

**JOINT
FISHERMEN AND SCIENTISTS
RESEARCH SOCIETY -
GULF OF MAINE LOBSTER FOUNDATION
LOBSTER SCIENCE WORKSHOP**

February 15, 2007
Best Western Glengarry Hotel, Truro, NS



This report contains excerpts from the complete workshop document. To obtain a copy of the complete workshop document contact Patty King, FSRS General Manager, at 902-876-1160 or by e-mail at pmdservices@eastlink.ca or access it on the web at www.fsrns.ca.

Workshop Coordinators/Chairs:

Patty King (PMD Services) FSRS General Manager
Erin Pelletier, Gulf of Maine Lobster Foundation

Report compiled by:

Christine MacKenzie, PMD Services Project Manager

Report edited by:

Christine MacKenzie, PMD Services Project Manager
Patty King (PMD Services) FSRS General Manager

Disclaimer

The discussions following the presentations and the breakout group discussions are presented as recorded and interpreted in the rapporteurs notes. The remarks were not confirmed with or edited by the participants. While every effort was made to ensure accuracy, it is possible that errors or misinterpretations may have occurred.

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1.0 Introduction

The Fishermen and Scientists Research Society (FSRS) and Gulf of Maine Lobster Foundation (GOMLF) held their third **Joint FSRS - GOMLF Lobster Science Workshop** on February 15, 2007 at the Best Western Glengarry Hotel in Truro, NS. The workshop built on the success of the workshops held in February 2003 and 2005 as part of the annual cross-boarder exchange. In 2004 and 2006 a lobster workshop was held as part of the Maine Fishermen's Forum.

The objective of the Lobster Science Workshop was to explore the relationship of various lobster recruitment and ventless trap projects and the advantages of the different methodologies. The Fishermen and Scientists Research Society (FSRS) Lobster Recruitment Project and the Gulf of Maine Lobster Foundation (GOMLF) Ventless Trap Survey rely on the efforts of volunteer fishermen. This differs from projects such as the New England Regional and Massachusetts Bay Ventless Trap Surveys which use a highly controlled survey design and provide compensation to fishermen who participate. This workshop explored the relationship of these projects and the advantages of the different methodologies. The workshop also continued the cross-border information sharing and collaboration initiated through previous workshops.

The workshop began with presentations on the various projects, including the FSRS Lobster Recruitment Project, GOMLF Ventless Trap Survey, Random Stratified Ventless Trap Survey in Massachusetts Bay, and Regional Ventless Trap Surveys. A presentation was also give on Using Artificial Collectors To Evaluate Post Larval Lobster Settlement and New England Lobster Settlement Index Project Update.

These presentations gave participants a good foundation for their breakout group discussions on the advantages of the different methodologies used for the various projects. The breakout groups were given a specific question to respond to - What are the advantages and disadvantages of the methodology of each of the projects and what recommendations, if any, would you make for the project? The following report summarizes the presentations and discussions, as well as the results of the breakout group discussions presented in plenary.

1.1 Agenda

Time	Topic	Speaker
12:00 - 1:00	Registration	
1:00 - 1:20	Opening Remarks/Workshop Objectives	Patty King, FSRS Erin Pelletier, GOMLF
1:20 - 2:00	FSRS Lobster Recruitment Project and GOMLF Ventless Trap Survey – Project Overview and Results	Carl MacDonald, FSRS Sara Ellis, GOMLF
2:00 - 2:30	Random Stratified Ventless Trap Survey in Massachusetts Bay	Tracy Pugh, Massachusetts Division of Marine Fisheries
2:30 - 3:00	Using Artificial Collectors To Evaluate Post Larval Lobster Settlement and New England Lobster Settlement Index Project Update	Rick Wahle, Bigelow Laboratory for Ocean Sciences
3:00 - 3:15	Coffee Break	
3:15 – 3:45	Regional Ventless Trap Surveys	Carl Wilson, Maine DMR
3:45 - 4:30	Breakout Groups	
4:30 - 5:15	Plenary Sessions – Review Results of Breakout Groups, Conclusions and Recommendations	Chairs – Patty King, FSRS and Erin Pelletier, GOMLF
5:15 - 5:30	Closing Remarks	Patty King, FSRS Erin Pelletier, GOMLF
5:30 – 6:30	Reception	

2.0 Presentations

2.1 Lobster Recruitment Index from Standard Traps

By Carl MacDonald, Fishermen and Scientists Research Society

2.1.1 Summary

Written by Alain d'Entremont, FSRS Fisheries Technician

The FSRS Recruitment Trap project began in 1999 and was initially scheduled to continue for five years. Following a review of the usefulness of the project it was decided that the project should continue for the foreseeable future.

The goal of the project is to have an indicator that shows how many lobsters would be expected to grow into the fishery in the following years. To achieve this, volunteer fishermen fish a specified number of standardized recruitment traps during the regular lobster season. The standardized trap dimensions are 14" by 40" by 21". These traps are constructed out of one-inch wire mesh and they do not contain escape vents. The difference is that these recruitment traps must be fished in fixed locations during the entire season. This year these fishermen are fishing throughout nine different Lobster Fishing Areas (LFAs 27-35) along the coast of Nova Scotia.

Fishermen are required to collect data on the size and sex for each lobster caught in their recruitment traps. To get the size data, fishermen use a measuring device provided by the FSRS that identifies 15 different size groupings. USA lobster fishermen also participate in this recruitment study and are using this same gauge. The original gauge had eight groupings and has been modified to add more larger and smaller groupings since the fall of 2003. Fishermen are permitted to keep and sell the legal size lobsters that they catch in their recruitment traps to offset their cost of purchasing the traps and doing the scientific data collection.

The project also involves bottom water temperature monitoring. Each participant is provided with a minilog temperature gauge that they place in one of their recruitment traps. This data is archived at the Bedford Institute of Oceanography's (BIO) Department of Oceanography and provides a large amount of data to the coastal temperature monitoring project. The data is available at <http://www.mar.dfo-mpo.gc.ca/science/ocean/database/Doc2003/cts2003app.html>. To access the website data you have to go to this page first. Then get a password/user name e-mailed to you. Then click on Coastal Time series and enter your user name and password. Then you have all the data at you finger tips.

The sharing of data collected is controlled, with confidentiality being the most important part. Fishermen receive their own catch and temperature data, and if results are presented to others they are grouped together in groups of at least three fishermen in order to maintain their individual confidentiality. The raw data is available without names attached with a

written request and recently DFO lobster biologists have been using FSRS data in their stock assessments.

Interesting statistics for each LFA presented at the conference:

- In Fall 2005, in LFA 33 and 34 there were 100 fishermen fishing 248 recruitment traps. During this time there were 5,289 trap hauls with 25,326 lobsters measured.
- In LFA 33, 20% of trap hauls in the Fall were less than 5 fm. In the Spring, everything was under 15 fm.
- In LFA 34, 12% were less than 5 fm and there are traps over 50 fm, even over 90 fm.
- In the Fall results for LFA 33 there seems to have been a slight increase in sub-legal catches. Over the past 7 years of the recruitment study, 2001 saw the largest number of recruits just under the minimum legal size, with 2005 coming second.
- 2001 was also the highest year in the Fall results for LFA 34 with catches still very high overall.
- In spring 2005 there were 180 fishermen fishing 508 recruitment traps. There was 16,790 trap hauls and 59,169 lobsters measured.
- Throughout the LFAs most recruitment traps were fished in depths between 5 fm to 10 fm.
- LFA 27 has shown an increase in the 71-75 mm range that has translated to an increase over time in 81 to 90 mm lobsters. This is thought to be due to the measurement increase in the minimum legal size for this area from 70 mm to 76 mm.
- LFA 30 has been undergoing a pulse of recruitment in the sub-legal sizes over the past 3 years and this has been felt in the area with a larger increase in catches of legal lobsters in 2006.
- LFA 29, LFA 31A and LFA 31B have all shown big increases in recruitment over the past few years with landings of legal lobsters increasing 5 or 6 times what they were in previous years.
- LFA 32 shows a fairly constant recruitment level below 71 mm; there was a slight increase in the 71-80 mm and 81-90 mm group in 2005. In 2006 there was an increase in almost all legal size groupings. Recruitment in this LFA is higher in the east of the LFA compared to the west portion.
- LFA 33 in the Spring shows a constant level of recruitment for the past few years, although the data from 1999 was mostly collected in the western portion of the LFA where it is believed there are more little lobsters.
- LFA 34 in the spring shows 2002 as the big year for recruitment and a real low recruitment in 2004. Water temperatures recorded in 2004 were the coldest by a couple degrees. Although recruitment was down for a bit, it rebounded and was back up in 2006.
- Water temperature data collected in the Spring of 2006 indicated that it was for the most part a warmer than average Spring in every LFA.

The future direction of the project is to continue working with the Gulf of Maine Lobster Foundation and to compare data and share results via the FSRS Data Management Working

Group. The possible expansion of the project into out of season sampling and expanding the number of LFAs and participants was also put forward.

2.1.2 Discussion

Written by Alain d'Entremont, FSRS Fisheries Technician

Q: What was the void in the temperature graph from Cape Sable Island?

A: The temperature gauge was removed from the water with the trap.

Q: How is this year compared to last year temperature wise?

A: We haven't looked at enough data yet.

Q: Was there a change of measure in LFA 30 or 31? Why is there an increase in landings?

A: There was no change in the measure in LFA 30. We don't know why there was such an increase in recruitment.

Comment: There was a measurement change in LFA 27 in 2002. You should see a change four years after.

Q: Has anyone looked at a connection between water temperature and catchability?

A: Ross Claytor is looking into the temperature data. There has to be some effect when years are really cold or really warm.

Q: What effect did Hurricane Juan have on LFA 34?

A: It didn't have an effect because the hurricane didn't hit that area. There was an affect around Sambro, but not a big affect in 34. There is certainly some effect by storms.

2.2 GOMLF Ventless Trap Survey (VenTS)

By Sara Ellis, Gulf of Maine Lobster Foundation

2.2.1 Summary

Written by Kate Gardiner, FSRS Fisheries Technician

The Gulf of Maine Lobster Foundation (GOMLF), a non-profit research organization, in collaboration with industry, government and volunteer lobstermen from Maine, Massachusetts and New Hampshire, has been attempting to collect long-term population information through recruitment of sublegal lobsters in Maine, New Hampshire and Massachusetts. This Ventless Trap Survey (VenTS) originated in 2000 through the Maine Department of Marine Resources and the New England Aquarium, with the GOMLF taking over the work from 2002 to present. In 2003, VenTS became standardized with the FSRS ventless trap survey.

Initially, the ventless traps used for the study were non-standardized, with lobstermen covering the escape vents of their own traps to collect the small lobsters. In 2004, the GOMLF switched to standardized traps which met the FSRS specifications. Not only would these traps allow for standardized samples in the various locations, but would also allow the GOMLF to compare their results to those of the long-running FSRS ventless trap survey. Along with standardizing the ventless traps, the measuring gauge size groupings were also standardized to FSRS size increments, with the addition of smaller increments for legal sizes to increase accuracy.

The original project design had ventless traps along with regular commercial traps set at specific locations throughout the year in shallow water (<10 fm). Traps were hauled at a minimum of two times per month and all lobsters were measured, sexed, and examined for egg stage and v-notch state when available. The exact location of the traps, depth, bottom type, time and date of haul, soak time, bait and wind speed/direction were also recorded along with a summary of the commercial catch. With the incorporation of the standardized ventless traps, a series of triples were deployed with the commercial (control) trap at the end of the line, followed by the non-standardized ventless trap and finally the standardized ventless trap attached to the buoy line. This set-up allowed for comparison between the catch rates of the non-standardized traps to those of the standardized traps. Initial analysis showed similar trends in catch rates between the two suggesting that data collected prior to 2004 may be compared to the current data. The use of a control commercial trap showed the effectiveness of both kinds of ventless traps at capturing sublegal lobsters.

At the start of the project, 34 volunteers throughout all three states (including all seven of Maine's lobster management zones) participated in the survey, however, the following year, participation dropped to only 11 fishermen and then 7 the subsequent year. This drop is likely due to the amount of additional work required, however, over the past three years, an average of 20-25 fishermen actively participated in the survey. Unfortunately, current participation is patchy, with only Maine lobster zones A, D, F and G surveyed for all six

years. Even with this patchiness, approximately 60,000 lobsters have been measured to date.

Unlike Canada, the U.S. lobster season is open year round, however, hauls decrease as the weather deteriorates. Even with less hauls, sublegal catches were decent throughout the year. An interesting note, there appears to be nearly a 1:1 ratio of males to females caught with only slightly more females caught than males.

Of all the lobsters measured, only 2% of the 30,000 sublegal lobsters examined were determined to be berried, while 16% of the legal sized and 71% of the large lobsters (n=14) were berried. Interestingly, when only considering berried females, nearly half of the lobsters examined were considered sublegal in size, due to the high proportion of sublegal versus legal lobsters that are caught in the ventless traps. The V-notch states were also examined and as expected, the smaller lobsters had less v-notches while the larger lobsters had a great proportion of v-notches.

The main purpose of the VenTS project has been to examine recruitment into the lobster population by examining catch rates of sublegal lobsters in an attempt to predict future population trends. Recent data would suggest an upward trend in the number of sublegal lobsters captured in 2006, however, further surveys are required to determine the extent of the increase. In contrast, 2001 appeared to have fewer lobsters than the following years, therefore, each zone was examined individually. With the removal of the low catches from New Hampshire and Massachusetts that year, Maine only had low counts in area D and area F had a peak in lobster numbers.

Although the survey produced significant results, there is always room for improvement. More even participation throughout the zones would be useful along with better spatial analysis (similar to FSRS analysis). Finding ways to standardize earlier surveys to current surveys and to deal with gaps in data are also issues requiring attention. Finally, more stable funding may allow for increased participation by aiding volunteer fishermen with some of the expenses they incur from sampling.

2.2.2 Discussion

Written by Kate Gardiner, FSRS Fisheries Technician

Q: Can the fishermen keep the legal size lobsters from the scientific traps?

A: Yes they can, but the fishermen have to use their own trap tags for the science traps.

Q: DFO allows recruitment traps as extra traps, does the same thing happen in Maine?

A: No. The ventless traps count towards the trap limit.

Q: Why do the standardized traps have a little lower yield than the modified ventless traps?

A: This is likely due to the smaller size of the standardized traps.

Q: Why are there a larger number of sublegal berried lobsters the further south you go?

A: Warmer water causes a smaller size at maturity.

2.3 Random Stratified Ventless Trap Survey in Massachusetts Bay

By Tracy Pugh, Massachusetts Division of Marine Fisheries

2.3.1 Summary

Written by Tracy Pugh, Massachusetts Division of Marine Fisheries

The Massachusetts Bay Ventless Trap Survey was an intensive survey conducted with a large number of sampling stations in a relatively small geographic region. The survey took place from 2004 through 2006, and was conducted by the Massachusetts Division of Marine Fisheries (MADMF). Funding for the survey was provided by the Northeast Consortium for survey years 2005 and 2006. Participating lobstermen were paid based on day-rate bids they submitted. MADMF provided lobstermen with the experimental gear and assigned locations (sampling stations) at which to fish the gear. One goal of the ventless trap survey was to improve the way lobster relative abundance is estimated by accounting for depth and bottom type in our survey design. Other goals included the use of this survey as a pilot study for the development of a coastwide ventless trap survey.

We used the habitat characteristics of depth and bottom type to stratify our study area, using a grid composed of cells (boxes) that were approximately $\frac{2}{10}$ mile by $\frac{3}{10}$ mile. Each grid cell had one of 11 possible combinations of depth and bottom type, thus there were 11 “strata.” Each strata had many possible cells, from which we randomly selected our sampling stations. We only adjusted the stations selected if they fell inside navigational channels or in non-navigable waters (too shallow, for example). At each station, we fished one six-pot trawl, with 3 vented and 3 non-vented traps alternating, spaced 150 feet apart. Sampling stations were permanently assigned. We used a soak period of three to five days. Captains were not allowed to keep any lobsters from the research gear.

The ventless trap survey was launched in the fall of 2004 as a pilot study with only 40 stations. In 2005 and 2006 the full survey was conducted at all 80 sampling stations. Stations were sampled twice per month in 2005 and 2006, from May through November. Data presented were from the 2005 survey period.

The size distribution of lobsters observed differed between trap types. Sublegal sized lobsters made up a higher percentage of the catch in the non-vented traps than in the vented traps. Legal sized lobsters made up a higher percentage of the catch in vented traps versus in the non-vented traps.

There was an increase in the percentage of females bearing eggs from shallow to deep water, and the percentage of notched females followed a similar trend.

The average catch of lobsters (sublegal and legal) per trawl haul were presented by both bottom type and by depth. The average catch of sublegal lobsters was higher in complex bottom types (boulder and pebble) than in featureless bottom (mud and sand/gravel). The

catch of legal sized lobsters was higher in boulder habitat than any other habitat. Sublegal lobster catch decreased as water depth increased, but there was no difference in the average catch of legal lobsters by depth.

There were seasonal variations in average catch by both bottom type and by depth. The average catch of sublegal lobsters increased from summer to fall in all bottom types. Sublegal lobster catch by depth increased from spring to summer in shallow water while decreasing in mid and deep water. From summer to fall, sublegal catch increased dramatically in mid and deep water, but stayed the same in shallow water. The average catch in legal lobsters also increased in all bottom types from summer to fall. Legal catch increased slightly in shallow water from spring to summer, then increased in deep water from summer to fall.

In general, data from 2005 show that egg-bearing females are more prevalent in deeper water. Lobster relative abundance tends to be higher in complex habitat types, especially for sublegal sized lobsters. Time of year affects the catch of lobsters observed in different habitat types.

The use of both vented and non-vented traps was necessary to observe a broad size range of lobsters. The use of permanent sampling stations allowed us to observe seasonal changes in habitat use, and our data suggest that the season in which a survey is conducted will affect the catch. Finally, the random selection of sampling stations within an appropriate stratification scheme allow the data collected to be used as estimates of lobster relative abundance.

2.3.2 Discussion

Written by Julie Sperl, FSRS Research Assistant and Tracy Pugh, Massachusetts Division of Marine Fisheries

Q: Where did the original bottom type data come from?

A: Massachusetts GIS datalayer, based on work published by Knebel in 1993.

Q: Were there commercial traps used in the survey?

A: No, all the traps used were experimental, using a design similar to the standard ventless traps used by FSRS.

Q: How many lobsters were caught per trap?

A: Our data were presented as average catch per trawl. In some habitat types, we averaged 40 lobsters per 6 trap trawl.

Q: How much money do the fishermen get for the survey?

A: The amount depends on the fisherman; each fisherman makes a bid (day rate) on doing their particular part of the survey.

Q: Have comparisons been made between this survey data and data collected by the FSRS survey?

A: It's not been done yet; the study needs to be done longer in order to get a time series to make year to year comparisons. We haven't made any comparisons between our survey and others due mainly to the differences in study design.

Q: Do both types of traps have the same size entrance ring?

A: Yes they both have a 5 inch ring, although we recognize that this may limit the upper size range of lobsters observed.

Q: How did you get the bottom type map?

A: A previous study looked at bottom type; there is camera work being done to confirm the findings of the original study.

Q: Do the survey stations remain the same from year to year?

A: Yes.

Q: Do you use hoop gates?

A: No. We use the same traps as Gulf of Maine.

Q: The data you presented was a sum of all 6 traps. So each trap haul was 6 traps. So 40 on the catch axis was 40 lobster/6 traps?

A: The data presented were average catch per trawl haul. So a value of 40 in boulder habitat (for example) meant that the average number of lobsters observed for the entire survey year was 40 lobsters per trawl haul. Some individual traps could have quite a few lobster, the maximum number of lobster in one ventless trap was about 80. We have some concerns regarding trap saturation, which we will examine in future work.

Q: How did you choose your fishermen?

A: We contract fishermen based on a competitive bid process. They bid and we grade the bids on vessel capacity, price and safety features, among other criteria.

Q: Where did you get the map of bottom type for stratification?

A: Bathymetry data (depth) came from a USGS GIS datalayer. The sediment data came from a datalayer produced by MassGIS based on data published by Knebel. We are currently verifying the sediment data using an underwater camera.

Q: What about salinity as an explanation for depth difference?

A: I don't think this is important because there were shallow sites that were not estuarine (in this area depth and salinity not related). The shallow water stations were not confined to areas that would tend towards estuarine conditions.

2.4 Collectors to Assess Deepwater Settlement of the American Lobster

By Rick Wahle, Bigelow Laboratory of Ocean Sciences

2.4.1 Summary – Rick Wahle’s Presentation

Written by Nell den Heyer, FSRS Project Officer

Lobster have a complex life cycle which includes a waterborne larval stage and the more familiar benthic stage. For several species of spiny and rock lobster, including Caribbean lobster, passive collectors have been used to monitor the abundance of waterborne post-larvae, and in the case of Australia’s western rock lobster they have even been used to forecast catches. Closer to home, an American lobster Settlement Index is showing promising signs that it will have predictive power along the New England Coast. The monitoring of post-larval settlement in American lobster also complements the ventless or recruitment trap survey data on the abundance of undersized or juvenile lobster.

Dr. Wahle presented examples of the use of lobster settlement in fisheries management. First, he spoke of the spiny lobster which has an 11-month planktonic or waterborne stage. Larval transport and survival during this stage appears to be important in determining the population dynamics as post-larval settlers have been used to forecast commercial catches. For example, Australia’s western rock lobster larvae have been collected on fibrous, pompom-like collectors since the 1960’s. Settlement indices translate to landings with a lag of 3-4 years. And, the peaks in settlement reflect cycles of the El Nino Southern Oscillation (ENSO) that are manifested by changes in average sea level height.

Understanding the processes that determine lobster abundance is a focus of Dr. Wahle’s research. The fishery in Canada and the US, which is dominated by catches in Maine, has a boom and bust cycle. He asks, is this boom and bust cycle related to pelagic processes that determine larval survival or post-larval settlement? Also, the geographic range of American lobster spans a dramatic environmental and biogeographic gradient. Do the processes that influence lobster abundance change over the geographic range?

Dr. Wahle presented estimates of lobster settlement from diver-based suction sampling at 65 sites in 13 regions along New England coast. The regions with the longest time series in mid-coast Maine, Rhode Island and New Brunswick were initiated in 1989, 1990 and 1992 respectively. Sampling expanded to other parts of Maine and Massachusetts more recently. Displaying a snapshot of data collected between 2000 and 2003 for all regions, Wahle illustrated that while there were consistent regional differences in the abundance of newly settled lobster, the annual fluctuation among the 13 regions were quite synchronous. Such large scale spatial coherence suggests oceanic processes that operate on a similar scale. He has shown that the lobster Settlement Index may be a useful forecasting tool. In Rhode Island after accounting for increased mortality due to disease in lobster, there is quite a good match between the model predictions and the abundance of pre-recruit lobsters caught in the state’s nearshore trawl survey. Similarly, in Maine he showed a strong correlation between

settlers and the trawl abundance between 2000 and 2006, with the exception of 2005, a year in which the Settlement Index severely underestimates the catch of new recruits in the trawl survey. However, after just having seen the talk by Sara Ellis on the ventless traps from Maine, Dr. Wahle noted that the trends predicted from the Settlement Index appear to match the trends in the ventless trap data, and that he would like to look into this index of abundance, as well as the trawl survey data.

Unfortunately, studying post-larval settlement of American lobster is not as easy as it is for spiny lobster. The floating fibrous Witham and pompom-like collectors do not work for American lobster. Suction sampling, used for the Settlement Index discussed above, does provide data on abundance of American lobster settlers, but it requires SCUBA divers, which are expensive and can only work in a limited depth range. To solve this problem, Dr. Wahle has worked with fishermen to develop a new post-larval collector for American lobster. These passive collectors are essentially flattened lobster traps containing rocks and a fine mesh bottom that are deployed for 2-3 months. However, unlike a conventional trap, planktonic postlarval lobsters settle through the wire mesh among the rocks, rather than entering through a trap head. The collectors are standardized in size, shape and materials and are relatively inexpensive to construct. They also have the advantage of being able to sample where suction sampling by SCUBA divers is not possible.

Dr. Wahle has tested these passive collectors. Abundance estimates from passive collectors and suction sampling in two cobble sites off the Coast of Maine are comparable. Dr. Wahle also investigated the potential loss of newly settled lobster when the collectors are hauled to the surface. There was no difference in the abundance of hatchery-reared post-larval lobster stocked into the collectors with and without an extra layer of screening after being deployed and hauled. There was also no difference in the numbers of naturally settling lobsters found in collectors that were covered and not covered by divers just before being hauled at the end of the settlement season. The collectors do catch some small fish including cunners, rock gunnels, sculpins, and even an exotic snowy grouper, but there was no evidence that the fish captured by the collectors impacted post-larval abundance. Similarly, the abundance of crab (rock, Jonah and spider) was not correlated with the abundance of settled lobster.

In the summers of 2007 and 2008 Dr. Wahle plans to deploy collectors to monitor lobster settlement in Eastern Gulf of Maine, Central Gulf of Maine and Southern New England. The collectors will be deployed at 3 depths and at the shallow sites suction sampling will be done to compare the methods. He is also hoping to collaborate with John Tremblay and Rémy Rochette, to extend the settlement survey into Canadian waters.

There were several questions from the audience about the deployment of the collectors and the fish and crab species also captured by the collectors. One fisherman wanted to know if there were any green crab caught in the collectors, while another wanted to know why the fish, particularly the cunners and sculpins which are known to eat lobster, were not having an impact on the abundance of lobster in the collectors. Dr. Wahle pointed out that the collectors were in 7-10 m of water which is a little deep for green crab in the area he works. And, Dr. Wahle suggested that perhaps the size and behaviour of the cunners, sculpins, and

newly settled lobster may explain the lack of evidence for impact. It may be that newly-settled lobster are not preyed upon by the small cunners and sculpins caught in the collectors. Another fisherman asked if the suction sampling and collectors would be comparable in other bottom types, not just cobble. And finally, there was a question about what might drive settlement variability from year to year. Dr. Wahle pointed to some preliminary analyses he is conducting that suggest the position of summer high pressure systems over the eastern US and Canada might be important, but that more multi-disciplinary research would be needed to address that question.

2.4.2 Discussion

Written by Nell den Heyer, FSRS Project Officer

Q. Did you catch green crab?

A. No, collectors were in 7-10m of water. Not many green crab at that depth where we had the collectors.

Q. In the test areas where you compared the suction sampling to the collectors, how similar was the habitat? Could bottom type or growth influence the suction sampling and collector comparison?

A. No influence of growth, and the habitats we looked at were very similar.

Q. How close was the bottom type to the material used in the collector?

A. Almost identical.

Q. Are you sure that cunner and sculpin in the traps had no effect on the catch?

A. No evidence in the data. The size range of lobster and fish was very limited. It may be that lobster at this size are not susceptible to the cunner and sculpin of this size.

Q. Did you say that cunners and sculpins did not eat any larvae?

A. In the collectors the number of cunners didn't significantly affect the number of larvae.

Q. What determines a good year of settlement?

A. There is some information that is starting to show that when summer high pressure systems (e.g., Bermuda Highs) are centered over New England we have a good year of settlement.

2.5 Regional Ventless Trap Survey

By Carl Wilson, Maine DMR

2.5.1 Summary

Written by Aaron Retzlaff, FSRS Assistant Data Analyst

The Regional Ventless Trap Survey is a collaboration of Maine, New Hampshire (though recent sampling has not included them), Massachusetts, Rhode Island, Connecticut, and New York. All of the collaborators share a common interest in the lobster populations located off their respective coasts. This project is intended to track relative abundance and define populations of sub-legal sized lobsters off of the eastern seaboard of the United States.

The aims of the Regional Ventless Trap Survey (RVTS) are to characterize abundance of lobster from Maine to New York and to produce a fishery independent monitoring program while improving the relationship between the commercial lobster industry and fisheries scientists.

The sampling program relies on a variation of a fully random and a random stratified sampling methodology. The area between Maine and Virginia is broken into three stock assessment areas (Figure 1) which are further subdivided into seven regional management areas.

In addition to stock assessment models, a traffic light approach is used as a multiple indicator tool for stock assessment in the US, with indicators grouped by measures of abundance, fishing mortality and fishery performance.

The most recent US lobster stock assessment has found mixed results regarding stock status. In Georges Bank and the Gulf of Maine abundance is relatively static. However, abundance and recruitment have been reduced in New England and area 514 of the Gulf of Maine. The major limitation on analysis has been found to be a scarcity of consistent data rather than predictive capacity and choice of models describing the US lobster resource. This lack of consistent sampling is largely due to variability in fishing conditions and local rules in the areas that the RVTS covers. Not every survey type can be applied to each area of the survey and results of the RVTS are variable depending on what type of gear is used. For example, trawl surveys in long island found differing relative quantities of small lobster than did ventless traps. It is likely that non-standard sampling methodologies could lead to erroneous interpretation of abundance and recruitment data.

Currently, data are collected by fishermen who are compensated for their work. The RVTS uses a competitive bidding process which seeks the best combination of vessel rate, vessel speed, and vessel capacity for use in the survey. Compensation is thought to be necessary because of the large time and labor investment required from the fishermen.

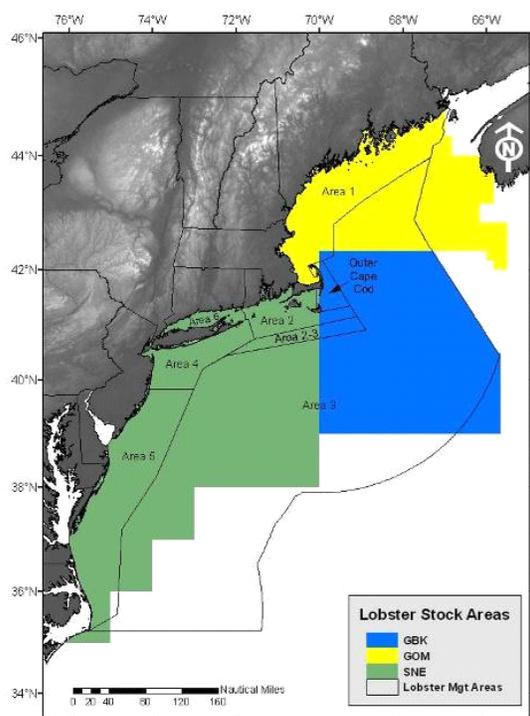


Figure 1. Stock Assessment Areas for the Regional Ventless Trap Survey.

The trapping methodology includes 144 traps per statistical area with three depth strata and eight sites for each stratum. For each of the eight sites there are six traps consisting of three vented and three ventless traps. The traps are baited twice per month and are left for a soak time of three days. Sampling is conducted from June to August. The traps have a 5” hoop diameter and are similar to those used by the Fishermen and Scientists Research Society in Nova Scotia. The traps are set as either triples or six trap trawls with ten fathoms between each trap.

In order to select sites randomly but also in a manner that results in specific depths, a grid with sections of one nautical mile is overlaid on the area of interest and each square of the matrix is assigned a depth classification. The grid is constrained to those waters within state boundaries (three nautical miles from shore) and then sections of the grid are selected at random. The fishermen are allowed to choose a site that is within a half

mile of the selected site.

An issue with this methodology is that despite there being equal numbers of traps in each area, because of the varying size of each area, there is not necessarily equal trapping effort being put forth for each area.

The sampling has found several general trends with lobster catches. Firstly, there is a reduction in catch in more southerly sampling areas. Both the vented and ventless traps seem to follow this general trend. Sampling has secondarily found patterns of trapping abundance with depth that also vary with latitude which are attributed to temperature differences. In northern areas during the trapping period, the warmer shallow waters are optimal for lobster and so northern latitudes see a greater number of lobster in shallower traps. However, in southern latitudes where shallow waters are above the optimal temperature for lobster, more are found in deep traps.

Some interesting questions have arisen from the RVTS such as whether other species found in lobster traps could be influencing lobster catchability, and whether either the trapping or trawling is selective in some manner.

Several points of discussion regarding the RVTS exist including why regional differences in results are found, what the required intensity of the RVTS is, what trap selectivity means to

the program, and whether bycatch represents significant data. The expensive nature of the program is also a point of discussion.

2.5.2 Discussion

Written by Aaron Retzlaff, FSRs Assistant Data Analyst

Q: Is trap saturation a factor during the RVTs?

A: Yes. More commercial traps in an area represent more feeding stations for the lobster. It is possible that using vented and ventless traps may not be required.

Q: More lobster are found in deep water for this survey because it is done during the summer. Why not do a fall survey to find out what the variability is seasonally?

A: There is an interest in studying seasonal effects however currently funding is limited.

A: Massachusetts wants to expand to the fall to get a better assessment.

Q: What is the effect of the mobile fleet on bycatch?

A: Because the RVTs is limited to a 3 mile limit the mobile fleet does not affect bycatch.

Q: Are there a lot of lobster getting in and out of the traps? Is there any video footage of the lobster trap efficiency?

A: We do want to do some video work but trap efficiency is probably not as bad as the 97% inefficiency some have speculated.

Q: Will you repeat the same stations in consecutive years?

A: No. New stations will be randomly selected. We may test trawls versus single traps.

3.0 Breakout Groups

Participants were divided into six breakout groups and were given a specific question to respond to and were asked to complete a worksheet summarizing the pros and cons of the projects and their recommendations. The results of the group discussions are highlighted in this section. Each group presented the results of their group’s discussions in a plenary session; a summary of the main points from these presentations and the conclusions are included in the next section.

Breakout Group Discussion Worksheet

What are the advantages and disadvantages of the methodology for each of the projects and what recommendations, if any, would you make for the project?

Project	Pros	Cons	Recommendations
FSRS Lobster Recruitment Project			
GOMLF Ventless Trap Survey			
Regional Ventless Trap Surveys			

FSRS Lobster Recruitment Project

Pros

Group 1:

- Inexpensive.
- More fishermen involved.
- Number of traps consistent in LFA, same number of traps in each.
- Anonymous (grouped data when presented).
- Increased sampling frequency.

Group 2:

- Consistent data.
- Can keep lobsters.
- Leaving traps in same location from year to year gives a predictive idea of the future.
- Traps are consistent within each LFA and in the States.

Group 3:

- Fishermen involvement/buy-in.
- Feedback to fishermen, catch and temperature reports.
- Standardized traps.

- Relatively low cost.
- Fishermen incentive – get to keep legal lobsters.
- Feedback through meetings.

Group 4:

- Willful data collection.
- Fishermen more reliable when not paid.
- Good outreach.
- Good coverage area.
- Time.
- Standardized gear and protocol.
- FSRS contributes to DFO data.
- Inexpensive.
- Fishermen do the work.

Group 5:

- All same trap.
- Good outreach.
- Large spatial coverage.
- Feedback to fishermen.
- Standardized traps.
- Fisherman incentive – keep legal lobsters.
- Based on large voluntary effort.
- Inexpensive/low cost.

Group 6:

- Large spatial coverage.
- More participation.
- Cheap.
- Participants get to see their data.

Cons

Group 1:

- Some areas low participation, others high.
- Seasonal fishery, different in LFAs.
- Fishery dependent.

Group 2:

- LFAs can't move the gear, aren't getting the whole picture of what's going on in other areas. Missing certain areas that aren't being fished.
- Inconsistency in bait type and soak times.
- Guys give up the traps because of the time involved in measuring and data collection.

Group 3:

- Bait not standardized.
- No stratification, by depth or substrate.
- Some movement of traps in some areas.
- No standardized soak time.

Group 4:

- Size selective.
- Not standardized bait.

Group 5:

- Size selective for small not large.
- Unclear that traps are fixed or moved.
- Not as independent from fishery.
- Limited to fishing season.
- Not standardized for bait or soak time.
- Not recognized effort.
- Limited to fishery areas.
- Not stratified.

Group 6:

- Seasonality a problem.
- Non-assigned stations.
- Limitations with timing of survey.

Recommendations

Group 1:

- LFA participation (add new LFAs)
- Compensation.
- Year round.

Group 2:

- More funding to hire more technicians.

Group 3:

- Evaluate the effect of soak time.
- Remove wind direction and speed.
- Add bottom type.
- Remove unnecessary details from logs, such as time of day.

Group 4:

- Find out if non-standardized bait has an influence.

Group 5:

- Expand temporal scale with selected locations to determine seasonal information.
- Soak times.
- Hire technician to sample commercial traps.
- Edit logbook, add bottom type.

Group 6:

- Look at out-of-season sampling in select locations.
- Assign stations to deal with variability in how stations are selected.
- Find appropriate timing for comparative purposes with other studies.

GOMLF Ventless Trap Survey

Pros

Group 1:

- Inexpensive.
- Year-round fishing.
- Now using standardized traps.
- Long-term study.

Group 2:

- Traps are consistent within each LFA and in the States.

Group 3:

- Same pros as FSRS.
- Low habitat impact compared to the trawl surveys.

Group 4:

- Adds to data.
- Inexpensive.
- Standard trap.

Group 5:

- Large temporal scale.
- Inexpensive.
- Traps not standardized in past, now they are.
- Low habitat impact.

Group 6:

- Cheap.

Cons

Group 1:

- Not many fishermen involved.
- Three traps used for one “standardized ventless trap”.
- Participants were once using any trap they wanted.
- Fishery dependent.

Group 2:

- Cannot keep legal lobsters.
- Guys give up the traps because of the time involved in measuring and data collection.
- Inconsistent measuring between fishermen.

Group 3:

- Uneven participation.
- Lower level of participation.
- The same as the FSRS cons.

Group 4:

- Small sample size.
- Low participation.

Group 5:

- Limited spatial.
- Not many participants.
- Not standardized trap.
- Not fixed stations.
- Uneven/low participation.

Group 6:

- Lack consistency in participation.

Recommendations

Group 1:

- Incentives – increase number of trap tags or money.
- Standardize soak time.

Group 2:

- Add more stations and add more volunteers.

Group 3:

- Remove wind direction and speed.
- Add bottom type.
- Remove unnecessary details from logs.
- Consider removing vented traps.

Group 4:

- Outreach.
- Reduce soak time to reduce work.

Group 5:

- Standardize soak times.
- Add more volunteers.
- More training.
- Remove/edit information not needed on the logbook.

Group 6:

- Assign stations to deal with variability in how stations are selected.
- Find appropriate timing for comparative purposes with other studies.

Regional Ventless Trap Surveys

Pros

Group 1:

- Fishery independent.
- Standardized design.
- Maine to New York, totally standardized spatially.
- Randomized sites.
- Overall pro – trap types for all projects same or very similar.

Group 2:

- More data availability.

Group 3:

- Stratified random.
- Fine detail is on size.
- Standardized soak time.
- Standardized bait.
- Generally more detailed information (shell disease, egg condition, etc.).

Group 4:

- Geographic range.
- GIS integration.
- Scientist on board.
- Consistent.

Group 5:

- Large spatial scale.
- More data available.
- Design is stratified random.
- Exact details on lobsters with calipers.
- Standard soak time.
- More information on survey on by-catch, disease.

Group 6:

- Put traps in areas where wouldn't put commercial traps.

Cons

Group 1:

- Expensive.
- Three months only.
- Short-term study.
- Study not as localized.

Group 2:

- Cannot keep legal lobsters.
- Not enough density (75 traps/100 miles).
- The cost of hiring technicians.
- No historical information because of moving gear to different areas each year.

Group 3:

- High cost.
- Questionable future due to cost.
- Lower fishermen involvement.

Group 4:

- Cost.

Group 5:

- Limited temporal coverage.
- Very expensive.
- Short.
- Cannot keep legal lobsters.

- Not enough density.
- No historic information because of moving stations.
- Low fishermen involvement.

Group 6:

- Expensive.
- Lower involvement.

Recommendations

Group 1:

- Expand sampling season.
- Funding needed to continue study long-term.

Group 2:

- Add more stations

Group 3:

- Remove vented traps.

Group 4:

- General Comments - Same comparison methodologies, ie: trap or trawl. Need to be in for the long-haul. Industry should be able to come together.

Group 5:

- Secure long-term funding.
- Identify funding for research.

Group 6:

- Increase depth.
- Find appropriate timing for comparative purposes with other studies.

4.0 Breakout Groups Summary and Conclusions

4.1 Breakout Groups Summary

The previous section of this report provides details on the breakout group discussions. The Breakout Groups session was followed by a plenary session where each group presented the results of their discussions. The following summarizes the main points from these presentations.

Pros

FSRS Lobster Recruitment Project

- Inexpensive.
- Large number of participants.
- Long-term data.
- Consistent data.
- Keep legal lobsters.
- Good area coverage and time.
- Leaving traps in one area (except in LFA 34 where there is some movement by those fishing the offshore area).
- Outreach.
- Feedback to fishermen (temperature and catch reports).
- Standardized traps.
- Willful data collection may make better data.
- Contributes to DFO data.

GOMLF Ventless Trap Survey

- Same as FSRS.
- Inexpensive.
- Year-round fishery
- Standardized traps.
- Long-term study.
- Leave traps in one spot.
- Low habitat impact.

Regional Ventless Trap Surveys

- Random – fishery independent.
- Maine to New York.
- More data available.
- Stratified.
- Data Collected is fine detail.

- Standard bait (not in Maine).
- Standard soak time.
- GIS integration.
- Using same trap.
- Putting traps in areas no one is fishing.
- One sampler on board.

Cons

FSRS Lobster Recruitment Project

- Seasonal fishery in LFAs.
- Fishery dependent.
- Missing areas not fished.
- Inconsistent bait and soak times.
- Lack of commercial data to match.
- Bait not standardized.
- Whole survey not stratified.
- Variability of site selections.
- Some move traps in LFA 34.
- Traps are size selective.

GOMLF Ventless Trap Survey

- Not enough participation.
- Three trap tags are used to get information from one trap.
- Inconsistent measuring among fishermen.
- Lack of consistency with participants.
- Variability in site selections.

Regional Ventless Trap Surveys

- Very expensive (hire technicians).
- Only three months.
- End date based on funding.
- Can't keep legal lobsters.
- Not enough density.
- No historical information due to moving gear.
- Questionable costs.
- Lower number of fishermen involved.

Recommendations

FSRS Lobster Recruitment Project

- Incorporate new LFAs.
- Somehow continue year round.
- More funding to hire more technicians.
- Evaluate effective soak times.
- Remove unnecessary information from log sheets, add bottom type.
- Look at bait data on size of lobsters.
- Choose sites.
- Find time to go over the data together with GOMLF.

GOMLF Ventless Trap Survey

- Extra trap tags.
- Standardize soak times.
- Add more training.
- Remove wind and speed or other data not used.
- Remove vented traps.
- Better outreach.
- Choose sites.
- Find time to go over the data together with FSRS.

Regional Ventless Trap Surveys

- Secure funding for long-term.
- Expand sampling season.
- Add more stations.
- Increase depth range, deeper water.

4.2 Conclusions

The FSRS Lobster Recruitment Project and GOMLF Ventless Traps Survey are very similar in their methodologies, with many aspects, such as trap design, measuring gauge and key information on the data sheets, being standardized. The two projects share many of the same pros and cons and recommendations for improvement. In comparison, the Regional Ventless Trap Surveys have a different methodology, which is also considered to have its pros and cons and recommendations for improvement.

The spatial and temporal coverage of the projects vary. The FSRS Lobster Recruitment Project and GOMLF Ventless Traps Survey operate during the lobster season in select lobster fishing areas, whereas the Regional Ventless Traps Surveys cover an area from Maine to New York, however, are only done during specific short periods. It was

recommended that all projects expand their sampling timeframes in an effort to get year-round sampling.

Fishermen's participation is an important part of all the projects. The FSRS Lobster Recruitment Project has the highest level of fishermen's participation. It was recommended that the other projects should increase the level of fishermen's participation. Outreach was also identified as important, with each project being successful in doing this to varying degrees.

A major difference between the Regional Ventless Trap Surveys and the other two projects is sampling site location. The Regional Ventless Trap Surveys use a random stratified design while the FSRS and GOMLF projects allow the fishermen to pick the location. The variability in site selection for the FSRS and GOMLF projects was considered a con and it was recommended that these two projects review how site selection is done. It was recommended that the Regional Ventless Trap Surveys add more sites.

The FSRS Lobster Recruitment Project and GOMLF Ventless Traps Survey are inexpensive to operate and rely on the volunteer efforts of fishermen. It is important that the value of this contribution be recognized. The Regional Ventless Trap Surveys are costly to operate. Funding is a challenge for all the projects and stable long-term funding needs to be identified.

It was noted that it is desirable to use the same analysis for the projects, whether done by trawl or trap, so results can be compared. The FSRS Data Management Working Group is one proposed avenue through which this can be discussed, where the projects can come together to determine what analysis needs to be done, how it should be done, and how it should be presented.

It was recognized that each of the projects have their strengths and that it is important that they all be continued. They all contribute to improving our understanding of the lobster resource. It is important that the dialogue and collaboration between the projects continues, that we continue to learn from each other and share our data and analysis.

5.0 Acknowledgements

The workshop would not have been possible without the cooperation of the Fishermen and Scientists Research Society and the Gulf of Maine Lobster Foundation and the financial support of our sponsors.

We would like to gratefully acknowledge the following organizations and companies for their support and financial contributions:

Director's Office, Science Branch, Maritimes Region, Fisheries & Oceans Canada
Nova Scotia Fisheries and Aquaculture – Lobster Science Fund
Nova Scotia Fisheries and Aquaculture
Darden Restaurant, Inc.
The Lobster Advisory Council
AMIRIX Systems Inc. (VEMCO Division)
Encana Corporation
Prospect Area Fulltime Fishermen's Association
Atlantic Electronics
AVC Lobster Science Centre
Halifax West Commercial Fishermen's Association
Eastern Nova Scotia 4X Community Management Board
Guysborough County Inshore Fishermen's Association
Scotia Harvest Seafoods
Maritime Aboriginal Aquatic Resources Secretariate
Scotia Fundy Inshore Fishermen's Association
Wade Company Limited

We would also like to gratefully acknowledge the following individuals:

Guest Speakers:

Carl MacDonald, Fishermen and Scientists Research Society
Sara Ellis, Gulf of Maine Lobster Foundation
Tracy Pugh, Massachusetts Division of Marine Fisheries
Carl Wilson, Maine DMR
Rick Wahle, Bigelow Laboratory of Ocean Sciences

FSRS Staff:

Nell den Heyer	Alain d'Entremont
Kate Gardiner	Jeff Graves
Carl MacDonald	Aaron Retzlaff
Julie Sperl	

The breakout group chairs, recorders and presenters.

And of course all those who attended the workshop.

Thank You

