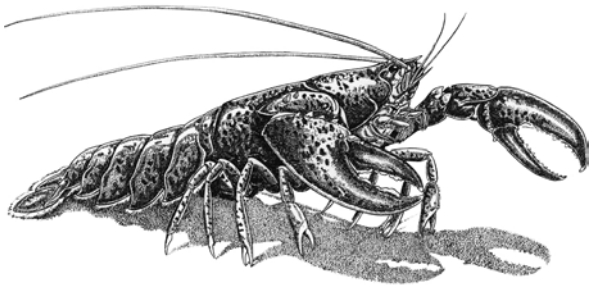
REVIEW OF THE
INTERSTATE FISHERY MANAGEMENT PLAN
FOR
AMERICAN LOBSTER
(*Homarus americanus*)

2002 FISHING YEAR



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I. Status of the Fishery Management Plan

Year of Plan's Adoption:	1997
Framework Adjustments:	Addendum I (1999) Addendum II (2001) Addendum III (2002)
Management Unit:	Maine through North Carolina
States with a Declared Interest:	Maine through North Carolina
Active Committees:	American Lobster Management Board, Technical Committee, Stock Assessment Sub-Committee, Socio-Economic Sub-Committee, Database Sub-Committee, Model Development Sub-Committee, Advisory Panel, Plan Development Team, Plan Review Team

II. Status of the Stocks

Trend Analysis

In the absence of an annual stock assessment for American lobster, the Technical Committee review annual trends in stock biomass and abundance as recorded by trawl surveys along the Atlantic coast. The 2003 annual survey trend analysis follows. The most recent data used in this analysis was collected in 2002.

Southern New England

Upon review of the trawl survey trends there was a consensus among the TC that lobster abundance in the SNE stock unit is at or close to time series lows. There has been an observable consistent decline in pre-recruit, recruit, and legal lobster indices among surveys, over the last 5 years. This decline follows record lobster abundance observed in the mid-1990's. The TC finds the low abundance of lobsters in the SNE stock unit particularly alarming in light of the current lobster health issues in this area, as well as the increased effort and fishing efficiency in the fishery as compared to when lobster abundance was low in the early 1980's.

Georges Bank & South

There was a consensus among the TC that lobster relative abundance in the GB&S stock unit has remained relatively stable over the time series as measured by the NMFS Fall survey. There seems to be a slight increase in relative abundance of the legal sized category in the last 3 years. Abundance trends in the NJF&F trawl survey do not track the NMFS survey well. The TC questions if the NJF&F trawl survey indices are allocated to the appropriate stock unit, as observed trends in the NJ survey appear to

track trends in the SNE stock unit more closely.

Gulf of Maine

There was a consensus among the TC members that lobster relative abundance in the GOM stock unit has increased over the time series as measured by the NMFS Fall survey. Legal sized relative abundance of males and females are at or near time series highs. However, relative abundance of recruit and pre-recruit size classes have dropped in recent years from high observed in the late 1990's. Relative abundance indices from the MADMF trawl survey have varied without trend over the time series for pre-recruit, recruit and legal size classes.

ASMFC External Stock Assessment – July 2000

The last stock assessment for lobster was completed via an external peer review during summer 2000. The Stock Assessment Report provides an analysis of the lobster stocks through 1998 and was summarized in previous FMP reviews. Overall, fishing effort is intense throughout the range of the species and the stock is defined as overfished in all stock areas, using the ASMFC standard of 10% egg production per recruit. At the time of the stock assessment, however, the majority of the Lobster Stock Assessment Subcommittee did not consider any of the stock areas to be recruitment overfished. The Stock Assessment Subcommittee considered all stock areas to be growth overfished, indicating that landings could be larger if the fishing mortality rate were reduced.

For assessment purposes, the lobster population is split into three regions: Gulf of Maine (GOM), George's Bank and South (GBS), and South of Cape Cod to Long Island Sound (SCCLIS). The quality and quantity of data do not currently permit the lobster population to be assessed at a greater level of detail.

In the Gulf of Maine, the average annual 1995-97 fishing mortality rates were 0.74 (49% annual exploitation rate) for females and 0.59 (42%) for males, with 80% confidence intervals of 0.54-0.88 and 0.30-0.70 respectively. In the George's Bank and South stock, the average annual 1995-97 fishing mortality rates were 0.41 (31% annual exploitation rate) for females and 0.63 (44%) for males, with 80% confidence intervals of 0.32-0.46 and 0.59-0.69, respectively. In the SCCLIS stock, average 1995-97 fishing mortality rates were estimated from fall landings and survey data were 1.41 for males (71%) and 1.25 for females (67%) with 80% confidence intervals of 1.2-1.5 and 1.07-1.37, respectively. These fishing mortality rates were much higher than the average 1995-97 fishing mortality rates in the other two assessment areas.

III. Status of the Fishery

Harvests of American lobster peaked in 1999 at 39,654 metric tons. The significance of this increase in harvest is most easily illustrated by comparing 1999 landings to that of the period between 1978-1987 (15-20,000 mt). Landings have continued to increase over time, with small decreases occurring in 1992, 1998, 2000, and 2001. Maine and Massachusetts account for 85% of the 2001 commercial landings, 68% and 17% respectively. The magnitude of recreational landings is unknown. In contrast to the 1990s, when all stock areas experienced increases in landings, the status of the fishery now varies dramatically by area.

During the fall and winter of 1999-2000, the lobster resource in western Long Island Sound suffered mass mortalities, the cause of which is still under investigation. Following requests from the Governors of NY and CT, the U.S. Secretary of Commerce, on January 26, 2000, declared the Long Island Sound die-off to be a commercial fishery failure. Following the declaration, the U.S. Congress appropriated $13.9 million to address the biological and economic consequences of the fishery failure. These funds were distributed

with $7.3 million to provide economic relief funds for impacted NY and CT lobstermen, and $6.6 million in research funds for a comprehensive research into the possible cause(s) of poor lobster health in LIS.

Lobster stocks in Lobster Conservation Management Area 2 have been facing steady declines since 2001. Survey indices and landings have been declining and the incidence of shell disease has been increasing. The Lobster Management Board has taken Emergency Action to accelerate planned gauge increases in Area 2. The Plan Development Team, Technical Committee, Socio-economic Subcommittee, and the LCMT in Area 2 are exploring various management programs to address this decline.

Table 1. Total commercial landings in metric tons. (Based on NMFS landings data as of 8/11/03)

Year	Metric tons	Pounds	$
1990	28,297	62,383,125	154,757,113
1991	29,073	64,093,998	166,014,347
1992	25,978	57,270,826	166,371,185
1993	26,290	57,958,940	160,260,573
1994	31,720	69,930,711	207,161,675
1995	31,742	69,978,238	214,465,158
1996	32,346	71,310,316	241,785,034
1997	37,455	82,572,804	271,573,416
1998	36,330	80,092,672	255,103,096
1999	40,442	89,158,577	329,500,980
2000	39,429	86,926,003	314,255,145
2001	32,481	71,609,391	251,220,398

Table 2. Landings of American Lobster by the states of Maine through New Jersey from 1990-2001 (pounds). (Source, NMFS Commercial Fisheries Statistics Web Page as of 8/11/03; 2002 values are preliminary and collected directly from state representatives when available)

Year	Maine	Massachusetts	Rhode Island	New York	Connecticut	New Hampshire	New Jersey
1990	28,068,238	17,054,434	7,258,175	3,431,111	2,645,800	1,658,200	2,198,867
1991	30,788,646	16,528,168	7,445,172	3,128,246	2,674,000	1,802,035	1,673,031
1992	26,830,448	15,823,077	6,763,087	2,651,067	2,439,600	1,529,292	1,213,255
1993	29,926,464	14,336,032	6,228,470	2,667,107	2,177,022	1,693,347	906,498
1994	38,948,867	16,100,264	6,474,399	3,954,634	2,212,000	1,650,751	581,396
1995	37,208,324	15,771,981	5,363,810	6,653,781	2,536,177	1,834,794	606,016
1996	36,083,443	15,330,377	5,296,110	9,408,689	2,888,683	1,632,829	640,207
1997	47,023,271	15,092,014	5,801,183	8,878,395	3,468,051	1,414,368	858,426
1998	47,036,836	13,278,726	5,618,440	8,525,590	3,715,316	1,194,653	721,811
1999	53,494,418	15,533,953	6,410,125	7,062,687	2,595,764	1,380,714	935,837
2000	57,215,406	15,802,888	6,921,573	2,991,331	1,393,565	1,709,746	891,183
2001	48,617,693	12,132,807	4,809,158	2,052,741	1,329,707	2,027,725	579,753
2002*	61,700,000	13,373,809	3,752,212	1,820,000	954,000	No info provided	No info provided

* 2002 values are preliminary

IV. Status of Assessment Advice

During the 1990s, the fact that lobster stock abundance either remained stable or increased despite high and, in some cases, increasing fishing mortality rates, led to a great deal of speculation concerning the resiliency of the lobster resource to high exploitation rates. Recent declines in lobster stocks in Area 6 and Area 2 have confused the situation even more because the relative importance of high fishing mortality rates compared to lobster health issues is not known.

The high priority recommendations for improvements in assessment methodology that were first made by

the PRT in 2001 have taken on new importance based on the need to develop management strategies that will rebuild depleted stocks. They include:

- Develop a database to calculate lobster landings by area caught, time period, sex, and length in a timely and efficient manner; (ASMFC is currently developing this database)
- Evaluation of additional stock assessment models and analyses that could provide the basis for alternative biological reference points for lobsters that would complement the current F10% maximum egg production per recruit reference point, and account for prevailing spawning stock size, total egg production, or recruitment; (ongoing work by the modeling subcommittee)
- Development of a yield per recruit analysis for male lobsters; (LobSense is an egg-per-recruit model, which provides yield-per-recruit analysis for both male and female lobsters but has not yet been reviewed by the lobster technical committee's)
- Analysis of biological risk and economic costs and benefits associated with different management policies that rely on stock assessment models and reference points; (SIMLOB is a bio-economic fishery simulation model which looks at economic costs and benefits associated with different management policies but has not yet been reviewed by the various lobster technical committees)
- Expanded use of annual trawl survey data for juvenile lobsters and development of surveys to monitor annual changes in abundance of pre-recruits and predict the effects of variable recruitment on stock abundance; and
- Expanded data collection efforts throughout the range of the resource to determine the spatial distribution of fishing effort and changes to the distribution of effort over time.

V. Status of Research and Monitoring

Prioritized Research Needs 2003

HIGH PRIORITY

- Initiate studies of life history events (molting, extrusion, mortality, etc.) in older/larger lobsters on a regular basis.
- Monitor the condition of the stocks and determine the effects of management measures and environmental changes on the abundance of the stocks and on the fisheries. (Currently monitored in part by annual survey trend reports by the Technical Committee.)
- Resolve the question of stock identification, particularly as related to inshore/offshore components south of Georges Bank. Appropriate genetic studies are highly recommended and a compilation and analysis of existing tagging data should be undertaken prior to any new tagging studies. (Bruce Estrella complied tagging studies in the early 1990s. The Technical Committee concluded that this compilation was fruitless because many databases were lost and the lack of consistent information across studies made it difficult for comparisons. See Note in References Section concerning work being conducted by the NEFSC. Susan Little, masters student at UNH, compiled a generalized review of movements and has been working with the AOLA to collect maturity and fecundity information. Kathy Castro at URI has tag recapture data that may be useful.)
- Yield-per-recruit analyses should be conducted for males.
- Include process error in growth, reproduction, etc; and evaluate effects of assumptions of maximum intermolt periods, maximum size and the partitioning of natural mortality in the egg production per recruit model. Obtain information on molting frequency and lobster growth, mortality, and recruitment among years and geographical areas. (Estrella/Massachusetts has an ongoing hatchery study on this topic.)
- Quantify changes in the spatial distribution of effort.
- Enhanced sea sampling and/or port sampling of offshore catches is urgently needed for biological

characteristics of catches and landings since current sampling in these areas is considered inadequate for assessment purposes. (See Note Reference Section concerning work being conducted by the NEFSC. ME, NH, and MA have been in discussions looking for common data elements, shell disease scoring has been added to all sea sampling protocols)

- Methods should be developed to derive standardized catch-per-unit-effort indices which include trap attributes, season, soak time, etc. Sea sampling should be modified to include collection of potentially important variables.
- Estimates of biological reference points for the Gulf of Maine stock are partly influenced by the assumed level of v-notching undertaken by area fishermen. No adequate estimate of the proportion of compliance with this voluntary measure now exists. A credible study of this issue is recommended to reduce uncertainty in estimation of biological reference points. (See Note in Reference Section concerning ongoing work. A v-notching model used by the TC does a credible investigation of observed percentages and V-notching rate)
- Analyze effects of different spatial combinations of survey stations in the Delury model.
- Develop area-specific data on effort and LPUE (Forthcoming with ACCSP logbook.)

MEDIUM PRIORITY

- Examine effects of measurement errors and define acceptable levels of risk in the egg production per recruit model. (Chen and Wilson 2001)
- Develop a monitoring plan to detect recruitment decline (Settlement surveys are conducted in ME, NH, MA and RI.)
- The inclusion of multiple survey indices in DeLury population models could potentially be useful in refining estimates of stock size and F, and should be explored. (A preliminary version of the DeLury model with multiple indices has been developed, but was not available for SAW-22).
- Predictions of EPR models should be validated with respect to data from fishery-dependent and fishery-independent sources including: length frequency distribution of catch, projected growth trajectory, and size-specific sex ratios, fraction egg bearing, fraction soft shell, and fraction V-notched.
- Explore alternatives to timing of events in the EPR model. Investigate geographic and seasonal patterns of growth, reproductive events, and fishing intensity from catch and sea sampling data. Standardize methods of sampling and statistical analysis are needed to determine these patterns.
- Obtain information on natural mortality rates. The effects of alternative partitioning of natural mortality (M) between hardshell and softshell should be investigated, and attempts should be made to estimate rates from field or laboratory data (Crecco et al 2003).
- Examine the sensitivity of F (10%) to input parameters in the egg production per recruit model. Specific information for micro-area is needed. (Chen and Wilson 2001)
- Additional analyses of biological attributes of the catch and survey data are needed to corroborate patterns and trends in F estimates.
- Examine temperature effects on growth, reproduction, etc. (Many lab studies have been done, but have not been related to the EPR model in the form of an environmental component.)
- Conduct spatial mapping of survey indices and projected egg production.
- More precise and accurate DeLury model estimates of stock size and fishing mortality rates can be made if the relative selectivity of pre-recruit and fully recruited sizes to the bottom trawl survey gear is resolved. Appropriate field studies of lobster availability and R/V gear selectivity are considered a priority.
- Develop standardized LPUE-index fishers.
- Investigate the effects of spatial distribution/movements/selectivity in the Delury model.
- Examine trap effects on catch.
- Undertake regional examination of temperature-yield relationship. (Estrella, Bruce, and Steven

Cadrin. 1991. Massachusetts coastal commercial lobster trap sampling program, 1990 Annual Report. 52 pp.; Fogarty, Michael J. 1988. Time series models of Maine lobster fishery: Effects of temperature. Canadian Journal of Fisheries and Aquatic Sciences, Volume 45, 1145-1153.)

- Examine temperature, effort, and abundance effects on catch.
- Use comparative evaluations of reproductive rates with respect to temperature.
- Terminology for lobster life stages need to be defined and standardized for each state's sampling programs in order to ensure comparability and synthesis of available data. (The TC now uses similar size classes for all comparisons)
- Examine fixed and random sampling.
- Include multiple input series in modeling for lobster.
- Compare fishery-dependent and fishery-independent length frequencies. (Completed through stock assessment process but no formal document. (in press. Schierer, Wilson and Chen. Comparison of port and sea sampling)
- Develop a time series of standardized fishing effort and compare with F.

LOW PRIORITY

- Compile existing tagging data-transfer rates.
- Compile existing larval data - transfer rates.
- Examine spatial differences in F (10%) in the egg production per recruit model.
- Evaluate potential biases in the Delury analysis due to incomplete coverage in different substrates.
- Assess the utility of satellite DNA and apply throughout range, if promising. Genetic identity of LIS population should be examined. (Dr. Irv Kornfield, University of Maine, paper in press/process for LIS data; papers on utility of satellite DNA should be out. See Note in Reference Section.)
- Conduct cooperative studies with fishers on gear efficiency.
- Obtain information on operational and socioeconomic data for the commercial fisheries.
- Undertake sensitivity analyses in the DeLury model.
- Develop models with enhanced size/stage structure.
- Test the thermal limit hypothesis. (Annis, PHD candidate Univ. of Maine, looking at larval diving in response to temperature)
- Examine effects of predation, regime shifts, etc. (Wendy Norton, MS student UCONN, looking at predation on post larvae)
- Establish field studies of density-dependent processes. (Bob Steneck in progress.)
- Combined analyses of inshore and offshore southern stocks produced intermediate results, and were sensitive to the research vessel series (Rhode Island inshore or NEFSC offshore) used for DeLury modeling. Quantitative methods for combining stock status and reference points to multiple stock areas are necessary for providing region-wide assessment advice for the American lobster resource through its range.
- Investigate spatial differences in demography of American lobster**.**

VI. 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 3.

Table 3. 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

- 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 on 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 also established seven Lobster Conservation Management Teams (LCMTs), each of which coincides with a management area. The Commission has approved three addenda for the purposes of incorporating LCMT recommendations for full implementation of Amendment 3. Addendum I incorporated measures from the LCMT proposals, which were intended to control effort. Addenda II and III were designed to address management measures affecting egg production. The measures included in Addenda I, II, and III supercede measures addressing similar issues under Amendment 3 and are summarized in Tables 4 below.

Table 4: Area specific management measures

Management Measure	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	OCC
Trap Limits/Numbers	Trap Cap (800)	Trap Cap(800)	Hist. Part.	Hist. Part.	Hist. Part.	Hist. Part.	Trap Cap -800 (25% Reduction by 2008)
Gauge Size (2001)	3-1/4"	3-9/32"	3-9/32"	3-1/4"	3-1/4"	3-1/4"	3-9/32"
Gauge Size (2002)	3-1/4"	3-5/16"	3-5/16"	3-5/16"	3-5/16"	3-1/4"	3-5/16"
Gauge Size (2003)	3-1/4"	3-11/32" 3-3/8"	3-11/32"	3-11/32"	3-11/32"	3-1/4"	3-11/32"
Gauge Size (2004)	3-1/4"		3-3/8"	3-3/8"	3-3/8"	*3-9/32"	3-3/8"
Gauge Size (2005)	3-1/4"		*3-13/32"			*3-5/16"	*3-13/32"
Gauge Size (2006)	3-1/4"		*3-7/16"				*3-7/16"
Gauge Size (2007)	3-1/4"		*3-15/32"				*3-15/32"
Gauge Size (2008)	3-1/4"		*3-1/2"				*3-1/2"
Escape Vent Size	*2 X 5-3/4 " (2007)	2 X 5-3/4 " (2003)	2 X 5-3/4 " (2003)	2 X 5-3/4 " (2003)	2 X 5-3/4 " (2003)	2 X 5-3/4 " (2003)	2 X 5-3/4 " (2003)
V-notch Definition	Zero Tolerance	ASMFC	ASMFC	ASMFC	ASMFC	ASMFC	ASMFC
Mandatory V-Notching	Mandatory		Mandatory Above 42° 30'				
Maximum Size	5"			5-1/4"*	5-1/2"*		

NOTE * - If necessary provisions (please see FMP, Amendment, and Addendum for details)

Issues:

There is ongoing concern about the health of the lobster resource in Area 6 and Area 2. The Lobster Management Board passed an Emergency Rule in February 2003 accelerating the gauge increases in Area 2 by one year to address stock declines in Area 2. Various subcommittees have been working on several management issues including the most restrictive rule and transferability. The transferability

subcommittee produced a list of components that should be included in all transferability proposals from LCMT's. The most restrictive rule subcommittee developed a proposal to change the interpretation of the most restrictive rule to address an unintended consequence of implementing history based allocation systems in some areas.

VII. Current State-by-State Implementation per Compliance Requirements (As of August 2003)

Most states are currently in compliance with all required measures under Amendment #3, Addendum I, Addendum II, and Addendum III. Massachusetts still needs to implement the Outer Cape Cod management program and has indicated they will do so in 2004 after exploring an alternative program through public hearings. Many states still need to implement various aspects of the most restrictive rule and have indicated they will do so by March 1, 2004.

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. The information collected under the ACCSP program will play an integral role in area management and the PRT encourages the full implementation of data collection programs to enhance the ACCSP data collection. The PRT recommends that states implement logbook programs to collect data that may not be collected through the Atlantic Coastal Cooperative Statistics Program.
2. The PRT is concerned about the ability of the lobster management program to respond to changing stock conditions and believe this issue should be explored further.
3. The PRT believes the ability to judge the success or failure of management measures on management area vs. stock unit basis is critical and recommends that the TC explore this further.
4. The PRT recommends a central database and standardized format for collecting all trap tag information. This would give the lobster program the ability to identify traps by management area and state. There would be administrative, enforcement and technical benefits to having this information compiled in one location.