret Ferrante  
State Senator Bruce Tarr  
Jackie Odell  
Vito Giacalone



# Greater Atlantic Region Bulletin

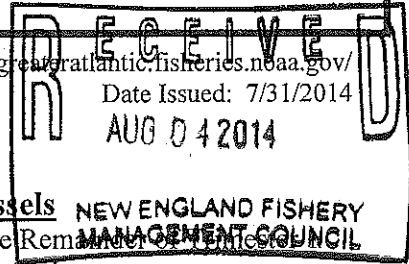
NOAA Fisheries, Greater Atlantic Regional Fisheries Office, 55 Great Republic Drive, Gloucester, MA 01930

For Information Contact:  
Sustainable Fisheries Division  
(978) 281 - 9315

<http://www.greateratlantic.fisheries.noaa.gov/>

Date Issued: 7/31/2014

AUG 04 2014



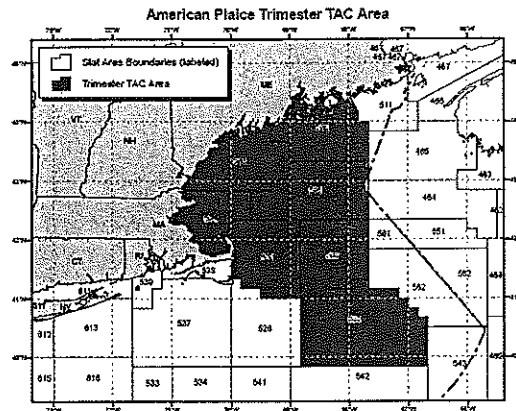
## Northeast Multispecies Common Pool Vessels

Trimester Total Allowable Catch Area for American Plaice Closed for the Remainder of Trimester 1  
Possession and Trip Limit Adjustments for American plaice

Effective: August 6, 2014, through August 31, 2014

Effective August 6, 2014, the American plaice Trimester 1 Total Allowable Catch (TAC) Area (statistical areas 512, 513, 514, 515, 521, 522, and 525) is closed to common pool vessels on a groundfish trip using trawl gear for the remainder of Trimester 1, through August 31. This closure is required because we have determined that 120 percent of the American plaice Trimester 1 TAC was harvested as of July 26. The areas will reopen at the start of Trimester 2 on September 1.

In addition, effective August 6, 2014, the possession of American plaice is prohibited for all common pool vessels in all areas, through August 31. The possession limit of American plaice will be unlimited at the start of Trimester 2 on September 1.



If you have crossed the vessel monitoring system (VMS) demarcation line and are currently at sea on a groundfish trip, you may complete your trip in all or part of the closed areas, and you will not be subject to the new possession limit. Please contact us at (978) 281-9315 if you have any questions. Quota monitoring reports are updated on the internet at <http://www.greateratlantic.fisheries.noaa.gov/>.

<i>Frequently Asked Questions</i>	
<b>Why is this action being taken?</b>	We must close the Trimester TAC Area to all common pool trawl vessels when it is projected that 90% of the Trimester TAC will be caught. The possession and trip limit for American plaice is adjusted to zero for the remainder of Trimester 1 for all common pool vessels to prevent further overharvest.
<b>How much of the quota has been caught of each stock?</b>	As of July 26, 2014, 120% of the quota for American plaice had been caught.
<b>When will the GOM Trimester TAC Area reopen?</b>	Areas 512, 513, 514, 515, 521, 522, and 525 will reopen on September 1, 2014, to common pool vessels fishing with trawl gear. Until then, you may not be fishing on a groundfish trip in those areas with trawl gear, even if you are not targeting American plaice.
<b>Can I still fish if I use gillnets or longline/hook gear?</b>	Yes, the closure only applies to vessels using trawl gear. However, Areas 513 and 514 remain closed to all common pool vessels fishing with trawl, gillnet, or longline/hook gear, which includes handgear vessels, due to the closure of the GOM Cod Trimester TAC area.

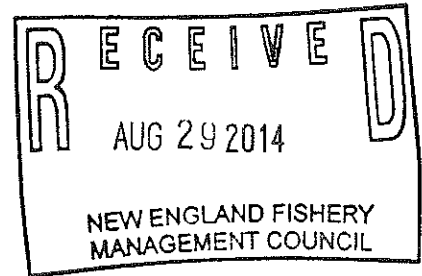
*For small entity compliance guides, this bulletin complies with section 212 of the Small Business Regulatory Enforcement and Fairness Act of 1996. This notice is authorized by the Regional Administrator of the National Marine Fisheries Service, Greater Atlantic Region.*





UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
Northeast Fisheries Science Center  
166 Water Street  
Woods Hole, MA 02543-1026

August 22, 2014



Mr. E. F. Stockwell, III  
Chairman, New England Fishery Management Council  
50 Water Street; Mill 2  
Newburyport, MA 01950

Dear Terry:

I want to thank the Council, Council Staff, and the Scientific and Statistical Committee for working closely with the Center to organize the SSC peer review for the recent Gulf of Maine cod assessment update.

In response to your letter of August 7, we were able to release the operational assessment terms of reference, the report, and an appendix to the public on August 15. We coordinated with the Council to schedule a teleconference meeting of the Assessment Oversight Panel on August 21. Lastly, our staffs also are closely coordinating the logistics for the peer review meeting, which is to be held later this month (August 28-29) in Portsmouth, NH.

As you requested, the Center will provide a report at the September Council meeting that describes the lessons learned from the new stock assessment update process used for Gulf of Maine cod, including estimates of staff time and budget resources spent for this assessment. We will also provide an overview of other New England groundfish stocks that are potential candidates for this approach, including summary information of survey and catch data for these stocks.

Sincerely,

Russell W. Brown, Ph.D.  
Acting Science and Research Director

cc: T. Nies  
R. Beal  
J. Bullard  
C. Moore  
J. Kritzer  
P. Sullivan



jc/fl/jp



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Northeast Fisheries Science Center  
166 Water Street  
Woods Hole, MA 02543-1026

August 1, 2014

Mr. E. F. Stockwell, III  
Chairman, New England Fishery Management Council  
50 Water Street; Mill 2  
Newburyport, MA 01950

Dear Terry:

We are writing to inform you that the Northeast Fisheries Science Center has completed an update of the Gulf of Maine cod stock assessment, and requests the Council's assistance in completing a peer review of this work.

First, some background on what led us to conduct the update. We have received numerous requests from the councils and industry over the years to provide more timely information on stock condition and to provide advance notice when we see early indications of changes in stock condition. As a result, the Northeast Fisheries Science Center has been developing ways to streamline the process for assessment updates. The intent of the effort is to develop a mechanism to alert managers to new signals observed in survey, catch, or other data collected between full assessments.

Upon examining the most recent survey data for Gulf of Maine cod, all major indicators of stock health appear to have deteriorated since the 2012 assessment. Given the information on Gulf of Maine cod and the availability of catch and age data for 2012 and 2013, we chose to do an updated assessment for Gulf of Maine cod.

Specifically, this assessment was selected for our trial because (1) we noted that all three survey indices (NEFSC spring survey; NEFSC fall survey; and Massachusetts DMF spring survey) in recent years declined to record low levels; (2) age data, survey indices, and prorated catch were all up to date through 2013 and available for use; (3) because of the recently conducted benchmark assessments for this stock, the data processing routines necessary to prepare data for use in assessments were in a high state of readiness; and (4) it is relatively complex, with two assessment models. If the new approach could be successfully used to produce a concise and timely update for this stock, then it would be easier to use for less complex assessments.

In conducting the update, it became apparent that virtually all indicators of Gulf of Maine cod stock condition have deteriorated since 2012 when the last assessment was conducted, and





prospects for improvement as well as rebuilding are dimming:

- Spawning biomass levels are estimated to be at 3 to 4 percent of the biomass target for maximum sustainable yield.
- Fishery resource survey indices and spawning stock biomass are at all-time lows.

The intent of undertaking this assessment update was part of a larger effort to develop a more efficient process for generating information on stock status. However, once the preliminary results of the assessment update became clear, we felt it was important to share what we have learned given the apparent grave condition of this stock.

We are requesting the Council's assistance to conduct a peer review of the stock assessment update with the participation by its Scientific and Statistical Committee. We discussed some peer review options with the Council Executive Director and hope you can soon finalize a plan for the peer review. Our staff stands ready to work collaboratively with you to accomplish the peer review, so that updated assessment results can be used to inform management decisions.

Sincerely,



Russell W. Brown, Ph.D.  
Acting Science and Research Director

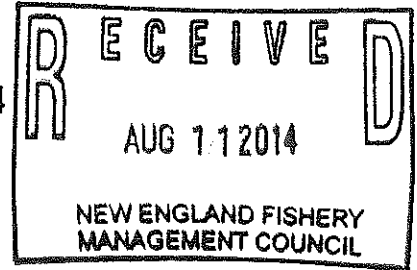
cc: R. Beal  
J. Bullard  
C. Moore



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
GREATER ATLANTIC REGIONAL FISHERIES OFFICE  
55 Great Republic Drive  
Gloucester, MA 01930-2276

Thomas A. Nies  
Executive Director  
New England Fishery Management Council  
50 Water Street, Mill 2  
Newburyport, MA 01950

AUG 11 2014



Dear Tom:

On March 27, 2014, I sent you a partial response to your February 11, 2014, letter regarding confidentiality of information as it applies to catch share programs. This letter provides answers to your remaining questions about confidentiality of monitoring information and costs.

On May 23, 2012, NOAA's National Marine Fisheries Service published a proposed rule (77 FR 30486) that would revise the confidentiality regulations to implement the 2006 changes to the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The comment period for the proposed rule has closed, and responses to comments and a final rule are being developed. We have answered your questions below based on the Greater Atlantic Regional Fisheries Office's interim practices for the handling of MSA confidential information. These responses may need to be revised based on further analysis or changes provided in the final rule.

**1. Can sector-specific monitoring costs be released to the public?**

Under MSA section 402(b), information that is required to be submitted to us, a state fishery management agency, or a marine fisheries commission in compliance with any requirement or regulation under the MSA, and any observer (including at-sea monitors) information must be maintained as confidential. As you are aware, we have directly paid for all sector at-sea monitoring costs since 2010. Because of this, some existing sector monitoring cost information for at-sea monitoring and the Northeast Fishery Observer Program may be released because it was not submitted in compliance with a requirement or regulation under MSA and is therefore not subject to the MSA's confidentiality requirements.

For information that is submitted to us due to a requirement or regulation under the MSA, section 402(b) of the statute includes a number of exceptions that authorize disclosure of confidential information if certain conditions are met. Most of these exceptions authorize disclosure to certain parties that must maintain the confidentiality of the information. One applies to limited access programs and authorizes information to be disclosed to the public when it is used by us to make a determination concerning allocation or monitoring of fishing privileges. We do not apply that exception to sector monitoring cost information submitted to us because the information is not used to make such a determination.





### At-Sea Monitoring Costs

The details of contracts with the Federal government are often released in response to requests under the Freedom of Information Act, but the specific costs charged by a particular company may be confidential. For instance, unit pricing (e.g., price per hour for a monitor) may be considered confidential business information. However, aggregating cost information from multiple providers may allow the release of average cost information, such as the average cost of monitoring a sea day, if it does not release company-specific unit pricing.

Our current and past contracts for at-sea monitoring services are posted on the Northeast Fisheries Science Center's at-sea monitoring program website at: <http://www.nefsc.noaa.gov/fsb/asm/>. Contracts for Northeast Fishery Observer Program services are posted at: <http://www.nefsc.noaa.gov/fsb/program.html>. Unit pricing information in these contracts has been redacted.

### Dockside Monitoring Costs

Unlike at-sea monitoring, individual sectors contracted directly with dockside monitoring providers and were responsible for paying those providers. Federal funds were awarded to the Gulf of Maine Research Institute to reimburse sectors for a portion of the costs of dockside monitoring. The amount of those awards (\$1.8M) is public information, but the amounts sub-awarded to each sector, and terms of any contract between a sector and a dockside monitoring provider, are exempt under the Freedom of Information Act because this is private information involving third parties.

## **2. Is the number of trips or days monitored by a specific vessel or sector confidential?**

### At-Sea Monitoring Trip Counts

Our determination of a vessel-specific count of trips receiving an observer (including an at-sea monitor) is not subject to the MSA confidentiality requirements because it is not based on information submitted to us. Similarly, a sector-specific count of monitored trips would not be confidential. A preliminary count of the number of trips that each individual sector had monitored in fishing year 2013 is currently available on our website at: [http://www.nefsc.noaa.gov/fsb/asm/coverage\\_web\\_report.pdf](http://www.nefsc.noaa.gov/fsb/asm/coverage_web_report.pdf).

If additional information about monitored trips, such as observed catch, was requested, then we could only provide aggregated information as allowed by the MSA.

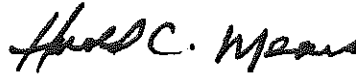
### Dockside Monitoring Trip Counts

Dockside monitoring providers submitted coverage information from fishing year 2010 to us in compliance with requirements under the MSA. We used that information to determine achieved dockside monitoring coverage levels and whether or not to approve dockside monitoring providers to operate in fishing year 2011. Dockside monitoring coverage level information may be released at the sector level because it was used to make a determination under a limited access

program. However, very little information exists about dockside monitoring coverage levels because of the short period of time the program operated.

Confidentiality of information is an important issue and questions regarding confidentiality of information as it applies to catch share programs will continue to be complex. When we publish a final rule changing the confidentiality requirements, we will review our policies and amend them as appropriate. If you have further questions about confidentiality of information please contact Ted Hawes in the Analysis and Program Support Division at 978-281-9296. For questions specific to the observer and at-sea monitoring programs please contact Amy Martins of the Fisheries Sampling Branch at 508-495-2266.

Sincerely,



John K. Bullard  
Regional Administrator





# Greater Atlantic Region Bulletin

NOAA Fisheries, Greater Atlantic Regional Fisheries Office, 55 Great Republic Drive, Gloucester, MA 01930

For Information Contact:  
Sustainable Fisheries Division  
(978) 281-9315

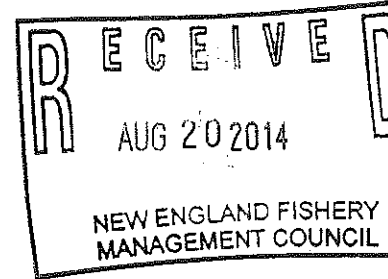
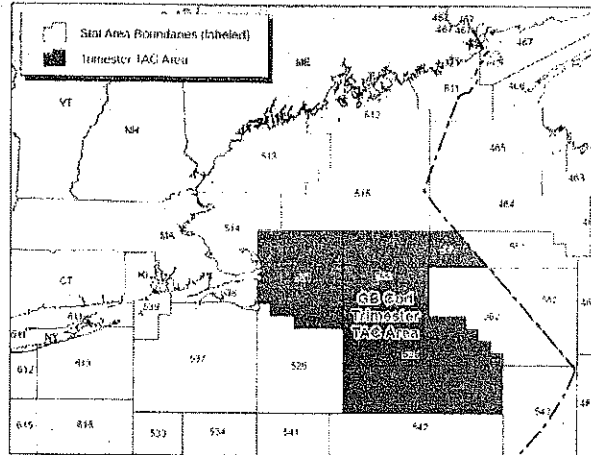
www.greateratlantic.fisheries.noaa.gov/  
Date Issued: 8/18/2014

## Northeast Multispecies Common Pool Vessels

Closure of the Georges Bank Cod Trimester Total Allowable Catch Area

*Effective Date: August 18, 2014, through August 31, 2014*

Effective immediately, August 18, 2014, statistical areas 521, 522, 525, and 561 are closed for the remainder of Trimester 1, through August 31, 2014, to all common pool vessels fishing with trawl gear, sink gillnet gear, and longline/hook gear. This closure is required because based on available information, we have determined that 90% of the Trimester 1 Total Allowable Catch (TAC) for Georges Bank (GB) cod has been caught. This area will reopen at the beginning of Trimester 2, at 0001 hours, September 1, 2014. If you have crossed the vessel monitoring system (VMS) demarcation line and are currently at sea on a groundfish trip, you may complete your trip in all or part of the closed areas.



REMINDER: Previously announced Trimester 1 closures due to overages of Gulf of Maine cod and American plaice remain in effect. Beginning on September 1, 2014, at 0001 hours (the start of Trimester 2), all Trimester TAC Areas will once again open to common pool vessels fishing with approved gear. Additionally, on September 1, the prohibition on retaining American plaice will be removed. Please contact us at (978) 281-9315 if you have any questions. Quota monitoring reports are updated on the internet at <http://www.greateratlantic.fisheries.noaa.gov/>.

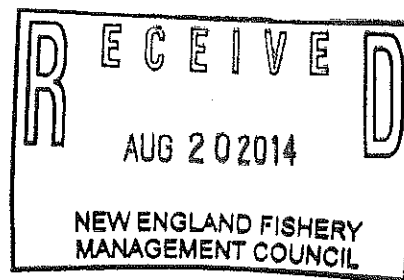
<b>Frequently Asked Questions</b>	
<b>Why is this action being taken?</b>	We are required by regulation to close the Trimester TAC Area for a stock once 90% of the Trimester TAC is caught to avoid quota overages.
<b>How much of the quota has been caught of each stock?</b>	As of August 14, 118% of the quota for GB cod had been caught.
<b>What happens if the Trimester TAC is exceeded? Underharvested?</b>	If the Trimester 1 TAC for GB cod is exceeded, the overage will be deducted from the Trimester 3 TAC. Any unused portion of the Trimester 1 TAC for GB cod will be carried forward to Trimester 2.

*For small entity compliance guides, this bulletin complies with section 212 of the Small Business Regulatory Enforcement and Fairness Act of 1996. This notice is authorized by the Regional Administrator of the National Marine Fisheries Service, Greater Atlantic Region.*

sc/jp - 8/25/14

August 20, 2014

Dr. William Karp, Science and Research Director  
Northeast Fisheries Science Center  
NOAA Fisheries Northeast Region  
166 Water Street  
Woods Hole, MA 02543



Terry Stockwell, Chair  
New England Fishery Management Council  
50 Water Street, Mill 2  
Newburyport, MA 01950

Dr. Jacob Kritzer, Chair  
Scientific and Statistical Committee  
New England Fishery Management Council  
50 Water Street, Mill 2  
Newburyport, MA 01950

Dear Dr. Karp, Mr. Stockwell, and Dr. Kritzer:

We are writing to express our concern that the recent benchmark assessment conducted for Gulf of Maine (GOM) haddock did not adequately address the Term of Reference (TOR)<sup>1</sup> concerning mixing between the Georges Bank (GB) haddock and Gulf of Maine haddock stocks. We also wanted to notify you of our concerns relating to the treatment of the 2012 year class for GOM haddock when setting a future ABC/ACL for this stock.

One of the reasons why the NEFMC and NRCC prioritized the GOM haddock assessment for 2014 was due to the great disparity between the ABCs for the GB haddock and GOM haddock stocks. In fishing year 2013, the ABC for the Georges Bank haddock stock was approximately 29,335 mt or 100 times greater than the ABC for the Gulf of Maine haddock stock. Concern was expressed by many NEFMC members that the large biomass and newly reported year classes of the GB haddock being recruited into that stock would spill over into the Gulf of Maine, which would prompt a shutdown of fishing in the Gulf of Maine due to the very low ABC prescribed for the GOM haddock stock.

On April 23, 2013 the NEFMC passed a motion to "task the PDT and SSC to examine the issue of GB haddock spillover into the GOM stock area, provide an estimate of the amount of spillover when large year classes of GB haddock occur, and provide suggestions as to how the anticipated spill-over of the strong 2010 year class can be used to adjust the GOM haddock ABC for FY 2013, 2014 and 2015."

After reviewing available data and literature on this topic, the PDT and SSC concluded in their reports to the NEFMC that exchange rates were not well characterized. The SSC further noted in their correspondence to the NEFMC in a Memo dated September 3, 2013 that "although the literature

<sup>1</sup> 3. Evaluate the hypothesis that haddock migration from Georges Bank influences dynamics of GOM stock. Consider role of potential causal factors such as density dependence and environmental conditions.

SSC, CBK - 8/21/14 jcl/jp



perhaps suggests an upper bound of 10% - this figure is not robust." The SSC also concluded that they could find "no scientific basis for adjusting haddock ACLs based on mixing or spillover."

*Both the PDT and the SSC agreed that some mixing was likely but they didn't have enough information available to recommend a specific percentage or number.* This prompted the NEFMC to prioritize a GOM haddock benchmark assessment during their subsequent discussions with the NRCC.

During the recent benchmark assessment for GOM haddock, the only material reviewed to address the mixing TOR was tagging data. Using this data Miller and Palmer concluded that "migrating rate estimates imply individuals starting in the Gulf of Maine have approximately a 94% probability of being in the Gulf of Maine for 1 year given they survived the interval. Individuals starting in Georges Bank have approximately 86% probability of being in the Georges Bank 1 year later." In summary, tagging data shows that 6% of the fish tagged in GOM migrating to GB and 14% of the fish tagged in Georges Bank migrating to the Gulf of Maine.

At the model meeting held for the assessment, Dr. Butterworth and Ms. Rademeyer conducted 3 scientific analyses on GOM haddock, using the SCAA model. The first analyses included an approach whereby the stock was treated as isolated, no mixing was estimated. The second analysis included an approach which allowed for interchanges in the form of permanent migration from (and to) the neighboring Georges Bank haddock population. The third analysis included an approach (known in the IWC Scientific Community as the sabbatical model) that allowed for interchanges which were not permanent in nature. The last analysis considered some GB haddock may visit the GOM area during a year, and perhaps be caught in the Gulf of Maine but if not suffering from mortality in some form, may return to the Georges Bank area (Butterworth and Rademeyer June 2014).

Dr. Butterworth and Ms. Rademeyer's model which addressed mixing between stocks was not selected as the final model sent to the Peer Review. The working group decided to only forward the Peer Review the assessment conducted by the NEFSC that did not include any consideration of mixing. Therefore, the only actual scientific model that explored mixing was not reviewed by the Peer Reviewers.

We hope in the days ahead the NEFMC, NEFSC and the SSC will be able to address this issue.

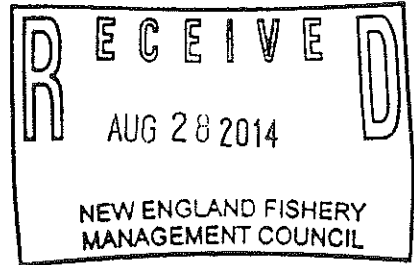
We also request the NEFMC and SSC look further into the application of uncertainty when estimating the strength of year classes and their impact on future recruitment estimates, as well as their impact on setting ABCs. This is in specific reference to the 2012 GOM haddock year class where there is a recommendation to down-weight the survey indices by 50%, but it also presents a broader question. Is there consistency in the treatment of the data? Does the scientific process consider uncertainty associated with extraordinarily low survey results in the same manner as it does for optimistic results? Has the process examined the impacts to a fishery when an overly pessimistic result has later proven by an updated assessment to be wrong?

Sincerely,

Maggie Raymond  
Associated Fisheries of Maine

Vito Giacalone  
Gloucester Fishing Community Preservation Fund

Jackie Odell  
Northeast Seafood Coalition



August 22, 2014

Mr. John K. Bullard, Regional Administrator  
National Marine Fisheries Service  
55 Republic Drive  
Gloucester, MA 01930

RE: Inshore/Offshore Line?

1. It appears to me there are 3 issues:
  1. What's offshore, where is the line?
  2. What's the declaration time?
  3. Will this help the fishery, or just cause more headache and heartache?
2. What % of GOM Cod are the off shore boats taking from the area of concern?
3. What % do the seals get?
4. How would a daily, weekly or monthly declaration change that?
5. Is a few miles (7) off the beach on both ends really offshore?
6. Modifying the 12" roller gear line on the north end to go NE at 43:00 & 69:50 instead of west might be more appropriate. Go NE at 43:00 & 69:50 or at 43:15 & 69:50.
7. Even if the line were as I just described and any form of in-out declaration, other than annual, I don't believe it would accomplish very much. Don't float a balloon and give everyone a pin.
- 7a. Any closures other than small discreet areas that apply to all user groups should be off the table.
8. All existing closures, rolling and year round, should apply to all user groups.
9. After a lot of thought, I personally think any line would be a lot of burden for not much gain. Item 6 and 7 would be the best route to go if there were a line.
10. Any split of GOM Cod should be considered but rejected. A lot of problems for no gain.

*Carl E. Bouchard*  
 Carl E Bouchard  
 F/V Stormy Weather  
 P.O. Box 219  
 Exeter, NH 03833-0219  
 cc: NE Fishery Management Council

*jcl/jp/rf - 9/9/14*

Public comment.



From: Jim Ford

Date: August 22, 2014, 2:07:57 AM EDT

To: Nefmc <pfiorelli@nefmc.org>

Cc: Johanna Thomas Thomas <jothomas@edf.org>, Bill Hoffman <bill.hoffman@state.ma.us>, <john.bullard@noaa.gov>, Amy Martin <Amy.Martins@noaa.gov>, Steve Eayrs <steve@gmri.org>, Hank Soule <shsector@gmail.com>, John Hoey <John.Hoey@noaa.gov>, Dan salerno <daniel.j.salerno@gmail.com>, Dave Leveille [nefs02@gmail.com](mailto:nefs02@gmail.com)

Subject: Party/ Charter

I usually do not care what goes on in the Party/Charter side of things ,but it makes no sense at all to shut them down Sept 1st for cod and haddock. They are now going to keep fishing and target pollock and reds and cusk which are in the same places as the cod and haddock. They are not changing gear to be fish specific. This is absolutely ridiculous to think this is saving fish. A dead fish is still a dead fish. Mortality on haddock in my opinion is at a minimum of 80 percent and cod varies maybe 20 percent depending on water temp and if foul hooked and so on. What I really don't understand is why they are not required to carry observers as the commercial sector. If you want full data like it seems Noaa wants why not spread the coverage across the board. Noaa is already sending them on groundfish, squid, scallop,whiting ,herring and trying to get them on lobster boats . Anything more than a 6 pack vessel should be observed. They get a lot of the juvenile fish that the commercial sector don't see as much of and you would get a pile of closed area data (Jeffrey's ledge) especially. I would think the more data available the better job can be done to help all that are involved in the decision making. By the way we have been observed 10 out of the last 14 trips ,don't think they stopped stacking observers yet! Sounds like what's going on with everyone , this is not a way to get quality data. Thanks Jim Ford

F/V Lisa Ann III

CS/jc/jp - 8/20/14





Dear Groundfish Advisory Panel Members,

I regret not being able to attend this meeting, and I hope that you'll read and consider my comments as you go forward with your discussion. At the risk of being overly negative, I'd like to start by expressing my complete dissatisfaction with the inability of the entire New England Groundfish Management system to enact meaningful conservation measures, while unduly burdening the recreational and small boat fleets with economic hardship both actively, by enacting crippling regulation that is of little or no value to conservation, and passively by their failure to effectively regulate those who are responsible for landing the majority of the Groundfish in New England.

I'll defend my negative opening remarks by saying that I believe that small boat, particularly handgear and recreational fishermen I, like myself, have an awful lot to be negative about. However, it is my hope that history will remember this meeting as the time and place where and when fisheries managers and decision makers began to fix New England's dysfunctional Groundfish Fishery through the incorporation of common sense, fairness, and science as it can and will contribute to the long term good of the fishery.

For as long as I've been involved in the fishery, it has seemed obvious to me that if fisheries managers want to bring about recovery in fish they must enact rules that incentivize more sustainable methods of fishing. The switch to catch shares has done the opposite. It rewards the largest boats, with permits that were responsible for landing the most fish, with the greatest access to the fishery. I can't think of a more irresponsible way to establish a system for managing a fishery. The troubling news from the latest trawl survey regarding Gulf of Maine cod is proof positive of the dysfunction that our current form of Catch Share management created.

Meanwhile, handgear and recreational fisherman who take (and have taken) the least from the resource, while fishing with the most traditional methods, have been punished with not only the dwindling stocks caused by unchecked catch shares, but drastically reduced seasons and limits for recreational fishermen and a tiny common pool quota for handgear fishermen.

My boat is, as far as I know, the only purely handgear groundfish boat in a sector. I read discussion of why joining sectors shouldn't be a "big deal" for handgear fishermen. The answer is this: when a fisherman is landing a few hundred pounds of fish, (on a good day) and that fisherman had to lease the right to land that fish, then that fisherman is essentially fishing for free, or at a loss. Compound that by paying VMS user fees and the inconvenience of hosting fisheries observers, who bring more gear than the fisherman does, aboard a 25-foot boat and you can start to understand why handgear fishermen don't want to join sectors.

For the handgear fishery to be successful they need access to their own ACE. The cost of leasing fish is the difference between making money and not making money for handgear fishermen. They also need exemption from closed areas as their gear type is used by the recreational fleet in those same closed areas to, in many cases, land as much or more fish than a commercial jig boat would, were they fishing side by side.

A vibrant handgear fishery would provide a mechanism, by which new entrants can enter the fishery. This is especially relevant as we look to the future and a possibly rebuild fishery. We must decide if we want that fishery to be one that is owned by a few

large corporations or one that is made up of diverse and independent fishermen from smaller coastal communities, much like Maine's lobster fishery.

Fortunately the opportunity to right many of these wrongs exists before us in Amendment 18. We need accumulation caps in commercial fishing for the same reasons that we have anti-trust laws that prevent monopolies in business. It is fundamentally unfair that a single person or corporation is able to own access to a public resource. This is no different than a private corporation setting up a tollbooth on a public road.

Within amendment 18 there is discussion of creating an inshore offshore line. I believe that we can have an inshore offshore fleet that will develop without drawing an arbitrary line on a chart. If designation of inshore and offshore is set by how many pounds of fish a given vessel wishes to land, that will determine which set of rules they follow. For example, if a vessel wishes to land more than 800 pounds of cod per day, then they would be considered an offshore boat and certain areas would be closed to them. This solves the problem of treating the boats who take the least from the resource the same as those who take the most, while protecting inshore areas from concentrated, so called "pulse fishing."

The final topic I'd like to discuss is that of Haddock mortality. I have observed this much talked about abundant year class of Haddock; anglers on charter trips with me have caught and released many of them because they were below the excessively high 21" minimum size. I would estimate the discard mortality is probably between 30-50% for haddock, depending on water temperature and careful handling.

Recreational fishermen generate the most economic activity per pound of fish landed. For example, on a recent charter aboard my boat, a family from the mid-west paid \$950 and because they were renting a house only wanted a few keepers. My relief captain catered the trip to them, focusing on inshore ledges and while they caught mostly short fish; they did have a couple keepers to take home and had a very enjoyable day on the water. Trips like this have a minimal impact to the fishery, and maximum benefit to the economy. Recreational fishermen have been unfairly punished with the premature closure of season for legal retention of cod and haddock. Even after it was admitted that the haddock closure was based on flawed data, it was left in place. This is fundamentally unfair and bad for the fishery. Charter businesses can operate with restricted bag limits. If the daily limit for cod were 6 fish at 21 inches, without the September closure, charter businesses could continue to operate through September, a month that is critical, as many of these businesses don't break even until well into August.

We, as fisheries managers are facing extraordinary challenges in the fishery. We must find the courage to make the meaningful changes that will bring about real results. It's time to fix catch shares. It's time to bring fairness and common sense back to fisheries management. Amendment 18 is our chance to enact the sort of changes that can prevent dangerous pulse fishing and preserve a means of access to the fishery by way of the small boat fleet. If this latest bad news regarding cod isn't a call to action, I don't know what is.

Ed Snell

Captain, Owner, *F/V Rita B.*  
207-651-8874