Spiny Lobster Review Panel Summary
Webinar
March 8, 2016
10:00 a.m. - 12:00 p.m.

Review Panel
Susan Gerhart
Doug Gregory
Bill Kelly
Kari MacLauchlin
Sherry Larkin
Bill Mansfield
Tom Matthews

Council Staff
Morgan Kilgour
Phyllis Miranda
Carrie Simmons
Gregg Waugh

NMFS Staff
Nikhil Mehta
Roy Crabtree

Others in Attendance
Jim Atack
Heather Blough
Erika Burgess
Clair Crowley
Robert Gaitanis
Ryan Gandy
Bob Gill
Erin Schnettler
George Sedberry
Simon Stafford

Summary

In Spiny Lobster Amendment 10 (2011), the Gulf and South Atlantic Councils recommended the spiny lobster annual catch limit (ACL) to be set at 7.32 million pounds (mp) with the annual catch target (ACT) set at 6.59 mp. The overfishing threshold (yield at the maximum fishing mortality threshold) was specified as the overfishing level (OFL) and was designated at 7.9 mp.

The ACL and ACT for spiny lobster went into effect on January 3, 2012. In the 2013-14 fishing year, landings were 7,923,969 lbs, which exceeds the OFL, ACL, and ACT; thus, a review panel was convened per the accountability measure outlined in Amendment 10. The spiny lobster review panel met to discuss the 2013-2014 OFL overage in Key West, FL in February, 2015.

In the 2014-15 fishing year, landings were 7,057,322 lbs, which exceeds the ACT, but not the ACL or OFL. The review panel (Panel) met via webinar to discuss the 2014-2015 ACT overage on March 8, 2016. Tom Matthews provided an overview of the spiny lobster fishery, including the landings history, number of permits, effort, value of the fishery and biological factors affecting the fishery. He also presented several alternatives for calculating the ACL, but noted that FWC did not recommend or prefer any specific alternative to the current ACL.

It was discussed that the spiny lobster fishery is likely growth overfished, and that allowing the lobster to achieve one more molt before harvest would build the stock. FWC has been working with other countries to only target legal-sized lobsters and the import size regulation has helped with this effort.

Mr. Matthews also briefed the Panel on commercial reporting requirements. Trip tickets must be submitted by the end of the month, and then the information is processed by FWC. Landings data

may not be available until up to ninety days after the reports are submitted to FWC. Fifty percent of the data is from daily electronic reporting, and the other fifty percent comes from manual trip tickets.

The Panel discussed the current ACT overage. As in the previous Panel meeting, Panel members concluded that spiny lobster is not the best candidate for quota management and that the methods used to calculate the ACT, ACL and OFL are not working. To capture the dynamics of the stock and to utilize all landings information available, the Panel approved the following motion:

Motion: to calculate the ACL based on the landings from 1991 through the most recent landings (2015-2016).

Motion carried with one opposed.

There was discussion that a rolling average could be appropriate as the dynamics of the stock fluctuate. There was concern that the ACL is supposed to set a limit, and if the limit is constantly changing because the landings are changing, then a limit is not really being set. Additionally, responses to declines in the fishery would be slow and trailing after actual declines. The Panel discussed that if the rolling average was over five to ten years then aberrations in landings would be softened.

Motion: To examine setting the annual catch limit based on a rolling average.

Motion carried with two opposed and one abstained.

The Panel discussed the possibility of including fishing effort data into the ACL trigger calculation in lieu of the availability of a stock assessment to determine the ACL. Fishing effort data is an important part of the stock assessment and could be used in a similar fashion to calculate or assess the ACL trigger. The Panel also discussed the trigger to the ACL and felt that that metric should also be reevaluated.

Motion: Examine setting the ACL trigger based on landings and the landings to effort index.

Motion carried.

The Panel discussed a potential stock assessment for spiny lobster. Currently, there is no plan for a new stock assessment, but there is new genetic information that up to forty percent of spiny lobster in Florida is from Florida stock. It was noted that fisherman are seeing changes in lobster movement and behavior based on salinity and nutrients.

The meeting concluded at 12:10 p.m.

2/25/16

AGENDA
REVIEW PANEL OF THE LOBSTER FISHERY 2014-2015 SEASONS
GULF OF MEXICO FISHERY MANAGEMENT COUNCIL OFFICE
Webinar

Monday, March 28, 2016: 10:00 am -12:00 pm

I. Welcome and Introductions- Gregory

II. Council charge- "If the ACT is exceeded the Councils will convene a review panel to determine if corrective action is necessary to prevent the ACL from being exceeded. Furthermore, if the catch exceeds the ACL more than once in the last four consecutive years, the entire system of ACLs and AMs would be re-evaluated as required by the National Standard 1 guidelines."- Staff

III. Review of Spiny Lobster Landings- Staff

IV. 2015 Spiny Lobster Review Panel Report- Staff

V. Landings, Effort, Projections and Commercial Reporting Requirements- FWC Staff

VI. Discussion on 2014-2015 ACT overage
   a. Overview of ACT/ACL/OFL using different metrics- Staff
   b. Panel Recommendations

Review Panel

Bill Kelly (GMFMC AP)
Sherry Larkin (SAFMC and GMFMC SSC)
Bill Mansfield (SAFMC AP)
John Hunt (Gulf SSC and FWC)
Tom Matthews (FWC)
Bill Sharp (FWC)
Sue Gerhart (NMFS)
Doug Gregory (GMFMC)
Kari Maclauchlin (SAFMC)

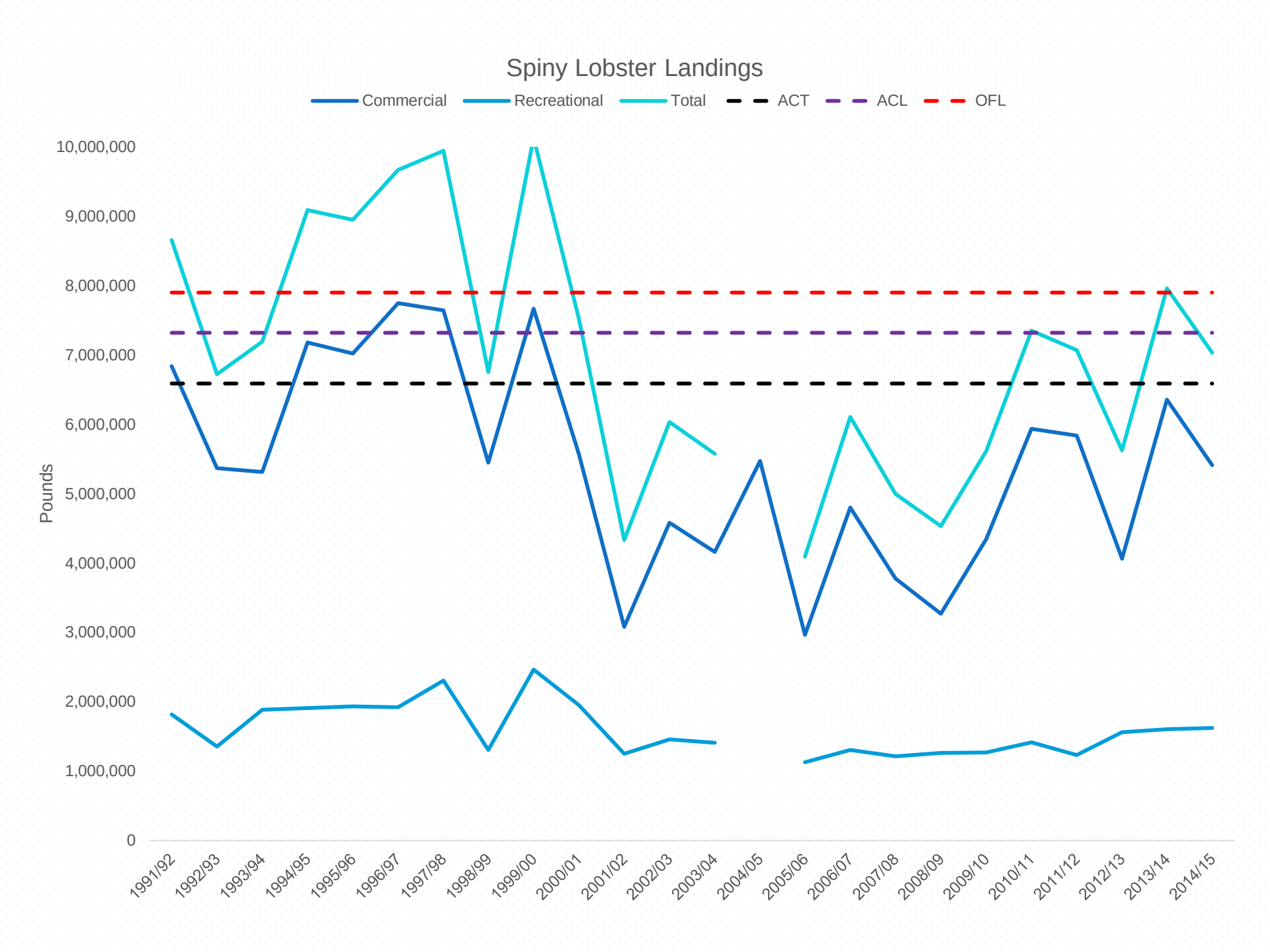
Staff: Morgan Kilgour (GMFMC)
Nikhil Mehta (NMFS)

Spiny Lobster

- If landings exceed ACT, the Councils will convene a scientific review panel to determine if regulations need to change
- A framework will be used to implement the changes
- NMFS will work with FL on any regulatory changes
- If the catch exceeds the ACL more than once in the last four consecutive years, the entire system of ACLs and AMs would need to be re-evaluated

2013/2014 Landings*	**7,803,644 lbs**
ACT= AM	6.59 million pounds =90% of the ACL
ACL=ABC	7.32 million pounds =mean + 1.5 S.D.
OFL=MSY	7.9 million pounds = mean + 2 S.D.

*as of 8/13/14- provided by FWC. Data are not final.


Spiny Lobster Landings
Commercial
Recreational
Total
ACT
ACL
OFL
Pounds
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
1991/92
1992/93
1993/94
1994/95
1995/96
1996/97
1997/98
1998/99
1999/00
2000/01
2001/02
2002/03
2003/04
2004/05
2005/06
2006/07
2007/08
2008/09
2009/10
2010/11
2011/12
2012/13
2013/14
2014/15

Spiny Lobster Review Panel Summary
Marriot Beachside Resort, Key West, FL
February 9th, 2015
9:00 a.m. - 5:00 p.m.

Review Panel
Susan Gerhart
Doug Gregory
Bill Kelly
Morgan Kilgour
Kari MacLauchlin
Sherry Larkin
Bill Mansfield
Kate Michie
Tom Matthews
Bob Muller
George Sedberry
John Hunt (not in attendance)
Bill Sharp (not in attendance)

Others in Attendance
Peter Bacle
Dave Hawtof
Shelley Krueger
Josh Nicklaus
Kelli O'Donnell
David Ram
Mimi Stafford
Simon Stafford
Lee Starling
Paul Zebo

Background
In Spiny Lobster Amendment 10 (2011), the Gulf and South Atlantic Councils recommended the spiny lobster annual catch limit (ACL) to be set at 7.32 million pounds (mp) with the annual catch target (ACT) set at 6.59 mp. The overfishing threshold (yield at the maximum fishing mortality threshold) was specified as the overfishing level (OFL) and was designated at 7.9 mp.

The ACL and ACT for spiny lobster went into effect on January 3, 2012. It should be noted that in the two years prior to implementation (2010/11, 2011/12), the landings exceeded the ACT. In 2010/11, the landings also exceeded the not-yet-implemented ACL. Spiny lobster landings (**Attachment 2**) did not exceed the ACT in the 2012-13 fishing year. In the 2013-14 fishing year, landings were 7,923,969 lbs, which exceeds the OFL, ACL, and ACT. Spiny Lobster Amendment 10 designated the accountability measure to convene a review panel if landings exceed the ACT.

On February 9, 2015, the Spiny Lobster Review Panel convened in Key West, FL. The Panel was comprised of staff from the Gulf Council, South Atlantic Council, SERO, and FWC/FWRI, in addition to representatives from the Gulf Spiny Lobster Advisory Panel (AP), South Atlantic Spiny Lobster AP, and the Gulf and South Atlantic Councils' Scientific and Statistical Committees (SSC). The Panel reviewed the landings and other information and provided recommendations to the Councils.

The overall recommendations from the Panel were as follows:

- The Panel does not recommend that a new stock assessment be conducted.
- The Panel discussed and concluded that the ACL is the wrong methodology to manage this fishery. It recommended that spiny lobster be considered as having a unique life history to be exempted from having an ACL.

- The Panel recommends that the OFL be redefined as MFMT.

The Panel reviewed the methods of calculating the current ACT, ACL and OFL and the accountability measures currently in place for spiny lobster. Lobster were assigned a tier three schedule for the ABC because many spiny lobster larvae come from outside the region and the stock assessment wasn't sufficient to inform the SSC. It was discussed that the ACT, ACL and OFL use landings for years that have the lowest commercial landings since 1976. With the current trends, the current ACL will be expected to be exceeded 1 out of every 3 or 4 years.

The group then reviewed several topics pertinent to spiny lobster: spiny lobster landings, a review of the 2010 spiny lobster stock assessment, the economic value of the fishery through time, disease prevalence, genetics, effort and permits, and stone crab landings.

In the 2013/2014 fishing season, the OFL of 7.9 million pounds was exceeded. The Council will receive a letter from NMFS and will have two years to address the overage. FWC/FWRI representatives on the Panel felt that the OFL should not be changed at this time. The OFL (7.9 mp) was set based on landings from fishing years 2000/2001-2009/2010. From 1990/91 through 2000/01, landings averaged at 7.7 mp and in six of the ten years, exceeded 8 mp. However in 2001/02, landings decreased sharply and over the next 12 years did not increase back to the landing levels in the 1990s. The average annual landings from 2001/02 through 2012/13 were 5.6 mp. Factors that could have affected landings include PaV1 virus (a virus affecting juvenile lobsters), the trap certificate program and trap reductions, national economic downturn, or environmental factors such as hurricanes. Because the OFL was set based on an assumption that the landings levels from 2000/01- 2009/10 was the result of these factors and this was the new 'norm' for the fishery, it may be too soon to know if the 2013/14 landings indicated an upturn for the fishery or was an anomaly. During discussion, it was noted that for the 2014/2015 fishing season, spiny lobster landings projections are about 5-6 million pounds.

The 2010 stock assessment was reviewed. Spiny lobster are difficult to assess for multiple reasons: there is anywhere between 10 and 40 % self- recruitment; the data suggest that the spawning stock is not location specific; age classes for each year are difficult to determine because spiny lobsters do not have hard structures (like otoliths) to age; and there is an inability to perform a Caribbean-wide stock assessment because not all countries report landings. It was noted during the discussion that other countries in the Caribbean have experienced similar landings trends as those in the U. S. The Panel did not recommend a new stock assessment because: it did not feel an assessment would provide any new information that would be useful in management; that there is no evidence that trends are due to population size; the same shortcomings from the previous assessment would still apply (large part of recruitment comes from Caribbean and we have no control over that); and a new assessment would only give the status of stock, not what is causing a change in status of if change is fishing-related.

The trend in spiny lobster prices for all gear types was reviewed and trap landings account for most of the price data. Stone crab landings and the price of stone crab do not seem to coincide with a spike in spiny lobster landings. Stone crab landings for the past two years are at an all-time low. In the current year, prices per pound of spiny lobster are going up (around $8-9/lb and up), and trip values are generally over $1000. The value of the fishery has more than doubled,

and since price is higher later in the season, fisherman have changed effort to catch fewer lobster at a higher price per pound later in the year to coincide with exports to China. The increased spiny lobster landings in 2013/14 may be a result of late-season effort (Jan-Mar) to accommodate the Chinese live market and demand around Chinese New Year which may have resulted in increased effort. In past years, effort tapered off towards the end of the season, but that appears less true recently. Additionally, to supply to the live market, boats have been equipped with live wells, which increase both initial gear costs and ongoing trip costs to run the live wells.

The dominant gear type in the fishery is trap, though bully-net landings have increased in 2013/2014 from 1% of the fishery to nearly 4% of the fishery. FWC is currently working to develop a CB endorsement similar to the CD (commercial dive permit) endorsement for divers. Recreational lobster permits have increased, but the number of participants in the recreational sector has not changed much. Florida FWC estimates recreational landings with data collected each year via an internet-based survey. All recreational lobster permit holders are asked to report spiny lobster landings between the special 2-day season in July through Labor Day. The internet-based survey has a response rate of about 10 percent.

After the information was presented, the group discussed possible metrics for addressing the ACL overage. A rolling ten-year time bracket to calculate the ACL and OFL was discussed, but there was concern that the increase in effort was why landings were higher and not a population increase. Additionally, the behavior of fishermen has changed. By landing lobster later in the fishing season, fishermen are getting more weight per individual. This behavior could explain the increase in landings in the last few years when harvest has been delayed to accommodate a live market.

Additional concerns with altering the time frame for calculating the ACT, ACL and OFL metrics were that environmental conditions before and after the 2000/01 season are different. Through this time, recruitment is assumed to be unchanged, so the cause of the decline in landings is unknown. Studies conducted by University of Florida researchers suggest that the decrease may have been caused by the PaV1 virus, which affects and kills juvenile lobsters. The Panel also discussed the decrease in landings after the 10% trap reductions in the 1990s and how this may have led to lower catches in the 2000s. However, the highest landings values were after the active reductions ended, and there have been no trap reductions since the four highest landings years in the 1990s. Ultimately, the reason for the decrease in landings is undetermined. Overall, the group thought that it would be inappropriate to use landings data prior to the 2000/01 season to calculate the metrics. The group did not recommend altering any of the metrics or how the metrics were calculated though the group was fairly confident that these limits will be reached again within the next four years.

The response to exceeding the OFL that was provisioned in the Gulf of Mexico shrimp amendment 15 document (in prep) was discussed as potentially being applied to spiny lobster. This provision states that while overfishing may occur one year, a response to overfishing would not occur unless the OFL was exceeded in a consecutive year. However, this would need to be added through an amendment process and is not currently in the Spiny Lobster FMP. There was a recommendation that a response to overfishing only occur after two consecutive years, but,

according to General Counsel, that would not be legal for spiny lobster. Trap reductions to decrease the effort so that the limits are not exceeded again was proposed but was not supported by the group.

The Panel discussed the potential closure of the fishery when it is projected to reach the ACL (in-season accountability measure). To do this, landings would have to be monitored in-season which is not how the fishery is currently monitored for the recreational sector. Weekly electronic reporting requirements recently implemented for dealers buying spiny lobster may help improve reporting and monitoring of commercially harvested spiny lobster. The commercial and recreational sectors are managed under a stock ACL and an in-season closure could disproportionately affect one sector more than the other as the two sectors fish at different times of year. There is weekly electronic reporting for the commercial sector of the fishery now by NMFS.

The group recommended that accountability measures should be reexamined instead of changing the ACT, ACL, and OFL. Several suggested accountability measures were directed solely at the commercial fishing sector. Industry would like to see additional research on the recreational sector including juvenile mortality studies during the two-day mini-season and improved data gathering on harvest levels. It was discussed that typically these would be some sort of restrictions or closure. The group was not in favor of closures, so it discussed other programs or other improvements to the fishery.

Biologically spiny lobster is very different from many species. Recruitment has been stable over many years but is not linked to production or local stock size. Recruits arrive over protracted periods from a wide area, but there is also local recruitment. This species does not fit the standard pattern of how species behave and how population dynamics work. Fifty percent of spiny lobster larvae are lost to the north Atlantic, and more than 50% of the recruitment comes from external sources. Spiny lobster also have the longest larval duration of any oceanic marine animal. Because of this, the Panel recommended that the Councils request an ACL exemption for spiny lobster.

The group discussed the current definition of the OFL which in amendment 10 was defined as the mean of landings from 2000-2010 plus two standard deviations. It was discussed that this metric was not the appropriate way to calculate the OFL and it was recommended to change the definition OFL to being equal to MFMT. While an absolute pound limit may hurt participants, a fishing mortality rate may not necessarily do so. The group was notified that this would require an amendment.

Public Comment Summary

Three individuals requested time to provide public comment to the Panel. A participant in the commercial dive portion of the lobster fishery suggested that there should not be a trip limit for divers because there is already a limit on the commercial dive licenses to limit dive effort. Effort is concentrated in smaller areas and there may end up being user conflicts. Transfers of commercial dive permits should not be allowed. Income of the fisherman should be better looked at to limit the fishery to professional fishermen. The bully-net data are inaccurate. One fisherman who sells spiny lobster to the Chinese live market contends that the number of trips

are not accurately reflected in the amount of live lobsters landed. In order to keep them alive, he keeps them in pens and wells, and then sells them. He makes sure that the lobster is in perfect condition. It's more effort to sell to the Chinese, but it's worth it.

In order to catch less than six million lbs., there should not be a trap reduction. Somehow, the 10% reduction in traps is not changing landings. At the time, effort limitation was necessary because the same number of lobster were being harvested even though the number of trap pulls had increased. The deal that was made with the lobster fishery was that six million pounds was the target. Once they get to the point where less than six million pounds were being harvested, then trap reductions would not continue, but this has not been the case.

The lobster trap certificate program coincided with a major decrease in lobster production and should be studied. Because of this program, smaller fisherman are forced out. The price of trap certificates has gone up and the number of investors has gone up. It's difficult to understand what the effort is by the number of trips, now that the boats are making day trips to bring back live lobster for the Chinese market. If the Chinese market goes away, then the price of lobster will drop. The price is absolutely driven by the Chinese.

Lobster Landings and the NAO Index

March 9, 2016

Including Plots

Correlative patterns between spiny lobster landings and the North Atlantic Oscillation (NAO) index were investigated to explore a potential relationship between the NAO index and lobster landings. Lobster landings data were available as an annual sum from 1991 through 2014. The NAO data set is a monthly index from 1950 through 2015. These data can be accessed in raw form here: http://www.esrl.noaa.gov/psd/data/correlation/nao.data. The index exhibits both seasonal and long-term patterns that preclude a direct comparison to the annual spiny lobster landings. For exploratory purposes, the raw data were decomposed into 'seasonal', 'annual', and 'noise' components (Figure 1).

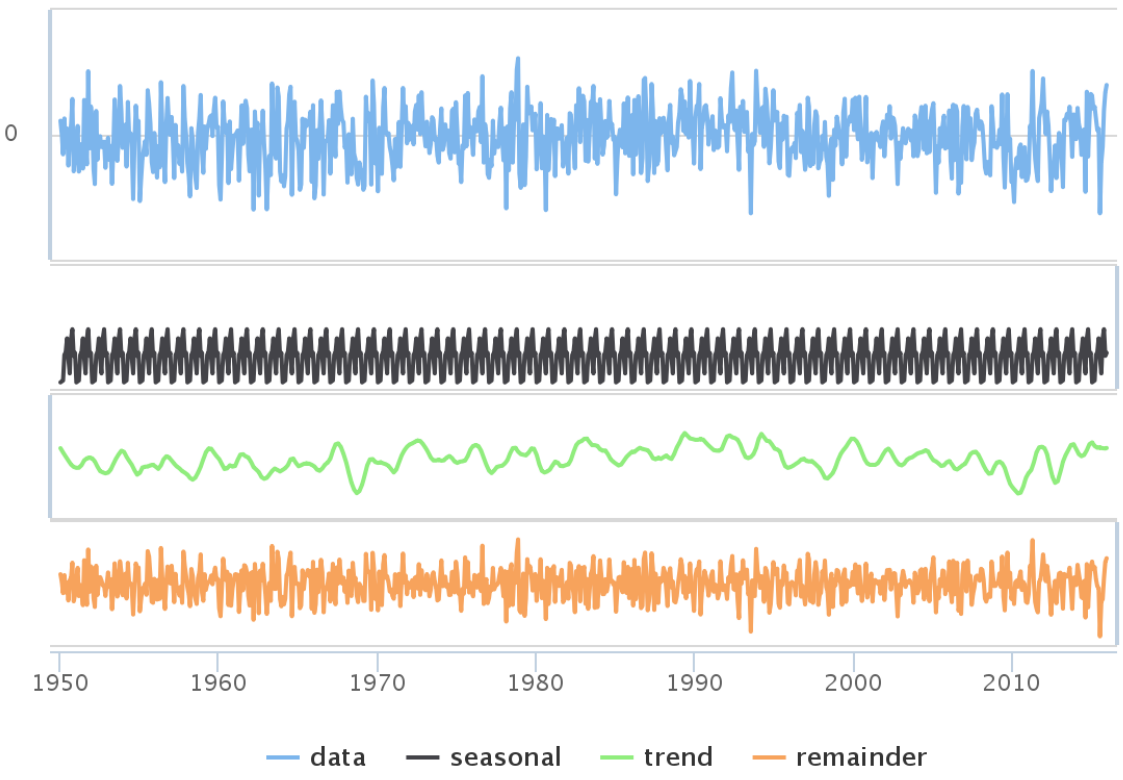


Figure 1. Time series decomposition was applied to the North Atlantic Oscillation (NAO) index from 1950 to 2015. These raw data (top panel) were decomposed into seasonal (second panel from top), annual (third panel from top), and residual components (bottom panel).

The annual component of the NAO time series was used as the basis for comparison to the lobster landings data by calculating the mean NAO index value for each year from 1991 through 2014 (Figure 2).

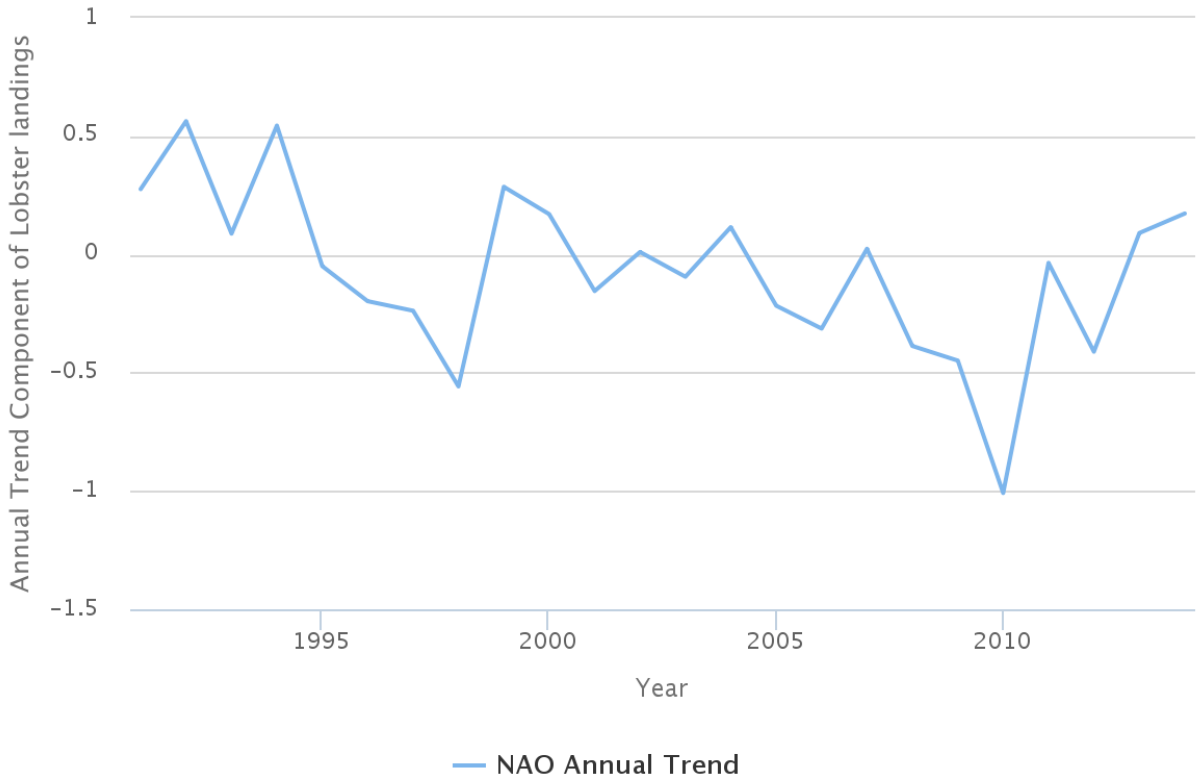


Figure 2. Mean annual trend as calculated from raw NAO data using seasonal decomposition.

Annual lobster landings were also calculated from 1991 to 2014 (Figure 3). Correlations between these two time series were approached three ways. First, the two time series were compared graphically by applying a z-score transformation to each time series and plotting both series on a common scale (Figure 4). This approach reveals both patterns of concordance (e.g., 1998 - 2008) and discordance (e.g., 1995-1997). However, this approach will not identify correlations based on lags (i.e., shifts of *n* years in either direction). This type of relationship is plausible if the NAO index were correlated with survivorship of an early age class and this change was not detected until *n* years later when the cohort enters the fishery; this is the second approach to the time series analysis. To examine this, a cross-correlation analysis was done that examines the correlation between two time series after shifting (both directions) up to 10 years (Figure 5). This analyses did not detect any significant correlations (i.e., $p < 0.05$) between the time series. However, this does not conclude that no relationship is present, in fact it does appear to exist based on visual inspection. The time series' of overlap are short and thus, statistical power to detect correlative relationships is low (i.e., pattern may exist that is not detected via statistical test(s) applied).

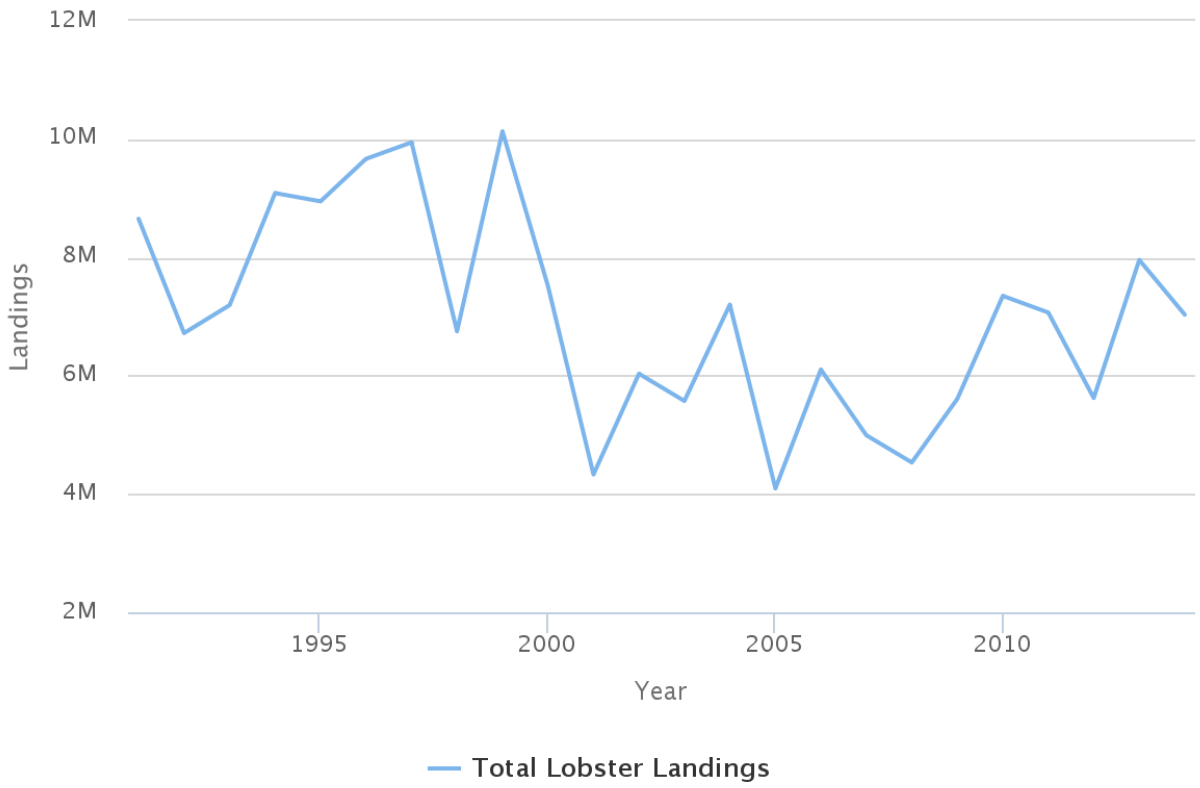


Figure 3. Total annual lobster landings.

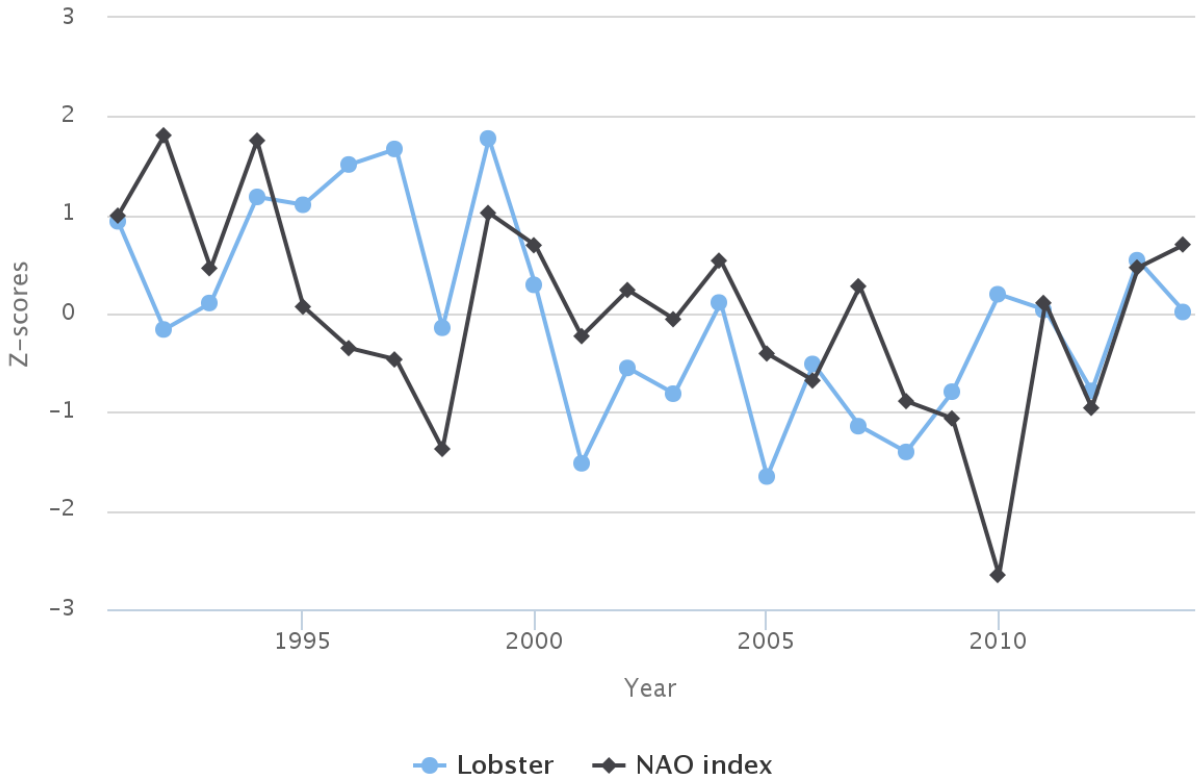


Figure 4. Standardized time series of the NAO index and annual lobster landings. Data was standardized to facilitate comparisons on a common y-scale.

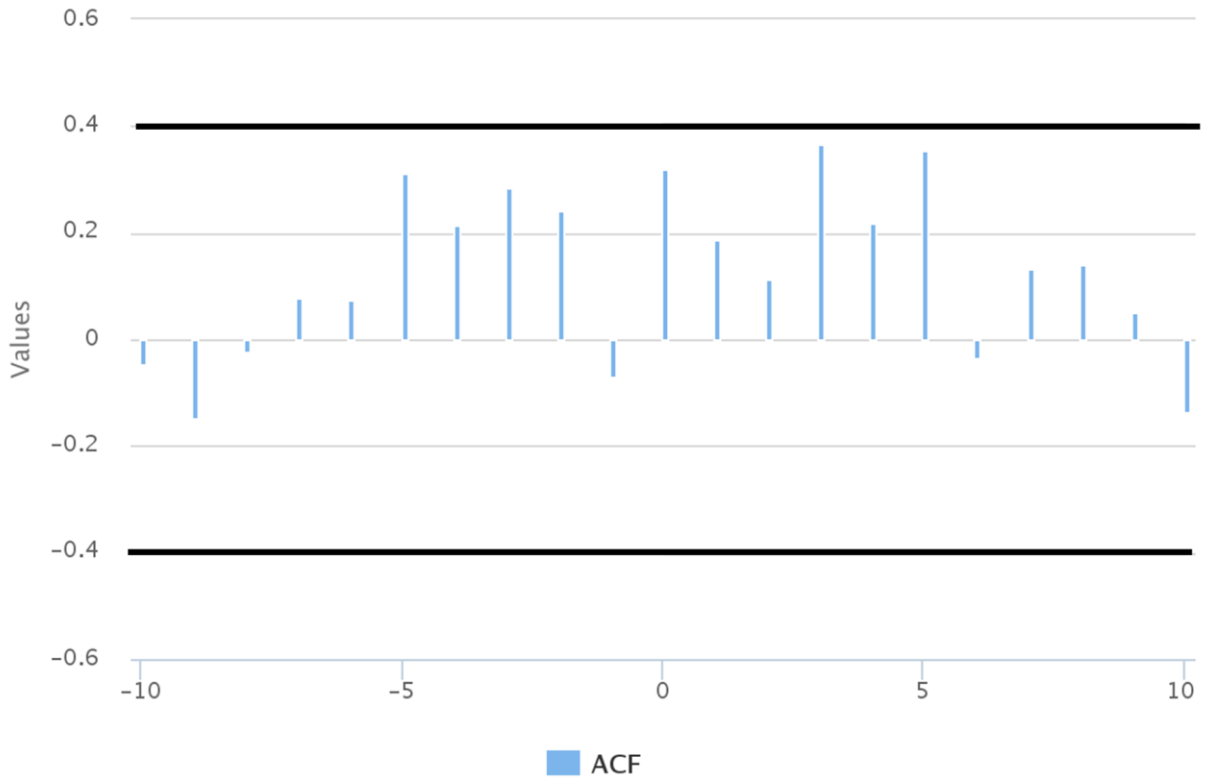


Figure 5. Plot of cross-correlations between the NAO and lobster landings time series. The solid black bars represent the correlation value that would be statistically significant. This analysis did not detect statistical relationships at any of the lags considered (i.e. up to 10 years shift in either direction).

A third approach was taken by regressing NAO values (x-axis) and lobster landings (y-axis; Figure 6). A weak pattern is present, although the slope was not significant ($p = 0.13$, $R^2 = 0.10$). This could be interpreted as a weak and noisy pattern that could be more fully explained by including other relevant predictor variables on extending the analyses through time (as more data become available). The treatment of the NAO data itself may also mask the relationship as animals may only respond to the NAO index during a portion of the year that cannot be parsed from the current lobster dataset.

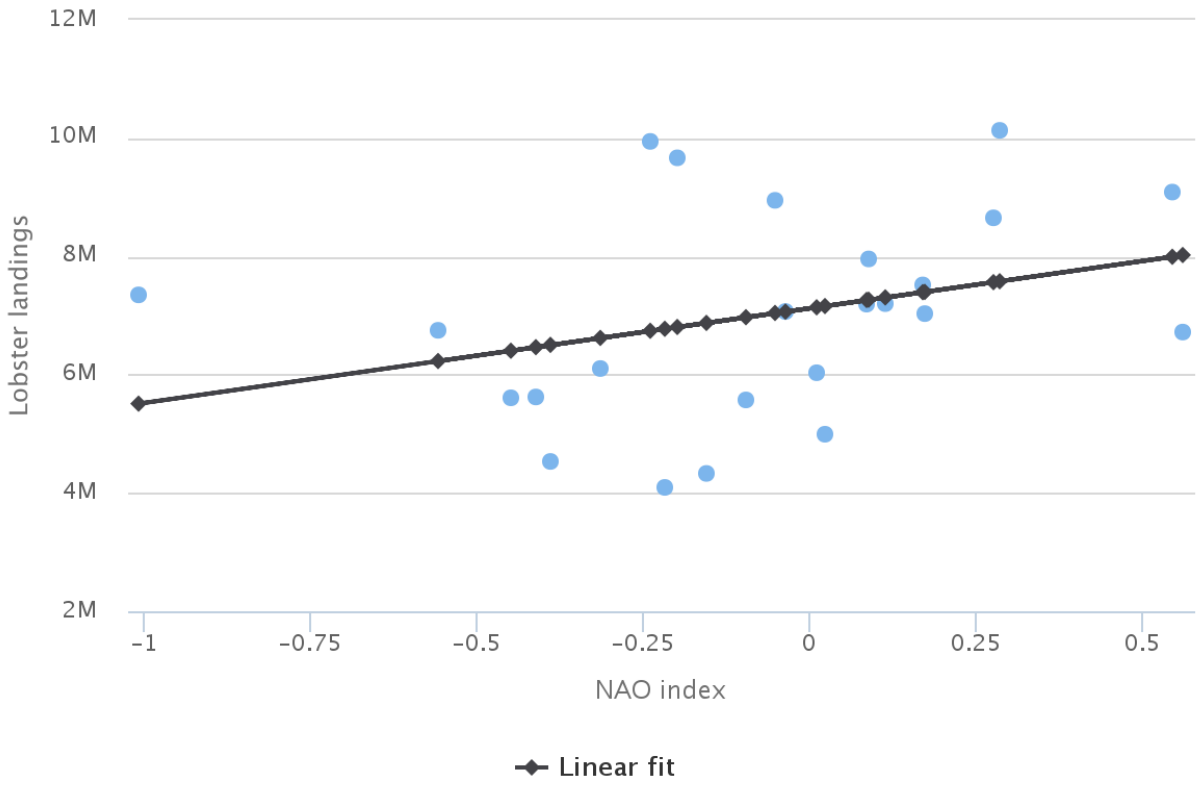


Figure 6. Scatterplot of annual NAO index and annual lobster landings from 1991 through 2014. The slope of the fitted regression line (solid black line) was not significantly different from 0 ($p = 0.13$, $R^2 = 0.10$).