2006 Lobster Research
Report to the Joint Standing Committee on Marine Resources

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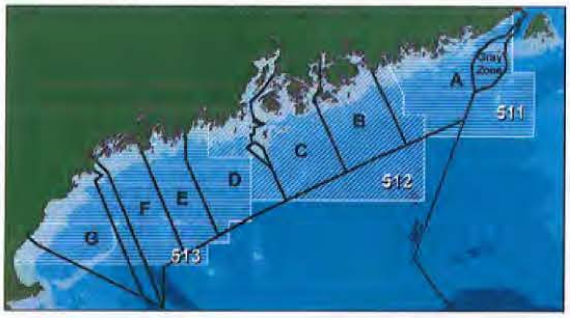

Summary

The DMR is responsible for the development and continuation of reliable scientific information for the use in management decisions regarding the lobster fishery. To accomplish this goal the DMR relies on monitoring programs first established in 1967 and more recent programs established in the 1980s, 1990s and as recently as 2006. Landings in 2005 were 67.4 million pounds valued at $311.5 million pounds. In 2006, two fishery-dependent and three fishery-independent programs were used to evaluate the lobster population and associated fishery. These programs amassed the most comprehensive data collection effort to date by the DMR and collaborating institutions in Maine. The lobster resource and associated fishery landings remained near historical high levels in 2006, but a decline in price paid to harvesters highlighted the expectation and need of the fishery for future landings to be above historical averages. The DMR is working closely with the University of Maine and the Bigelow Laboratory for Ocean Sciences and the lobster fishery to develop new tools that will increase the capacity of the DMR to systematically analyze the effects of conservation and management options.

Five-year research plan

Systematic monitoring of the lobster resource begins with repetitive long-term sampling programs. These programs must be based on a statistical design that can differentiate the real and apparent trends and that are logistically feasible to conduct. In addition, a balanced approach must be taken to recognize the biases in each survey.

In the next five years the DMR will continue to monitor the lobster fishery with established fishery dependent programs (port and sea sampling). Anticipated development of trip level reporting by lobster dealers and harvesters, administered by the DMR landings program, will greatly increase the information available to characterize the fishery. Fishery independent programs have been formalized with the adoption of a lobster settlement dive survey, an inshore trawl survey and the establishment of a Regional Ventless Trap Program. These programs will be used to form the basis of predictive models and assessment tools that will help mangers understand the effects of proposed management measures. An independent review of all DMR lobster programs will be performed to objectively evaluate the sampling design and importance providing comprehensive guidance on the American lobster resource and associated fishery.

2006 Accomplishments

Port Sampling

The commercial port-sampling program began in 1967 as Maine's first comprehensive survey of the lobster fishery. The program remains largely the same in our 39th consecutive year. The objective of the port-sampling program is to survey the commercial fishery through probability sampling, a multistage sampling plan with stratification allowing estimates of total catch and effort. Lobster buyers that have five or more boats fishing are added to a continuously updated dealer database. The port samplers randomly draw ten dealers a month from this list. All lobstermen who deliver their catches on sample-days are interviewed for catch and effort information. In addition, we randomly select a cluster sample of 10 lobsters per boat for biological data (Thomas, 1973).

Highlights of the 2006 sampling season:

- Landings were estimated to be 54.2 million pounds for 2006, a statewide decline of 15% from the estimated peak in 2003 (Figure 1).
- A total of 90 dealer locations were randomly selected. We received information at 62 dealers or 75% of those drawn.
- The port sampling crew collected lobster catch/effort data and biological information from 544 boats (8 fewer boats than sampled in 2005) landing lobster from Kittery to Eastport, Maine.
- The total catch sampled weighed approximately 51.4 tons and consisted of 102,780 lobsters with a landed value of $520,424.
- The price in 2006 was much lower than 2005, the average price for lobsters was $5.53 for hard, $3.75 for soft, and $4.91 for select. In 2005, the average price for lobsters was $5.67 for hard, $4.28 for soft, and $5.45 for select. The average hard-shell price fell $0.14 from 2005 to 2006, soft-shell price fell $0.53 and selects price fell $0.54.
- During interviews most fishermen were very unhappy with the price in 2006, many claiming a very poor season economically, but poundage was consistent.
- Nearly 88% of lobsters were landed in the first molt group, the highest level since 1991(89.25%). This value has varied from a low of 70% in 1973 to a high of 90.1% in 1989, with an average of 81.62%.

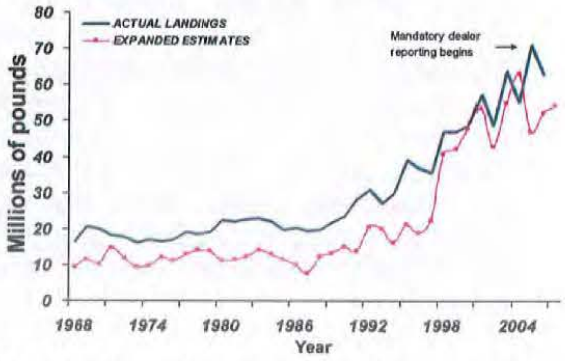

Figure 1. Reported landings and expanded estimates of landings based on the Port Sampling program. It is estimated that landings were

underestimated by 30% during the period of 1996 through 2003.

Sea Sampling

The DMR sea sampling program began collecting at-sea catch/effort and biological information on legal and discarded lobsters from the near shore Maine lobster fishery in 1985. The sea sampling program was initiated at the request of industry, managers and scientists to gain insight into the discarded portion of the lobster population. Over the years, the program has expanded to become the largest at-sea sampling program for lobster in the northeast. An integral component of lobster management conservation strategy is based on the v-notching program to protect reproductive females. Sea sampling is our only opportunity to monitor V-notching in the Maine lobster fishery. Time-series of catch rates and biological data have been used in numerous investigations of width/length relationships, fecundity, size-at-maturity, sex ratio, geographic variation, growth, V-notch composition, and selectivity. Data from the sea sampling program contribute directly to the ASMFC American lobster stock assessment.

From 1985 through 1997, three ports (Cape Porpoise, Boothbay Harbor and Tenants Harbor) were sampled once a month with the same fishermen May through November. In 1998, the program expanded, increasing participation and sampling areas to include all seven Maine Lobster Management Zones (LMZ) May through November. Since 1999, the program has become a standardized quota-based design where three sampling trips are scheduled to be completed for each management zone (A-G) from May through November. During the winter of 2005-06, the program piloted a modified winter sampling design comprised of three sampling trips in each of the three statistical areas along the coast of Maine. The study area is primarily defined by the Maine territorial sea and nearshore Federal waters where the majority of annual landings are caught.

Highlights of the 2006 sampling season:

- A total of 150 at sea sampling trips were completed for the sampling season.
- The combined catch per trap haul for all zones in 2006 of legal lobsters was below the 1998-2006 monthly average for all months except July and October (Figure 2).
- The catch rates of oversize lobsters were above the monthly average in all months except June and July while the catch rates of illegal lobsters was similar to the 9 year average.
- Catch rates of sublegal lobsters were similar to the 1998-2006 average.
- When analyzed by zone, the average catch rate of legal lobsters in 2006 was similar to the 5 year (2001-2006) average catch rate except in Zone B where the 2006 catch rate was higher than the 5 year average (Figure 3).
- In the western region and most eastern extreme of the state (Zones D-G and Zone A), the

catch rate of sublegals in 2006 was similar to the 5 year average while Zones B and C sublegal catch rates were higher than average.

- The 5 year average catch rates of oversize lobsters largely decreased from east to west (A to G) with a peak in Zone C, and, in 2006, the decreasing trend was observed without the peak in Zone C and there were more oversize lobsters than the 5 year average (except Zone C).
- The average of sublegal lobster across all zones and months during the 2006 sampling season was 1.62 trap haul^{-1}(averaged by month and zone, Table 4). Zone E had the highest catch rate of sublegal lobster at 2.09 trap haul^{-1} and Zone A had the lowest at 1.06 trap haul^{-1}.
- The percentage of females with a V-notch has varied over time, with legal sized lobsters with a v-notch have dropped from an average of 44.6% before 1991 to an average of 32.1% since 2001
- The percentage of sublegals with eggs increased from 0.6% between 1985 and 1991 to 2.0% after 2001. This trend could be explained by the increase in minimum size in 1989 allowing more sublegal females to reproduce.
- The average percentage of measured females that were both berried and had a v-notch or natural mutilation was 67.5%.

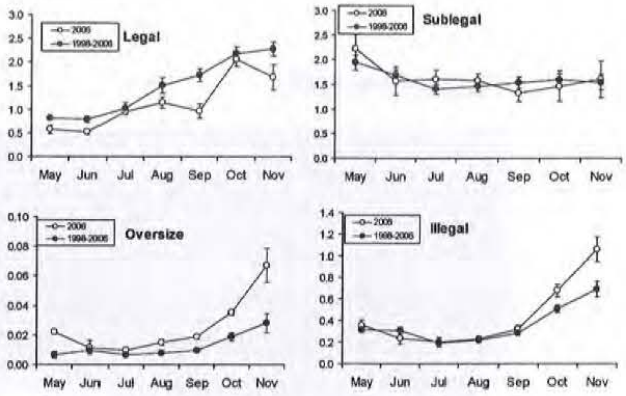

Figure 2. Catch per trap of legal, sublegal, oversize and illegal lobster for the 2006 sampling season and the monthly averages for the 1998-2006 sampling seasons.

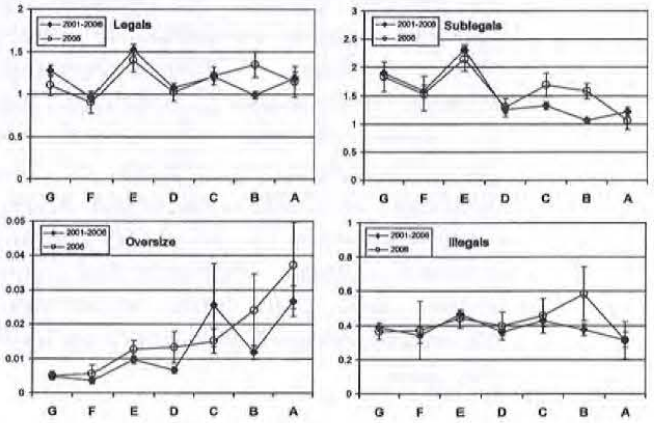

Figure 3. Catch per trap of legal, sublegal, oversize and illegal lobster for the 2006 sampling season compared to the zone (west to east) averages for May-November 2001-2006 sampling seasons.

Settlement Index

Researchers from the University of Maine and Bigelow Laboratory for Ocean Sciences have identified critical life history phases for lobsters and effective survey methods to monitor them. Using fishery-independent surveys, researchers and the DMR hope to track juvenile populations and generate predictive models of future landings. In 2000 settlement surveys were expanded to cover all seven of Maine's lobster management zones (LMZs A-G) in order to create a statewide index of settlement to further this goal.

In previous years DMR has contracted with The University of Maine and Bigelow Labs to conduct the field work and some of the analysis for this survey. Beginning in 2001 the DMR began to build capacity to conduct dive surveys independently and with each successive year DMR took on more responsibility for conducting the in-water portion of the monitoring program (2003/2004 provided lead diver for LMZ A-D, 2005 all dive services for LMZ A-D and assisted with LMZ E-G). The 2006 survey was conducted entirely by DMR staff and divers. 40 fixed sites statewide were surveyed with a minimum of 4 sites per LMZ (fig 1.). Researchers at Bigelow Labs will continue to assist in analysis and dissemination of results. Having a single agency conducting all survey work will assist with consistency of sampling and has reduced overall costs.

Highlights of the 2006 sampling season:

- Settlement for LMZs A, B, C, D and G were higher than the seven year average within each zone.
- LMZs E and F were slightly below their seven year average.
- The pattern of higher settlement in the western portion of the state was not as pronounced in 2006 as many of sites in the east (LMZ B, C, and D) were at similar levels to that of the west.
- Mid-coast (Zone E) settlement has been tracked since 1989. 2006 was the first year below median levels (1.1 per m^2) since 2001 (Figure 5).

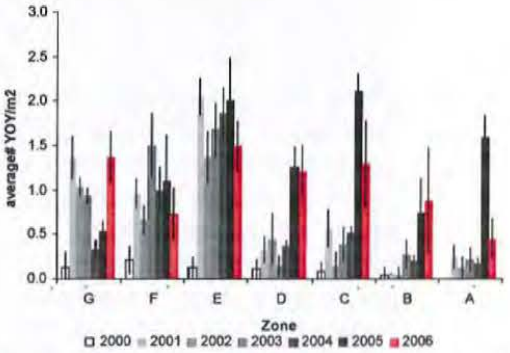

Figure 4. The average settlement density of juvenile lobster, 2000-2006, by Lobster Management Zone. Zones are displayed west to east.

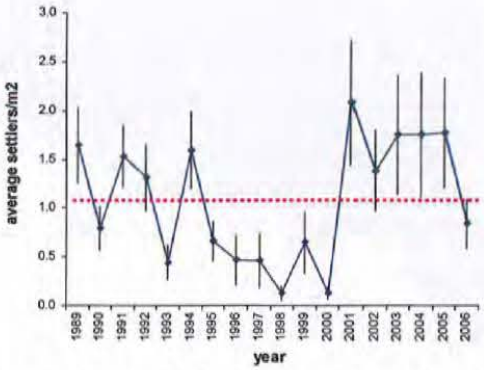

Figure 5. Time series of mid-coast settlement (Zone E) from 1989-2006 maintained by, Dr. Richard Wahle, Bigelow Laboratory for Ocean Sciences. The time series average (1.08/m^2) is represented by the red broken line.

Inshore Trawl Survey

Initiated in the Fall of 2000, the Maine/NH Inshore Groundfish Survey is a stratified random trawl survey distributed between five regions and four depth strata. The survey is conducted in the Fall and Spring of each year. This is a multi-species survey, where lobster is one of several dominant species caught in the trawls.

Highlights of the 2006 sampling season:

- 85 tows completed out of the desired 115 this fall.
- Lobsters were encountered in 80 out of 85 tows.
- Zone A had the lowest success rate with only 8 out of 23 tows completed.
- The stratified mean number per tow for Fall 2006 equaled the time series median of 114.0 (Figure 6).

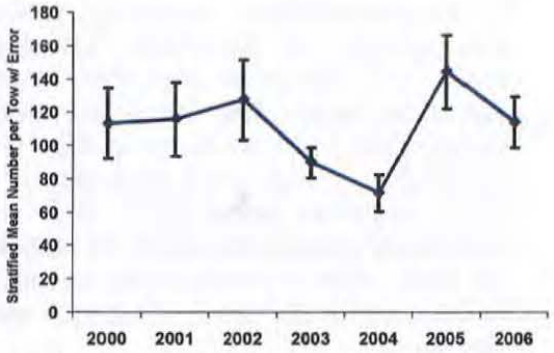

Figure 6. Stratified mean number per tow of lobster caught in the Fall trawl survey, 2000-2006.

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.

Maine's Department of Marine Resources (DMR) commenced this cooperative random stratified ventless trap survey in June 2006 based on a regional sampling design developed cooperatively by New England coastal states from Maine to New York. This survey differs from previous ventless

projects as traps are placed at randomly chosen locations and depths.

A random-stratified sampling design was applied to nearshore statistical areas from Maine to New York. Each statistical area was assigned three depth strata (1 to 20 m, 21 to 40m and 41 to 60m). In Maine coastal waters, the three statistical areas (511, 512 and 513) were divided into eight (8) stations for each depth of three strata, resulting in 24 stations for each statistical area (Figure 1).

Highlights of the 2006 sampling season:

- A total of 72 stations were randomly selected, and visited twice monthly during June, July and August (Figure 7).
- Catch rates were significantly higher in ventless traps, than standard traps with vents, due to the higher retention of sublegal lobster by ventless traps (Figure 8).
- Catch rates were higher in eastern Maine than in western Maine, which is contrary to prior published results.
- Results indicate no difference in catch rates by depth strata.
- Trap selectivity may be limiting catches below 65 mm. This issue will be addressed by undertaking dive surveys in the following survey to determine a "true" picture of the lobster population traps are sampling from.
- In the future results from Maine will be compared to parallel surveys in Massachusetts, Rhode Island and New York.

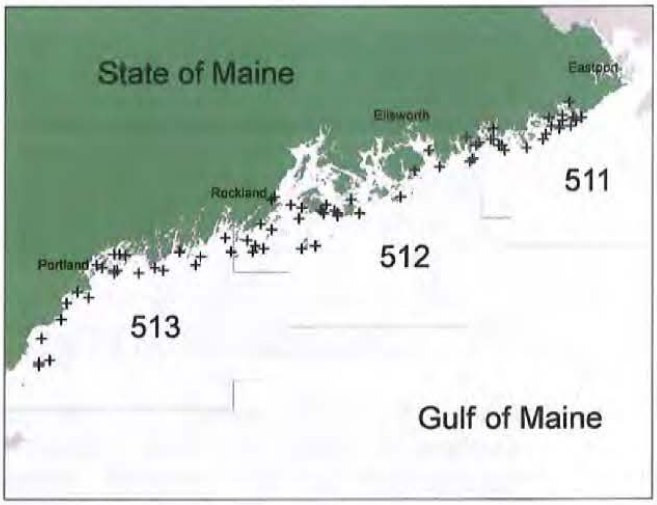

Figure 7. Randomly selected sampling stations for the 2006 ventless trap survey. At each station, six traps were deployed (three vented and three ventless) and visited twice monthly from June through August.

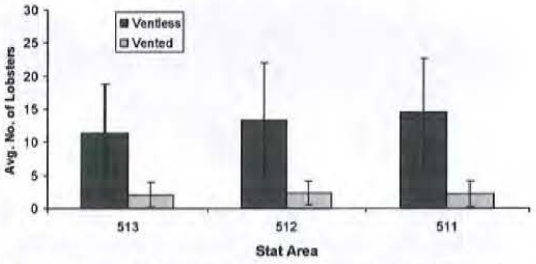

Figure 8. Average catch per trap haul of lobsters in ventless and vented traps in the three nearshore statistical areas of maine during June through August 2006.

Yearly Gross Budget

Lobster sampling programs are supported by a variety of state (OSR accounts) and federal sources (NOAA). In many cases, such as the inshore trawl and settlement surveys, resources are shared as staff are assigned to multiple projects. Lead project staff are generally supported by OSR accounts, while projects operating costs are funded through federal sources.

Table 1. Estimated costs for lobster monitoring programs.

Project	Annual Budget	Staffing Requirement	Source of Funding
Port Sampling	$65,000	MR Specialist II, seasonal field tech	OSR Accounts, Federal (NOAA)
Sea Sampling	$175,000	MR Scientist I, Specialist I, 5-6 field technicians	Federal (NOAA)
Settlement Survey	$25,000	MR Scientist I (partial), 3 field tech	OSR Accounts, Federal (NOAA)
Inshore trawl Survey	$450,000	MR Scientist II and I	Federal (NOAA)
Ventless Trap Survey	$350,000	MR Scientist I, 2 seasonal field tech	Federal (NOAA)
Total	**$1,065,000**		