Atlantic States Marine Fisheries Commission

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MEMORANDUM

October 21, 2014

To: **American Lobster Management Board**

From: **Dan McKiernan, Board Chair**

Re: **Decision pathways for potential Cancer Crab management**

In May of 2014, the ASMFC Policy Board approved a motion "to initiate a Cancer Crab FMP, with a focus on Jonah Crab, and task the American Lobster Board with the development of the FMP". A Public Information Document (PID) was drafted and public comment was received at hearings and in writing. A review of the comments suggests there were some predominant themes that emerged and consensus views – on some issues - that could become components of a future management plan.

The upcoming Lobster Board meeting has a very ambitious agenda and a short two hour time slot. To facilitate the Board's business, I want to distill the issues down and focus on the decisions that need to be made concerning the possible development of a Cancer Crab FMP. This will provide a pathway to facilitate the discussion and actions necessary for the board to make decisions on cancer crabs management.

The Board should execute a series of decisions (with motions) that will determine whether a management plan will be drafted, which committees (and their composition) will be established to support the management plan, and what issues should be included in draft management plan.

First, a motion should be made that based on the public feedback received in the PID hearings that the **Lobster Board shall continue (or alternatively to reject) the development of a Cancer Crab FMP**.

If affirmative to continue the development of a management plan, then decisions need to be made on the creation and/or composition of a Plan Development Team, (PDT), Technical Committee (TC) and Advisory Panel (AP):

- **A motion should be made to task the Plan Development Team (PDT) with the development of the FMP for cancer crab.** There are two options for the Board to consider:
    - Assign the development of the FMP to the current Lobster PDT or,
    - Create a separate Cancer Crab PDT, comprised of state and federal representatives with a knowledge of and a declared interest in the cancer crab fishery. PDT nominations require Board approval (can be accomplished via email).
- **A motion should be made to determine the make-up of a TC, which is responsible for providing scientific and technical advice in the process of developing and monitoring an FMP**. There are two options for Board to consider:

- Task the American Lobster Technical Committee (TC) to provide any necessary support to the PDT in the development of an FMP or,
- Task staff to begin organizing a separate Cancer Crab TC.

- **A motion should be made to task the American Lobster AP to provide any necessary support to the PDT in the development of an FMP or, alternatively the Board could task staff to begin organizing a separate Cancer Crab AP.** The current membership of the American Lobster AP is comprised of: four representatives from the states of Maine and Massachusetts: two representatives from the states of New Hampshire, Rhode Island, Connecticut, New York, and New Jersey; and some members of LCMTs. The American Lobster AP last met in 2009. A management board may at any time establish an AP to assist in carrying out the board's responsibilities. AP nominations require Board approval (can be accomplished via email or at the February meeting).
- **A motion should be made specifying which management plan concepts and/or specific management options** to include in the draft FMP based on input received during the PID public comment period and Board discussion (see below).

I have drafted a list of concepts and/or specifics for review and consideration for inclusion in the draft management plan:

1. Management should be coordinated through the Commission
2. Establish consistent coast-wide management through the ASMFC with recommended complementary rules in federal waters.
3. Management objectives should include conservation, sustainability and enhancement of economic return.
4. Minimum size in the range of 4" to 5" carapace width should be established for one or both species with protection of spawning and mature females a priority. To facilitate compliance and effective law enforcement, tolerance for incidental non-compliance should be considered.
5. Directed trap fishery to be limited to only those who hold a state and/or federal lobster permit and any traps set for the capture of cancer crabs shall bear an official lobster trap tag. Distinguish directed fishery from non-directed fishery, with possible trip limits on non-directed fishery.
6. Recreation license not needed, but subject to state by state preferences.
7. Require mandatory fishery-dependent data collection based on, at a minimum, the standards established for lobster management.
8. Require fishery independent data collection by states that have a declared interest in fishery. Encourage further life history investigations.
9. Consider regulations pertaining to possession of crab parts
10. Specify gear characteristics such as trap size, escape vents, and ghost panels.

Please contact me if you have questions or suggestions. Thank you for your thoughtful consideration of these issues.

M14-102

2013 REVIEW OF THE ATLANTIC STATES MARINE FISHERIES COMMISSION FISHERY MANAGEMENT PLAN FOR AMERICAN LOBSTER (*Homarus americanus*) 2012 FISHING YEAR

Prepared by the Plan Review Team

October 2014

2013 REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN FOR AMERICAN LOBSTER (*Homarus americanus*) 2012 FISHING YEAR

1.0 Status of the Fishery Management Plan

Year of ASMFC Plan's Adoption:	Amendment 3 (1997)
Framework Adjustments:	Addendum I (1999) Addendum II (2001) Addendum III (2002) Addendum IV (2003) Addendum V (2004) Addendum VI (2005) Addendum VII (2005) Addendum VIII (2006) Addendum IX (2006) Addendum X (2007) Addendum XI (2007) Addendum XII (2008) Addendum XIII (2008) Addendum XIV (2009) Addendum XV (2009) Addendum XVI (2010) Addendum XVII (2012) Addendum XVIII (2012) Addendum XIX (2013) Addendum XX (2013) Addendum XXI (2013) Addendum XXII (2013) Addendum XXIII (2014)
Management Unit:	Maine through North Carolina Lobster is managed in seven different Lobster Conservation Management Areas (LCMA, see appendix A)
States with a Declared Interest:	Maine through North Carolina (Excluding Pennsylvania and DC)
Active Committees:	American Lobster Management Board, Technical Committee, Lobster conservation Management Teams, Plan Development Team, Plan Review Team

2.0 Status of the Fishery

2.1 Landings History

The lobster fishery has seen incredible expansion in effort and landings since the 1950-1975 when landings varied around 30 million pounds. From 1976 – 2008 the average coastwide landings tripled, increasing from 30 million pounds to peak of 96 million pounds in 2006 (Table 1). Since 2008, total coastwide landings have exponentially increased to just under 150 million pounds in 2012. However, landings have varied by LCMA (Table 2). Maine and Massachusetts account for 85% and 10%, respectively, of the 2012 commercial landings. Landings were also reported by (in descending order) New Hampshire, Rhode Island, New Jersey, New York, Connecticut, Maryland, Virginia, and Delaware. The ex-vessel value for all lobster landings in 2011 was 429 million dollars.

Lobster pots are the predominant commercial gear; other gear types include otter trawls, gill net, dredge and SCUBA. Lobster is also taken recreationally with pots and by hand while SCUBA diving. The magnitude of recreational landings is unknown because all states do not collect recreational harvest data.

2.2 Recent Management Actions

The 2009 assessment that indicated the resource presented a mixed picture of stock abundance throughout its U.S. range, with low abundance and poor recruitment in SNE T. In the spring of 2010, the American Lobster Technical Committee (TC) reviewed trends in abundance from 2008 and 2009 and considered a variety of biological and environmental factors that may be impacting Southern New England (SNE) lobster stocks. In May 2010, the TC submitted a report to the Board contending that it was their belief that the SNE stock was experiencing recruitment failure. Evidence suggested the reproductive potential and abundance of the SNE stock had continued to fall to lower levels than what was presented in the 2009 assessment. While larval production and settlement are inherently variable, sustained poor production can only lead to reduced recruitment and ultimately to reduced year class strength and lower future abundance levels. The TC contended that recruitment failure was caused by overwhelming environmental and biological changes coupled with continued fishing. At that time, the TC recommended a five year moratorium on harvest in the SNE stock area to provide the maximum likelihood of rebuilding the stock above the threshold and toward the target abundance in the foreseeable future.

Following the presentation of the TC reports to the Board concerning recruitment failure and stock projections, the Board moved to have the findings reviewed by the Center for Independent Experts (CIE). The TC and comments from the CIE reviewers concurred that environmental changes in concert with fishing mortality were the principal causes of the recent stock decline and resulting lower recruitment levels. Although it is not possible to predict how recruitment may change in the near future it has been noted that environmental conditions are unlikely to return to the previous favorable state observed in the early 1990's and that reducing exploitation is therefore necessary to prevent further avoidable erosion of the spawning stock, thereby increasing the chances of stock recovery should recruitment and natural mortality conditions improve. There was general agreement with the TC reports that a moratorium or severe reductions (~75%) in fishing mortality were needed immediately to maximize chances of rebuilding the stock.

To address the concerns of the declining resource the Management Board approved addendum XVII which reduced exploitation by 10% in the management areas within SNE in February 2012. The management areas have initiated either mandatory v-notch programs or season closures or a combination of the two meet the requirements of the addendum.

The Board also approved addendum XVIII as the first phase of management action to scale the SNE fishery to the size of the SNE resource, including an option for a minimum reduction in traps fished by 25% for LCMA 2 and 3. The remainder of the LCMAs in SNE will be implementing plans to also address this Board task.

In 2013 the Board approved Addenda XIX – XXII. Addendum XIX implemented conservation tax of 10 % for any transfer or full business sale of LCMA 3 traps. In response to action taken by the New England Fishery Management Council (NEFMC) that allowed limited groundfishing fishing in a previously closed area (Closed Area II), the American lobster offshore pot fleet fishing in this area developed an agreement with the groundfish sector to prevent gear conflicts and give equal access to the area by both fisheries. As a result, through Addendum XX, it is prohibitive to set or store lobster traps in Closed Area II from November 1 to June 15 annually and all lobster trap gear must be removed from the water by October 31st.

As the second phase of management action to scale the SNE fishery to the size of the SNE resource, the Board approved Addendum XXI, which modifies the previous trap transferability rules for LCMAs 2 and 3, as well as provides further guidance. Furthermore, modifications to the single and aggregate ownership caps for LCMA 3 were approved under Addendum XXII.

In August 2014, the Board approved Addendum XXIII, which updates the habitat section of Amendment 3.

3.0 Status of Assessment Advice

3.1 Most Recent Assessment (2009)

The 2009 peer-reviewed stock assessment report indicated the American lobster resource presents a mixed picture, with record high stock abundance and recruitment throughout most of the Gulf of Maine (GOM) and Georges Bank (GBK), continued low abundance and poor recruitment in Southern New England (SNE), and further declines in recruitment and abundance in NMFS Statistical Area 514 (Massachusetts Bay and Stellwagen Bank) since the last assessment. The Peer Review Panel noted particular concern regarding the status of the stock throughout the SNE assessment area and within Area 514 and recommended that further restrictions are warranted for both areas.

The assessment showed current abundance of the GBK stock is at a record high and recent exploitation rates are at a record low. Recruitment has remained high in GBK since 1998. Sex ratio of the population in recent years is largely skewed toward females (~80% from 2005 to 2007) for unknown reasons. The Technical Committee noted the stock could experience recruitment problems if the numbers of males in the population are low.

Table 1. Landings (in pounds) of American Lobster by the states of Maine through Virginia (Sources NMFS, ME DMR, NY DMR). *C= confidential data*

Year	ME	NH	MA	RI	CT	NY	NJ	DE	MD	VA	Total
1981	22,631,600	793,400	11,220,500	1,871,200	1,010,800	890,200	593,700	55,700	63,200	2,200	39,132,500
1982	22,730,100	807,400	13,150,900	3,173,700	1,094,100	1,121,600	846,300	90,700	64,800	4,700	43,084,300
1983	21,976,500	1,310,560	12,421,000	5,114,400	1,854,000	1,207,500	769,900	56,700	86,500	600	44,797,660
1984	19,545,600	1,570,724	14,701,800	5,259,900	2,011,600	1,308,100	927,700	103,800	98,900	17,400	45,545,524
1985	20,125,000	1,193,881	16,295,100	5,140,100	1,676,000	1,240,900	1,079,600	118,500	82,300	1,100	46,952,481
1986	19,704,400	941,100	15,057,600	5,667,900	1,656,100	1,407,100	1,123,000	109,000	57,700	1,000	45,724,900
1987	19,747,800	1,256,170	15,116,800	5,317,100	1,735,591	1,146,700	1,397,100	84,100	49,900	1,000	45,852,261
1988	21,738,800	1,118,900	15,866,312	4,759,100	2,053,800	1,779,890	1,557,300	66,200	23,000	300	48,963,602
1989	23,368,800	1,430,400	15,444,300	5,725,800	2,096,900	2,345,051	2,059,600	76,500	17,500		52,564,851
1990	28,068,238	1,658,200	17,054,434	7,258,175	2,645,800	3,431,111	2,198,867	68,300			62,383,125
1991	30,788,646	1,802,035	16,528,168	7,445,172	2,674,000	3,128,246	1,673,031	54,700			64,093,998
1992	26,830,448	1,529,292	15,823,077	6,763,087	2,439,600	2,651,067	1,213,255	21,000			57,270,826
1993	29,926,464	1,693,347	14,336,032	6,228,470	2,177,022	2,667,107	906,498	24,000			57,958,940
1994	38,948,867	1,650,751	16,094,226	6,474,399	2,212,000	3,954,634	581,396	8,400			69,924,673
1995	37,208,324	1,834,794	15,755,840	5,362,084	2,536,177	6,653,780	606,011	500	2,855		69,960,365
1996	36,083,443	1,632,829	15,323,277	5,295,797	2,888,683	9,408,519	640,198		28,726	1,252	71,302,724
1997	47,023,271	1,414,133	15,087,096	5,798,529	3,468,051	8,878,395	858,426	648	34,208	2,240	82,564,997
1998	47,036,836	1,194,653	13,277,409	5,617,873	3,715,310	7,896,803	721,811			1,306	79,462,001
1999	53,494,418	1,380,360	15,533,654	8,155,947	2,595,764	6,452,472	931,064			6,916	88,550,595
2000	57,215,406	1,709,746	15,802,888	6,907,504	1,393,565	2,883,468	891,183			311	86,804,071
2001	48,617,693	2,027,725	12,132,807	4,452,358	1,329,707	2,052,741	579,753			19	71,192,803
2002	63,625,745	391	12,853,380	3,835,050	1,067,121	1,440,483	264,425	551			83,087,146
2003	54,970,948		11,385,049	3,474,508	671,119	946,449	209,956	2,099	22,778		71,682,906
2004	71,574,344	2,097,396	11,295,474	3,064,417	646,994	996,109	370,112	13,322	14,931	13	90,073,112
2005	68,729,861	2,556,232	9,879,983	4,343,736	713,901	1,154,470	369,264		39,237	21,988	87,808,672
2006	72,662,294	2,666,344	10,966,322	3,749,432	792,894	1,242,601	470,877	3,706	26,349	28,160	92,608,979
2007	63,959,191	2,468,811	10,143,301	2,293,494	568,696	716,300	680,392	5,946	6,128		80,842,259
2008	69,863,132	2,567,031	10,597,614	2,771,968	426,292	1,210,436	632,545	4,347	32,429		88,105,794
2009	81,175,847	2,985,166	11,781,490	2,831,742	446,861	1,047,276	179,740	6,064	30,988	21,472	100,506,646
2010	95,506,383	3,658,894	12,768,448	2,922,823	396,391	307,194	641,556	108	30,005	16,347	116,248,149
2011	104,693,316	3,917,461	13,717,192	2,752,505	159,493	344,233	627,077	10	40,090	12,878	126,264,255
2012	125,759,424	4,236,740	14,917,238	2,932,388	236,846	272,961	919,260	C	C	C	149,363,970

Table 2. Estimated lobster landings (in pounds) by lobster conservation management area (LCMA)* (*Source, ASMFC Lobster Data Warehouse*). **This table can only be update in years when stock assessment reports are being conducted.**

Year	LCMA 1	LCMA 2	LCMA 3	LCMA 4	LCMA 5	LCMA 6	LCMA OCC	Grand Total
1981	32,369,320	527,284	4,321,500	441,478	115,653	1,220,159	134,327	39,129,721
1982	32,123,750	1,656,479	4,961,680	622,674	99,093	1,359,058	163,105	40,985,839
1983	32,826,685	2,958,366	5,645,179	633,254	71,804	2,428,633	198,448	44,762,369
1984	29,862,411	2,978,985	6,409,741	795,180	135,652	2,704,070	208,832	43,094,871
1985	31,590,759	2,992,330	5,853,851	964,043	170,998	2,273,337	261,929	44,107,247
1986	30,080,507	3,081,903	5,829,275	1,084,282	125,969	2,362,128	298,747	42,862,811
1987	30,682,754	3,219,900	5,357,273	1,473,841	98,486	2,378,765	276,250	43,487,269
1988	32,362,492	3,259,336	5,132,943	1,666,439	85,142	3,195,208	295,985	45,997,545
1989	36,800,166	4,175,114	5,450,786	2,232,935	106,126	3,735,250	352,155	52,852,532
1990	41,720,481	4,374,062	8,783,629	2,431,198	237,410	4,250,654	581,447	62,378,881
1991	43,648,773	4,140,145	8,537,053	2,096,138	115,020	4,393,986	740,267	63,671,382
1992	39,055,380	3,795,367	7,124,248	1,448,866	77,854	4,362,551	738,026	56,602,292
1993	40,962,969	3,772,494	6,773,992	1,597,447	89,495	3,968,663	938,486	58,103,546
1994	51,597,880	5,602,507	5,684,252	554,367	26,013	5,738,398	848,181	70,051,598
1995	49,771,715	4,960,453	5,008,551	962,077	45,054	8,564,325	1,000,609	70,312,784
1996	47,992,628	4,880,328	4,896,782	978,376	52,758	11,705,439	852,532	71,358,843
1997	58,016,197	5,324,775	5,549,295	1,162,862	36,623	11,650,701	849,126	82,589,579
1998	56,187,841	5,273,463	5,043,939	1,534,067	41,963	10,575,143	797,019	79,453,435
1999	65,375,535	6,938,658	6,166,601	1,346,509	77,621	8,331,142	739,904	88,975,970
2000	69,265,611	5,651,160	5,436,618	1,123,486	53,364	3,802,880	765,801	86,098,920
2001	57,531,942	3,862,054	5,525,209	762,408	55,537	3,013,551	611,242	71,361,943
2002	73,607,600	3,445,004	5,483,983	442,425	14,838	2,230,869	786,137	86,010,856
2003	63,005,041	1,110,534	6,978,808	423,583	17,394	1,448,011	804,355	73,787,725
2004	80,448,651	1,184,942	6,722,671	480,203	93,270	1,534,130	993,689	91,457,556
2005	76,240,627	1,464,433	7,442,771	457,275	54,181	1,673,396	966,787	88,299,470
2006	80,846,400	1,853,505	7,588,539	516,130	59,928	1,840,308	1,048,051	93,752,862
2007	70,862,089	1,430,836	6,375,646	617,978	56,866	1,263,648	1,132,991	81,740,055
Grand Total	1,354,836,205	93,914,418	164,084,815	28,849,521	2,214,112	112,004,403	17,384,426	1,773,287,900

*Landings data are not collected by LCMA in all states. To separate landings by LCMA NMFS statistical areas are placed into a single LCMA. For a complete description of how estimates are completed send a request to the PRT Chair, ktaylor@asmfc.org.

The assessment showed current abundance of the SNE stock is the lowest observed since the 1980s and exploitation rates have declined since 2000. Recruitment has remained low in SNE since 1998. Given current low levels of spawning stock biomass and poor recruitment further restrictions are warranted.

The assessment recommended revisions to the reference points set in the FMP, which the Board approved in 2010. Stock status is determined by comparing threshold values to the average abundance and exploitation rate during recent years (2005-2007). Thus, "overfishing" would occur if the average recent exploitation rate were higher than the threshold. A stock would be "depleted" if average recent abundance fell below the threshold. . The GOM and GBK stocks are not depleted and overfishing is not occurring, while the SNE is depleted but not experiencing overfishing. The Board set the SNE abundance reference points to a lower target level than the GOM and GBK stocks because it believes the SNE stock has limited ability to rebuild to higher historical levels.

The next assessment is scheduled for peer review in 2015.

4.0. Status of Research and Monitoring

4.1 Research Needs

4.1.1 University of Maine Model Development

The University of Maine lobster model used for this assessment should be revised and enhanced in the following ways in order to improve future assessments:

- Explore feasibility of estimating all or a portion of the growth transition matrix.
- Expand model to include any number of surveys by sex. This includes changing the structure of input data files, modifying corresponding sections of code to accommodate any number of surveys and fishery types by sex or both sexes combined, and estimation of survey selectivity by sex.
- Incorporate trends in natural mortality, maturity, and growth, where appropriate.
- Check estimation and form of non-linear CPUE relationship with abundance, explore standardization/treatment of commercial CPUE.
- Explore incorporation of ventless trap and settlement surveys.
- Create graphics viewer in R for examining MCMC and projection outputs; include MCMC chain convergence criteria / diagnostics.
- Reduce gap-filling of landings and biosamples to the extent possible and allow the model to handle data gaps statistically.
- Specify number of years across which to conduct the assessment (e.g. to ease performance of sensitivity and retrospective analyses).

4.1.2 Program Research

New research and expansion of existing monitoring programs in the following areas would provide information needed to improve future stock assessments as described in the assessment and peer review report:

1 - Fishery-Dependent Information

Accurate and comparable landings are the principal data needed to assess the impact of fishing

on lobster populations. The quality of landings data has not been consistent spatially or temporally. Aligning stock management areas with area designations for landings and management is necessary. Enhanced sea sampling and port sampling to create a more complete record of biological characteristics of the catch and harvest would also improve the usefulness of these data. This is especially needed in offshore waters. In addition, investigations are needed to determine where lobster are being caught and if and how this changes over time. A lot of progress has been made recently by improvements in landing reporting programs (SAFIS, 10% mandatory reporting, and mandatory vessel trip reports in some areas) and increased port and sea-sampling programs. However, many of these gains are about to be lost due to lack of funding. There was very little funding for the offshore port-sampling program and shrinking funds for sea-sampling programs will impact the spatial and temporal extent of sampling efforts in 2012. These types of programs are essential for accurate lobster assessments and must have dedicated funding.

2 - Growth

The apparent mismatch of biological reference points and current stock status from this and previous assessments, poor model fits to certain length data sources in the new assessment, and samples of large lobster from Georges Bank with clean shells (no fouling or shell disease), suggest that growth and maturity may not be characterized correctly. All of the information used to estimate molt frequency and much of the information used to estimate molt increments was collected from hatchery reared lobster. Hatchery growth may not be an accurate model of growth in the wild, particularly for large lobster. Research and tagging programs should be developed to generate better more accurate information on growth, particularly for large lobster.

3 - Fishery-Independent Information

There is a need to develop consistent techniques that monitor distribution and abundance of lobster independent of the fishery. Current methods (e.g. trawls) are limited in area (gear conflicts) and do not target primary lobster habitat (unable to access complex bottom). A coastwide ventless trap survey was initiated in 2006 to develop a time series of lobster relative abundance and recruitment while attempting to eliminate the biases identified in conventional surveys. The survey was conducted from 2006 to 2012 from the Gulf of Maine to Long Island Sound. Funding is necessary to continue the survey. These data will need to properly integrated as indices of abundance into future assessment models.

Little is known about the cause and implications of the sudden recent increase in proportion females in offshore GOM and GBK. Given the potential for sperm limitation and decreased stock productivity that could result, more research is needed on this phenomenon.

Current stock boundaries separate the US and Canadian lobster population into semi-discrete stocks, so it is necessary to understand how much adult and larval exchange occurs between stocks and if this exchange represents a significant recruitment subsidy to US stocks. How do differing management strategies in adjacent stocks fit if exchange rates are high? This is particularly important given the similarities in the increasing size and proportion of female in the offshore Gulf of Maine and Georges Bank stocks.

4 - Age

All assessments of lobster stock status have been based on analyses of length data. Age is assumed by applying per-molt growth increments and molt frequencies to the length data. Based on these analyses, the American lobster has been treated as an extremely long-lived animal, reaching a reproductive maximum at a relatively old age. These assumptions are based on no actual age data. Applying aging techniques developed in England and Australia for lobster and other crustaceans would greatly improve our understanding of how many year-classes support the current trap fishery, how length relates to age, and how variable the age structure is over stock area and time. Research has been initiated on ageing techniques in New England in ME and CT. This work should be continued and expanded.

5 - Ecosystem-based Management

NOAA's 2009-2014 Strategic Plan for Fisheries Research recommends the inclusion of ecosystem and environmental information in all stock assessments. Further examination of lobster mortality not related to the fishery would provide a better understanding of factors limiting productivity and longevity. Research has been conducted in Southern New England in response to the Long Island Sound lobster die off elucidating the affects of temperature, pesticides and shell disease. Initial modeling work has been developed relating North Atlantic Oscillation (NAO) and water temperature shifts to larval and adult survival. Additional topics should include: predator/prey interactions and community structure (e.g. gut content analyses), directed tagging studies to estimate natural mortality, climatic shifts in ocean currents and temperature in all stock areas, and toxic substances causing chronic stress or disease. Investigations of stock unit carrying capacity should be explored, specifically: How should lobster be managed in a stock whose carrying capacity has declined or may be declining? What metric should be used to measure carrying capacity for lobster? How would a climate- induced range contraction be defined, and how should a stock whose range has contracted be managed?

6 - Investigation of Trans-boundary Assessments

Investigate conducting joint US and Canadian assessments. The two most productive U.S. stocks, (Gulf of Maine and Georges Bank), are shared with Canada. The two stock areas should be assessed as a jointly, and linkages between US and Canadian fisheries and the dynamics of different management strategies on shared stocks should be examined.

7 - Investigation of Historical Levels of Stock Production

One limitation of current trend-based reference points is the period covered by the assessment. Investigations of past levels of stock size and size structure could provide additional insight into setting reference points that relate to the full range of stock productivity. Current status should be compared to some reasonably high stable period of stock production. Otherwise current stock status may be compared to a median value that is a continued diminishing return. In addition, extending backwards in time, to the extent practicable, all data sources in the stock assessment model should be explored. Internally generating estimates of the stock-recruitment relationship within the length-based model is recommended as well.

4.2 Monitoring

Table 3. 2012 sampling requirements and state implementation (✓- sampling conducted but below FMP requirement or has been reduced, ✓ sampling conducted at level required by FMP, ✓+ sampling conducted beyond FMP requirement). There is no specific requirement for port and sea sampling (see text below).

State	100% Dealer reporting	10% Harvester Reporting	Overall Fishery Dependent Biological Sampling	Sea Sampling	Port Sampling	Ventless Trap Survey	Settlement Survey	Trawl Survey
ME	✓	✓	✓-	✓	✓	✓	✓	✓
NH	✓	✓+ 100%	✓-	✓	✓	✓	✓	✓ (ME)
MA	✓	✓+ 100%	✓-	✓		✓	✓	✓
RI	✓	✓+ 100%	✓-	✓-	✓-	✓	✓	✓
CT	✓	✓+ 100%	✓-	✓-			✓	✓
NY	✓	✓ 100%	✓-	✓-	✓-			✓(CT)
NJ	✓	✓	✓-	✓				✓

Addendum X requires that states conduct sufficient biological sampling to characterize the commercial catch. Specifically it requires that states weight sampling intensity by areas and season to match 3-year average of area's seasonal commercial catch. This volume of sampling well exceeds current state budgets for lobster biological sampling. Table 3 describes the level of sea and port sampling conducted by the states.

Maine has suspended its port sampling program following the 2012 sampling year. NY was unable to conduct multispecies port sampling during 2012 due to a delay in contract development and a reduction in IJ funds. Connecticut minimized their sea sampling in 2010 as a result of IJ reduction as well. Additionally federal funding for Rhode Island's sea sampling program was lost in May 2012; however, state funds were used to continue sampling from June through the end of the year. The PRT is concerned that funding for both fishery independent and dependent data collection is at risk. State resources are shrinking, making it more difficult to secure funding for these programs. These data collection programs need long-term funding in order for the stock assessment committee to use them for stock assessments.

Young of the Year Settlement

Several states conduct young-of-year (YOY) surveys to detect trends in abundance of newly-settled and juvenile lobster populations. These surveys attempt to provide an accurate picture of the spatial pattern of lobster settlement. States hope to track juvenile populations and generate predictive models of future landings.

Maine: In 2000, settlement surveys were expanded to cover all seven of Maine's lobster management zones (LMZ) in order to create a statewide index of settlement to further this goal. The settlement survey remains the one opportunity to index one year class of lobsters.

In 2012 settlement was below the time series mean for many of the seven management zones (Figure 1). In most areas, this was the second consecutive year of low settlement. There has been a general decline in settlement since the mid-2000s, and projections indicate a downturn in landings is likely.

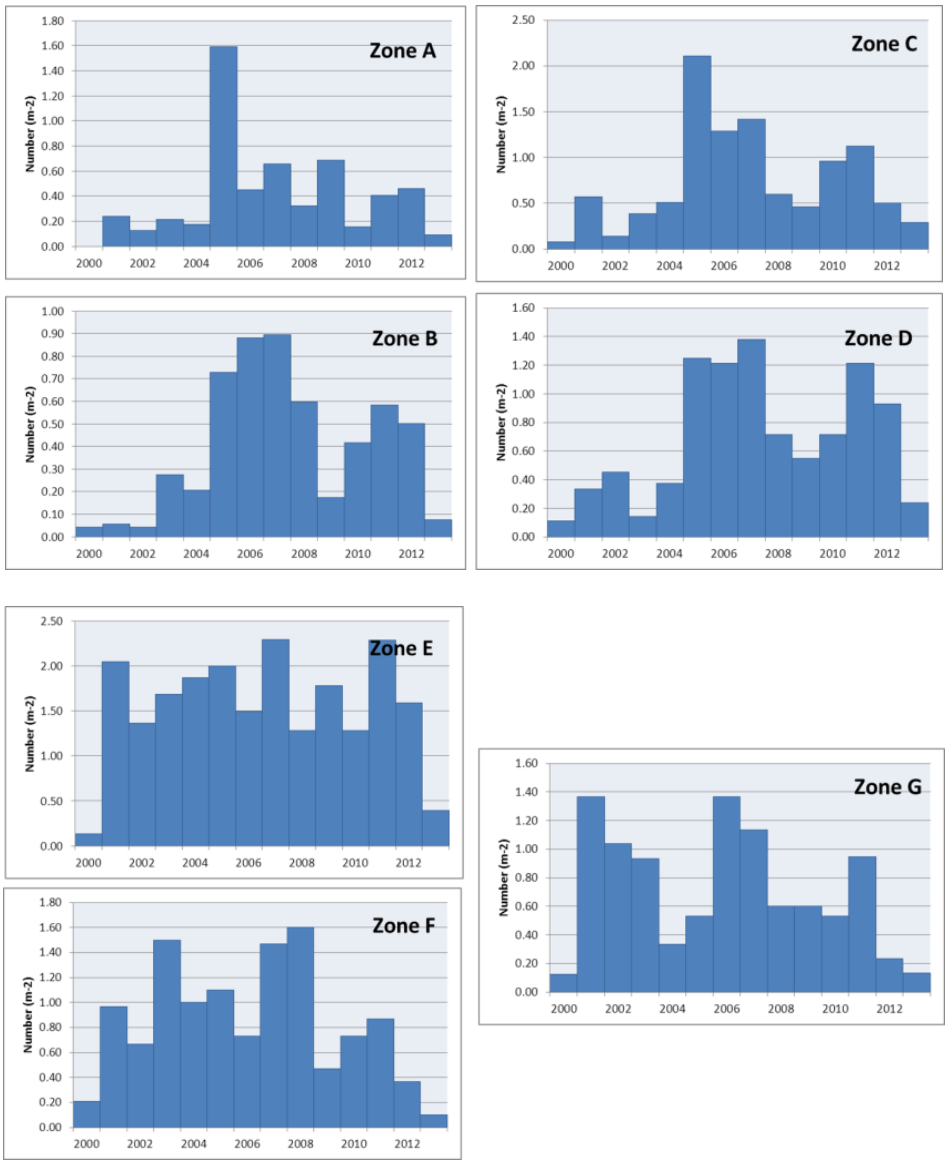

Figure 1. Lobster settlement in Maine's seven lobster management zones from 2000-2013. Zones run from east (Zone A) to west (Zone G).

New Hampshire: New Hampshire Fish and Game (NHF&G) conducted a portion of the coastwide American Lobster Settlement Index (ALSI) in the past 5 years. In 2012, a total of 30 juvenile lobsters were sampled from three sites, three were YOY, two were one year olds (Y+), and 25 were older juveniles.

The CPUE (#/m^2) index associated with YOY lobsters showed a general upward trend from 2008 through 2011, followed by a decrease in 2012 to the second lowest catch rate of the time series (Figure 2). The index for Y+ lobsters varied around 0.2 (#/m^2) from 2008 through 2010, increased in to a time series high in 2011 and decreased in 2012 to a time series low.

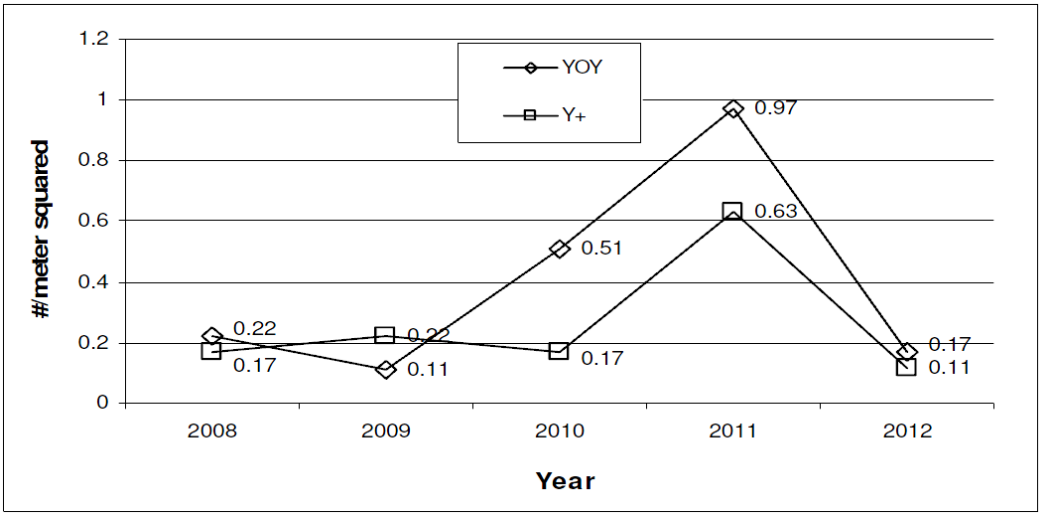

Figure 2. Catch per unit effort (#/meter^2) of both YOY and one year old (Y+) lobsters captured during the American Lobster Settlement Index in New Hampshire state waters from 2008 through 2012.

Massachusetts: Annual sampling for early benthic phase/juvenile (EBP) lobsters was conducted using SCUBA and airlift suction sampling equipment from August to September in 2012. Density indices of newly settled post-larval lobsters were calculated (17-year time series) and coastal habitat important to the settlement of these juveniles continues to be defined. Sampling was completed at 21 sites spanning seven regions in Massachusetts coastal waters (six Buzzards Bay sites, two Vineyard Sound sites, three Cape Cod Bay sites, two South Shore sites, three Boston Harbor sites, three Salem Sound sites, and two Cape Ann sites). Data for all sites were used to generate density estimates of EBP lobster and other decapod crustaceans. Densities of EBP lobsters from 1995 to 2012 are presented in Figure 3. Cape Ann, Salem Sound, Boston, South Shore, and Cape Cod Bay are all within LCMA 1, while Buzzards Bay and Vineyard Sound are within LCMA 2.

In 2012 densities of YOY lobsters in LMCA 1 were well below median values in the three regions with long time series (Salem Sound, Boston Harbor, and Cape Cod Bay). The 2012 YOY lobster density in Buzzards Bay was zero, below the time series median for LCMA 2.

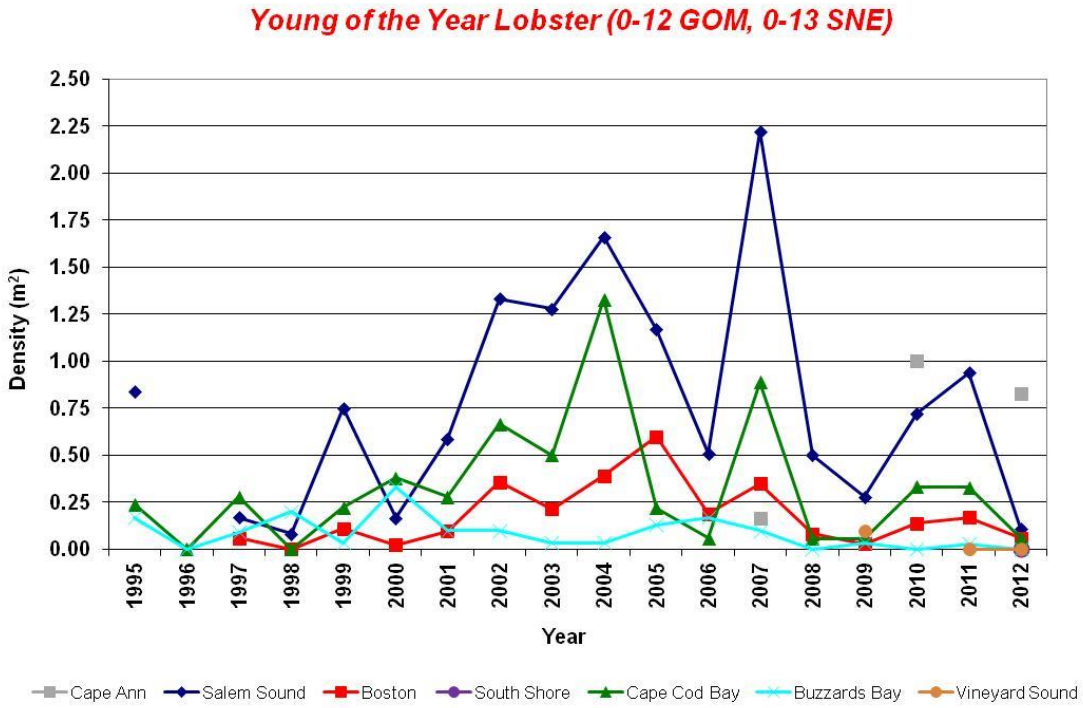

Figure 3. YOY lobster density in seven Massachusetts regions; *LCMA 1* – Cape Ann, Salem Sound, Boston, South Shore, Cape Cod Bay, *LCMA 2* - Buzzards Bay, Vineyard Sound.

Rhode Island: The YOY Settlement Survey (Suction Sampling) was conducted at six fixed stations with twelve randomly selected 0.5-meter quadrats sampled at each survey station, for a total of 72 samples. The survey stations are located outside of Narragansett Bay along the southern Rhode Island coast, from Sachuest Point (east) to Point Judith (west). The 2012 YOY Settlement Survey index was 0.09 YOY lobster/m^2 (Figure 4).

Connecticut: The Connecticut Department of Energy and Environmental Protection Larval Lobster Survey is conducted each summer to provide an index of zero-class recruitment in western Long Island Sound. Annual production in 2012 (15.2 larvae/1000 m^3 water sampled) remained below the long-term median value (78.6) and ranked 28th in the 30-year time series (1983-2012). The median value has been exceeded only once, in 2007, since 2000 with the other 11 years' production below the median value. The lowest value in the time series was recorded in 2006 (9.1 larvae/1000 m^3), followed by 2002 (15.0 larvae/1000 m^3, Figure 5). The larval program will not be continued after 2012.

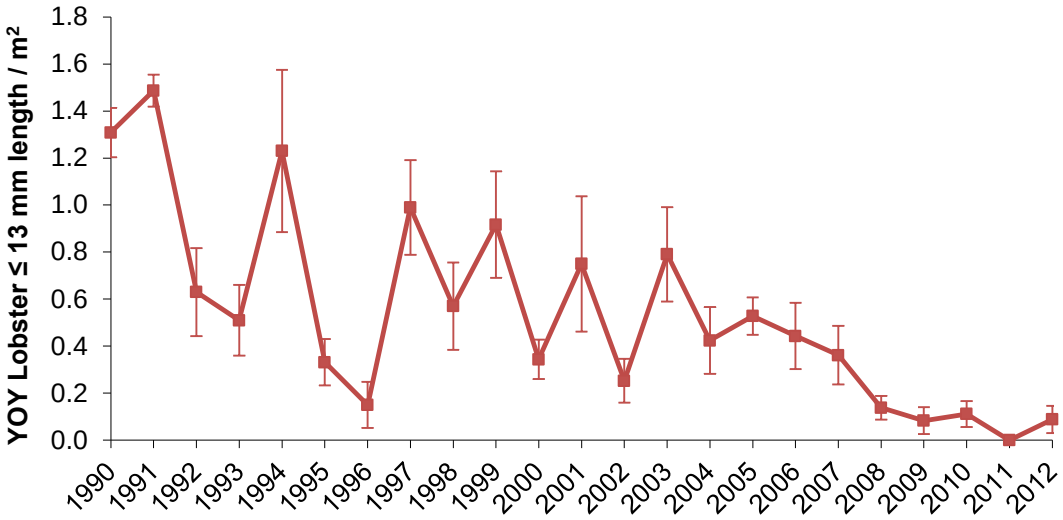

Figure 4. RI YOY settlement index (+/- SE) for 1990-2012.

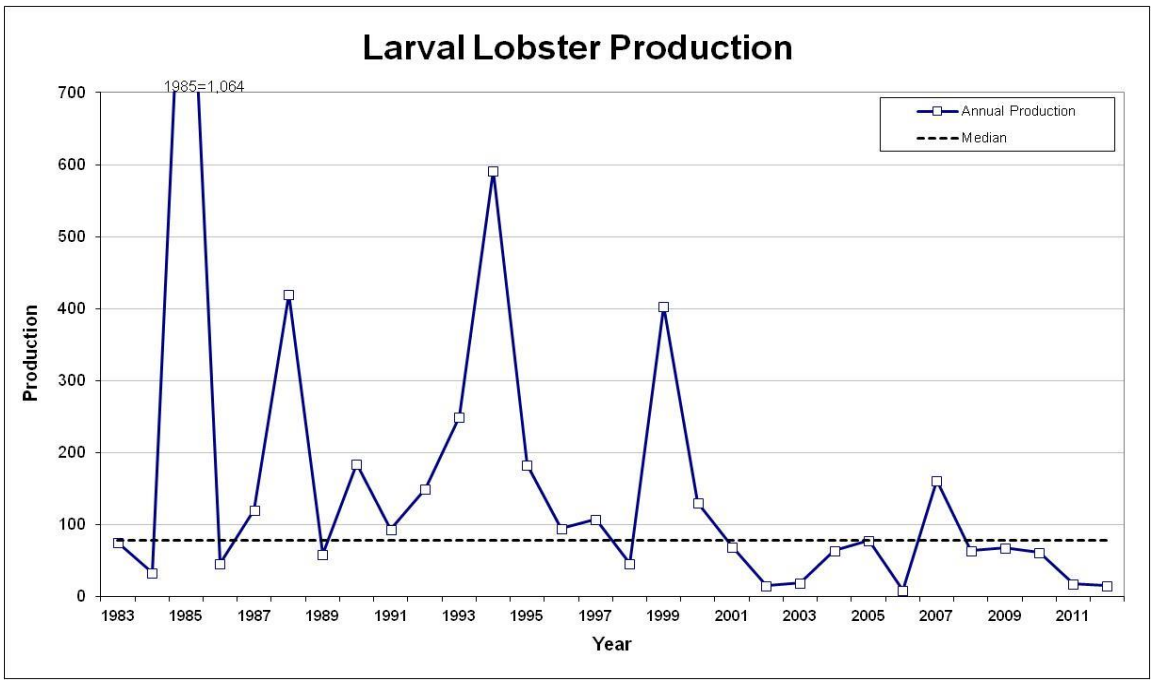

Figure 5. CT DEEP Larval Lobster Survey time series.

Ventless Trap Survey

To address a need for a reliable index of lobster recruitment, a cooperative random stratified ventless trap survey was designed to generate accurate estimates of the spatial distribution of lobster length frequency, lobster relative abundance while attempting to limit the biases identified in conventional fishery dependent surveys. In the past, fishery-dependent trap sampling data have not been included in generating relative abundance indices for the American lobster due to

associated bias with the data collection method. In order to collect unbiased data, a fishery-independent survey, wherein scientists and contracted fishermen cooperatively collect the data, will provide greater control over the sampling design and data quality and quantity necessary to maintain a stratified sampling approach.

A random-stratified sampling design was applied to nearshore statistical areas from Maine to New York. The survey was a cooperative effort between state fisheries agencies and commercial lobstermen, who were contracted to fish at pre-determined sampling locations along the New England coast from Maine to New York. Each statistical area was assigned three depth strata (1-20 m, 21- 40 m and 41-60 m).

Maine: Since 2007, Maine coastal waters have been sampled, dividing the three statistical areas (511, 512 and 513) into eight stations for each depth of three strata (Figure 6). 2012 marked the seventh year of this survey, with traps being set from June – August. The 2012 catch rates were at the time series high all three statistical areas (511 - Schoodic east, 512 - Muscongus Bay to Mount Desert Island, and 513 - MA to Pemaquid Point).

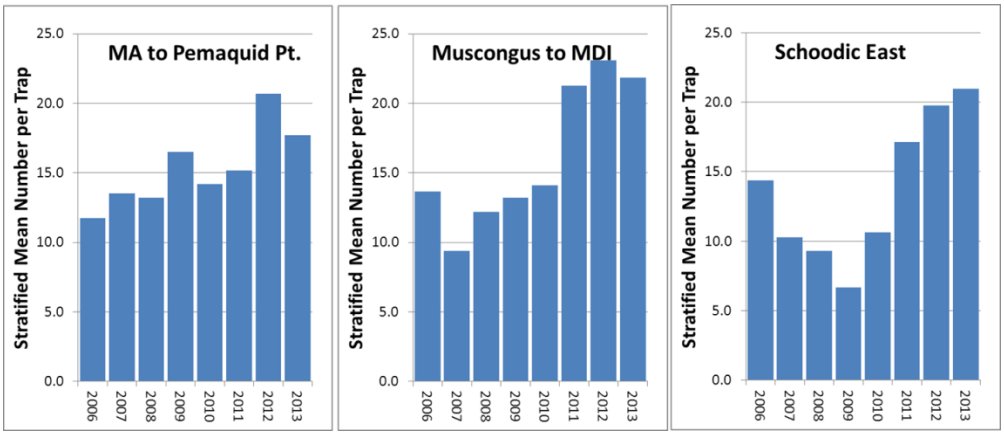

Figure 6. Maine's stratified ventless trap catch rates by Statistical Area for 2006-2013 (all sizes).

New Hampshire: Since 2009, NHF&G has been conducting the coastwide Random Stratified Ventless Trap Survey in state waters (statistical area 513). New Hampshire follows the standardized coastwide procedures for this survey. A total of three sites were surveyed twice a month from June through September in 2012. Catch per unit effort (stratified mean catch per trap haul) from 2009 through 2012 is presented in Table 4. The relative abundance indices associated with this survey shows a general upward trend from 2009 through 2012.

Year	Stratified mean catch per trap
2009	6.9
2010	9.2
2011	13.9
2012	13.8

Table 4. Stratified mean catch/trap haul, for all lobsters captured during the coastwide Random Stratified Ventless Trap Survey in New Hampshire state waters from 2009-2012.

Massachusetts: The coast-wide ventless trap survey was initiated in 2006 and expanded in 2007. Each station was sampled with a six pot trawl in which vented and ventless lobster traps were alternated (3 of each per trawl). The survey took place from June through September in statistical areas 514 and 538, and stations were sampled twice monthly. For 2011 and 2012 the Southern New England portion of the survey was expanded into Federal waters of Area 538, and into the northern-most section of Area 537.

Figure 7 shows the stratified mean CPUE for lobsters in S.A. 514 (part of LCMA 1). The average catch of sublegal lobsters is much higher than the catch of legal-sized lobsters, and has shown an increasing trend since 2007, particularly in the last two years. The catch of legal-sized lobsters was slightly higher in 2012 than any other year in the time series. For most of the time series the CPUE of legal-sized lobsters has varied around the time series mean of 0.52 lobsters per trap.

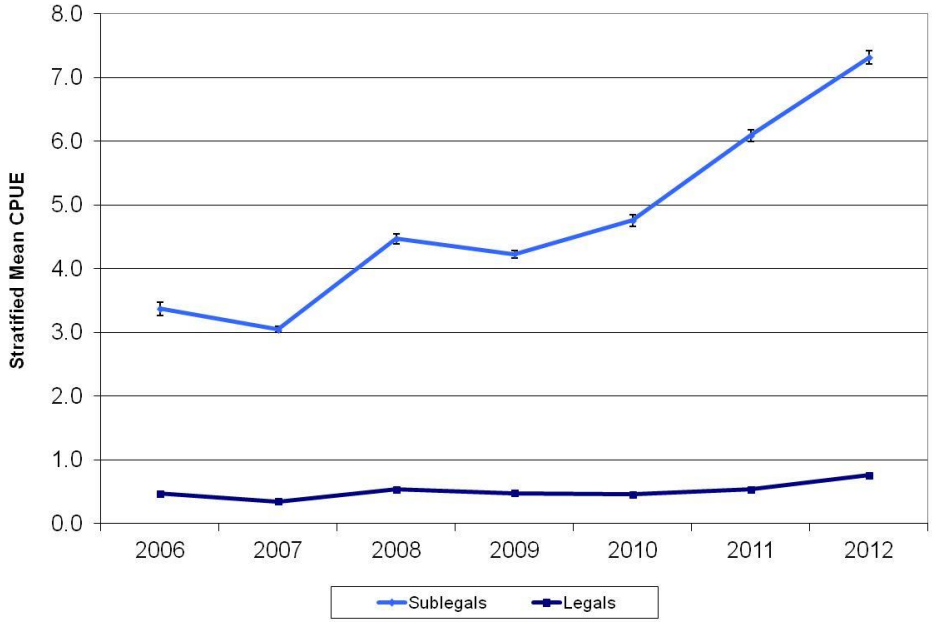

Figure 7. Stratified mean catch per trap haul (±S.E.) of sublegal (< 83 mm, light colored line) and legal (≥ 83 mm, dark line) lobsters in Area 514 in Massachusetts.

Figure 8 shows the stratified mean CPUE for lobsters in statistical area 538 (part of LCMA 2). The average catch of sublegal lobsters is again higher than the catch of legal-sized lobsters, and generally declined through 2010. In 2011 and 2012, sublegal CPUE increased, although this may in part be related to the expansion of the survey area to regions outside Buzzards Bay, where thermal conditions may be more tolerable. The legal-size CPUE has also slightly increased since 2010, but has remained below 0.5 all throughout the time series, with the lowest value observed in 2008 (0.11).

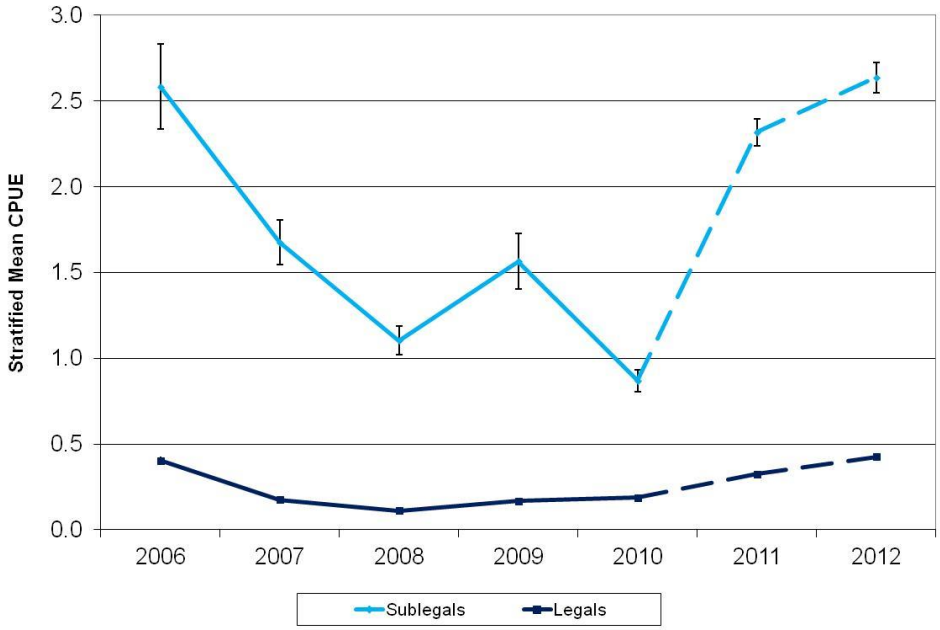

Figure 8. Stratified mean catch per trap haul (±S.E.) of sublegal (< 86 mm, light colored line) and legal (≥ 86 mm, dark line) lobsters in LCMA 538 in Massachusetts. Dashed lines represent the time period when the survey was expanded.

Rhode Island: The Ventless Trap Survey (VTS) was conducted June to August, completed a total of 18 survey sampling trips, and sampled a total of 3,616 lobsters from 834 trap-hauls (Figure 9). All sampling was conducted in LCMA 2 (Statistical Area 539).

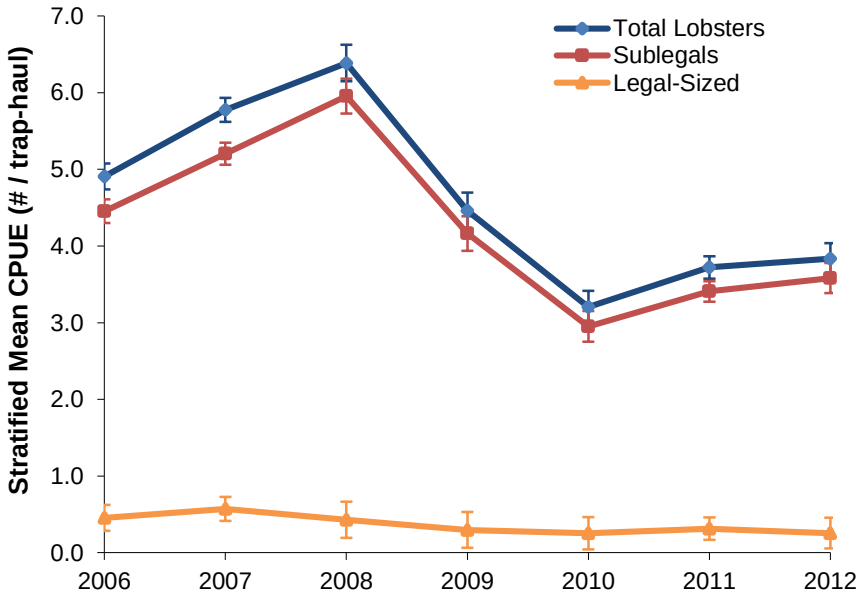

Figure 9. Stratified mean catch (#) per trap-haul (+/- SE) for sublegal (<=85mm CL), legal-sized (>=86mm CL), and all lobsters in Rhode Island's VTS.

V. Status of Management Measures and Issues

Amendment 3 established management measures that require coastwide and area specific measures applicable to commercial fishing. The coastwide requirements are summarized in Table 5.

Table 5. 2012 coastwide requirements and prohibited actions

- Prohibition on possession of berried or scrubbed lobsters
- Prohibition on possession of lobster meats, detached tails, claws, or other parts of lobsters by fishermen
- Prohibition on spearing lobsters
- Prohibition on possession of v-notched female lobsters
- Requirement for biodegradable "ghost" panel for traps
- Minimum gauge size of 3-1/4"
- Limits on landings by fishermen using gear or methods other than traps to 100 lobsters per day or 500 lobsters per trip for trips 5 days or longer
- Requirements for permits and licensing
- All lobster traps must contain at least one escape vent with a minimum size of 1-15/16" by 5-3/4"
- Maximum trap size of 22,950 cubic inches in all areas except area 3, where traps may not exceed a volume of 30,100 cubic inches.

Amendment 3 to the Interstate Fishery Management Plan for American Lobster (December 1997)

American lobster is managed under Amendment 3 to the Interstate FMP for American Lobster. I

Amendment 3 establishes seven lobster management areas. These areas include the: Inshore Gulf of Maine (Area 1), Inshore Southern New England (Area 2), Offshore Waters (Area 3), Inshore Northern Mid-Atlantic (Area 4), Inshore Southern Mid-Atlantic (Area 5), New York and Connecticut State Waters (Area 6), and Outer Cape Cod. Lobster Conservation Management Teams (LCMTs), composed of industry representatives, were formed for each management area. The LCMTs are charged with advising the Lobster Board and recommending changes to the management plan within their areas.

Amendment 3 also provides the flexibility to respond to current conditions of the resource and fishery by making changes to the management program through addenda.

The commercial fishery is primarily controlled through minimum/maximum size limits, trap limits, and v-notching of egg-bearing females.

Addendum I (August 1999)

Establishes trap limits in the seven lobster conservation management areas (LMCAs)

Addendum II (February 2001)

Establishes regulations for increasing egg production through a variety of LCMT proposed management measures including, but not limited to, increased minimum gauge sizes in Areas 2, 3, 4, 5, and the Outer Cape.

Addendum III (February 2002)

Revises management measures for all seven LCMAs in order to meet the revised egg-rebuilding schedule.

Technical Addendum 1 (August 2002)

Eradicates the vessel upgrade provision for Area 5.

Addendum IV (January 2004)

Changes vent size requirements; applies the most restrictive rule on an area trap cap basis without regard to the individual's allocation; establishes Area 3 sliding scale trap reduction plan and transferable trap program to increase active trap reductions by 10%; and establishes an effort control program and gauge increases for Area 2; and a desire to change the interpretation of the most restrictive rule.

Addendum V (March 2004)

Amends Addendum IV transferability program for LCMA 3. It establishes a trap cap of 2200 with a conservation tax of 50% when the purchaser owns 1800 to 2200 traps and 10% for all others.

Addendum VI (February 2005)

Replaces two effort control measures for Area 2 – permits an eligibility period

Addendum VII (November 2005)

Revises Area 2 effort control plan to include capping traps fished at recent levels and maintaining 3 3/8" minimum size limit

Addendum VIII (May 2006)

Establishes new biological reference points to determine the stock status of the American lobster resource (fishing mortality and abundance targets and thresholds for the three stock assessment areas) and enhances data collection requirements.

Addendum IX (October 2006)

Establishes a 10% conservation tax under the Area 2 trap transfer program

Addendum X (February 2007)

Establishes a coastwide reporting and data collection program that includes dealer and harvester reporting, at-sea sampling, port sampling, and fishery-independent data collection replacing the requirements in Addendum VIII.

Addendum XI (May 2007)

Establishes measures to rebuild SNE stock, including a 15-year rebuilding timeline (ending in 2022) with a provision to end overfishing immediately. The Addendum also establishes

measures to discourage delayed implementation of required management measures.

Amendment 4

In 2000, the Lobster Board considered and failed to approve Amendment 4 to the FMP. The Amendment proposed allowing conservation equivalency be applied to two provision of Amendment 3- limits on non-trap gear and a prohibition on the possession of v-notched lobsters. The v-notch proposal, in particular, arose out of an effort to resolve ongoing litigation brought by fishermen challenging the validity of the Commission's fishery management plan.

Addendum XII (February 2009)

This addendum addresses issues that arise when fishing privileges are transferred, either when whole businesses are transferred, when dual state/federal permits are split, or when individual trap allocations are transferred as part of a trap transferability program. In order to ensure that the various LCMA-specific effort control plans remain cohesive and viable this addendum does three things: First, it clarifies certain foundational principles present in the Commission's overall history-based trap allocation effort control plan. Second, it redefines the most restrictive rule. Third, it establishes management measures to ensure that history-based trap allocation effort control plans in the various LCMAs are implemented without undermining resource conservation efforts of neighboring jurisdictions or LCMAs.

Addendum XIII (May 2008)

Solidifies the transfer program for OCC and stops the current trap reductions.

Addendum XIV (May 2009)

This addendum alters 2 aspects of the LCMA 3 trap transfer program. It lowers the maximum trap cap to 2000 for an individual that transfers traps. It changes the conservation tax on full business sales to 10% and for partial trap transfers to 20%.

Addendum XV (November 2009)

This addendum establishes a limited entry program and criteria for Federal waters of lobster conservation management area 1.

Addendum XVI: Reference Points (May 2010)

This addendum establishes new biological reference points to determine the stock status of the American lobster resource (fishing mortality and abundance targets and thresholds for the three stock assessment areas). The addendum also modifies the procedures for adopting reference points to allow the Board to take action on advice follow a peer reviewed assessment.

Addendum XVII (February 2012)

This addendum establishes a 10% reduction in exploitation for LCMA within Southern New England (2, 3, 4, 5, and 6). Regulations are LCMA specific but include v notch programs, closed seasons, and size limit changes. While approved, the addendum is not final until the inclusion of LCMA 6 plan.

Addendum XVIII (August 2012)

This addendum reduced traps allocated by 50% for LCMA 2 and 25% for LCMA 3.

Table 6. 2012 LCMA specific management measures

Mgmt Measure	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	OCC
Min Gauge Size	3 1/4"	3 3/8"	3 1/2"	3 3/8"	3 3/8"	3 3/8"	3 3/8"
Vent Rect.	1 15/16 x 5 3/4"	2 x 5 3/4"	2 1/16 x 5 3/4"	2 x 5 3/4"	2 x 5 3/4"	2 x 5 3/4"	2 x 5 3/4"
Vent Cir.	2 7/16"	2 5/8"	2 11/16"	2 5/8"	2 5/8"	2 5/8"	2 5/8"
V-notch requirement	Mandatory for all eggers	Mandatory for all legal size eggers June 1, 2012	Mandatory for all eggers above 42°30'	Mandatory for all eggers July 1, 2012	None	None	None
V-Notch Definition (possession)	Zero Tolerance	1/8" with or w/out setal hairs[1]	1/8" with or w/out setal hairs[1]	1/8" with or w/out setal hairs[1]	1/8" with or w/out setal hairs[1]	1/8" with or w/out setal hairs[1]	State Permited fisherman in state waters 1/4" without setal hairs Federal Permit holders 1/8" with or w/out setal hairs[1]
Max. Gauge (male & female)	5"	5 ¼"	6 3/4"	5 ¼"	5 ¼"	5 ¼"	State Waters none Federal Waters 6 3/4"
Measures to change in 2013							
Min Gauge size			3 17/32" Jan 1, 2013				
V-notch requirement					Mandatory for all eggers Jan 1, 2013		
Season Closure				Feb 1- Mar 31, 2013	Feb 1- Mar 31, 2013		

VI. Current State-by-State Implementation per Compliance Requirements

All states are currently in compliance with all required measures under Amendment 3 and Addendum I-XVIII.

VII. De Minimis requests.

The states of Virginia, Maryland, and Delaware have requested de minimis status. Virginia and Delaware meet the de minimis requirement. The current two year average of lobster harvest for Maryland exceeds the *de minimis* threshold, but it is the first occurrence of this since the *de minimis* guidelines were established in Addendum I (1999). Maryland is currently taking action to address this issue.

The PRT recommends that the states implement all biological measures contained in the FMP. The PRT recommends the states conduct biological sampling of their lobster fishery to improve the stock assessment but not require sampling. *De minimus* states are required to collect harvest annual harvest data, but the PRT recommends harvest data is collected monthly for use in the stock assessment.

VIII. Recommendations and Issues

The following are issues the Plan Review Team would like to raise to the Board as well as general recommendations:

1. With the decline of resources for data collection program and the need for development of consistent techniques to monitor distribution and abundance of lobster, the PRT recommends that a regional data collection program be implemented. A regional initiative would stream line state and regional programs and provide consistent information for assessment use.

2. PRT recommends the ASMFC socioeconomic subcommittee evaluate the socioeconomic data being collected by states and determine what additional data should be collected in order to provide more robust evaluations of management changes. The development of the trap transfer programs will also have significant impacts on the lobster fishery. The PRT recommends the socioeconomic subcommittee recommend specific data that should be collected as transfers occur in-order to provide reports to the board on socioeconomic impacts of transfers once the program begins.

3. The PRT encourages the full implementation of data collection programs to lobster management. The PRT recommends that all states implement 100% harvester and dealer programs as outlined in Addendum X.

4. The PRT encourages state and federal jurisdictions to continue to work cooperatively to achieve the goals of the FMP.

5. The PRT recommends the TC explore oceanographic and climate change impacts on lobster stock, including lobster productivity.

6. The PRT recommend that states add to the annual compliance report the number of permits issued and number of those permits that are active by state and LCMA (and zone for ME).