2.3 Regional Summary - Settlement Collectors Along Coastal Nova Scotia in 2008 - Lobster Bay, Port La Tour, Sambro and Cape Breton, NS

By John Tremblay, Research Scientist, Fisheries and Oceans Canada

2.3.1 Presentation

Settlement collectors along coastal Nova Scota in 2008

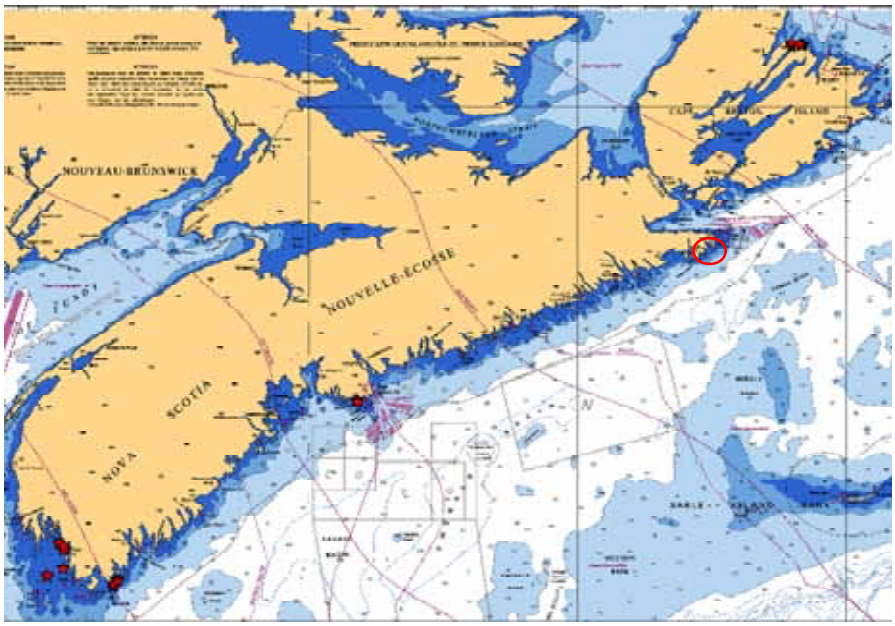
Joint project of DFO and FSRS

With thanks to the Province of Nova Scotia

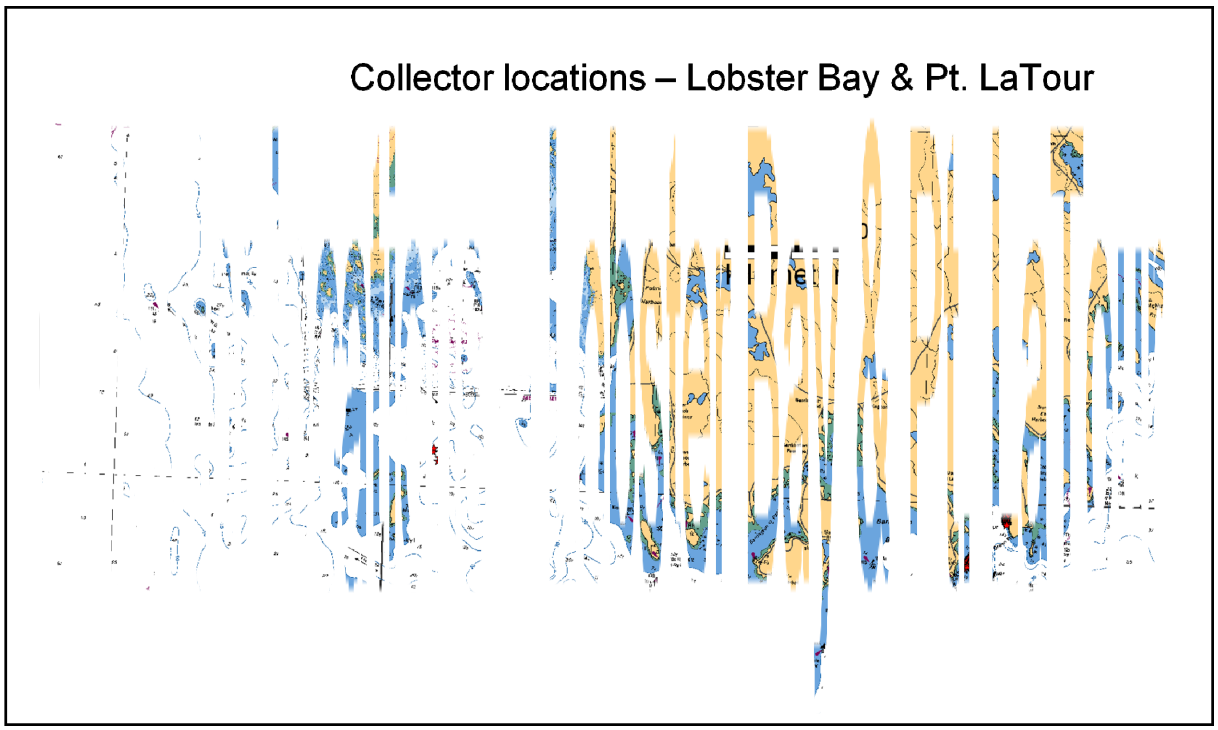
Summary

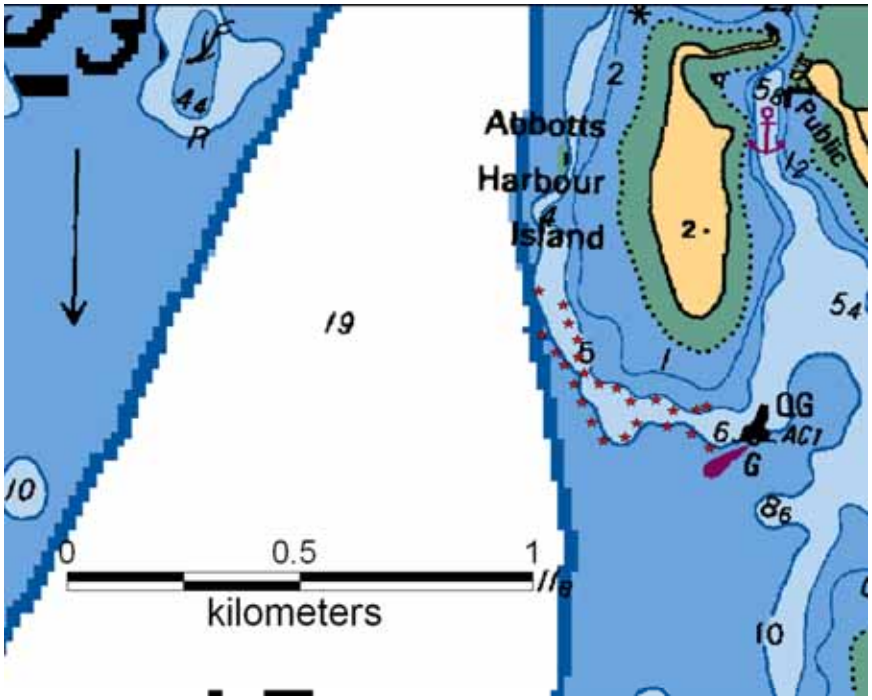
- What collector design did you use? (eg: weight, size of rocks, general construction)
  - **Wahle design, 200-250 lb;**
- How many collectors did you deploy and where? (including depth and type of bottom)
  - **288 total; 138 Lobster Bay; 50 at each of Pt. LaTour, Pennant Point & Big Bras d'Or**
- Did you attach a temperature gauge to any or all of the collectors?
  - **At least one per site**
- What method did you use to deploy and retrieve the collectors? (Including transportation to the vessel, loading on vessel, deploying and retrieving from vessel)
  - **Pullmaster winch; overhead winch; A frame**
- Did you have any problems with deployment and retrieval and, if so, how did you address them? Are there any unresolved problems?
  - **Challenges deploying & retreival where pullmaster type winch unavailable**
- What data did you collect?
  - **Lobster, crab size & sex, fish size, number of other taxa; detailed analysis of some**
- What format is your data in? Is it in a format that will allow it to be easily shared?
  - **Excel spreadsheets**
- Has all your data been entered?
  - **Lobster data yes; data for other taxa not as yet**
- What results did you see?
- What are your plans for 2009? Will you be expanding your project? Do you foresee using this tool for long term monitoring. Pros and cons of using it for long term.
- Other issues?

Locations in 2008



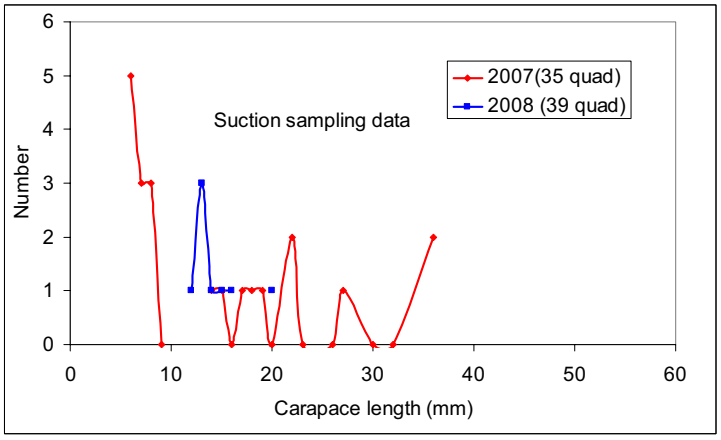
Lobster Bay (Lower Argyle)


Collector locations – Lobster Bay & Pt. LaTour



Suction sampling – Oct 2008

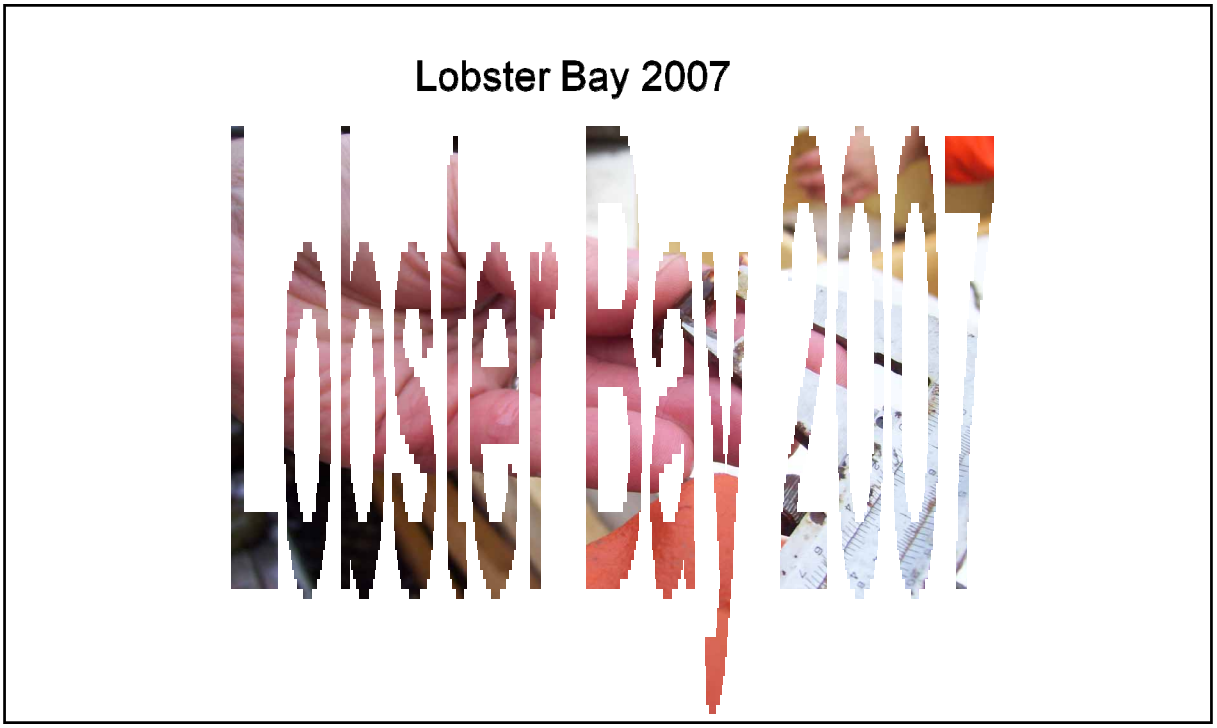
Steve Nolan, Alan Reeves, Megan Veinot, Shelley Armsworthy



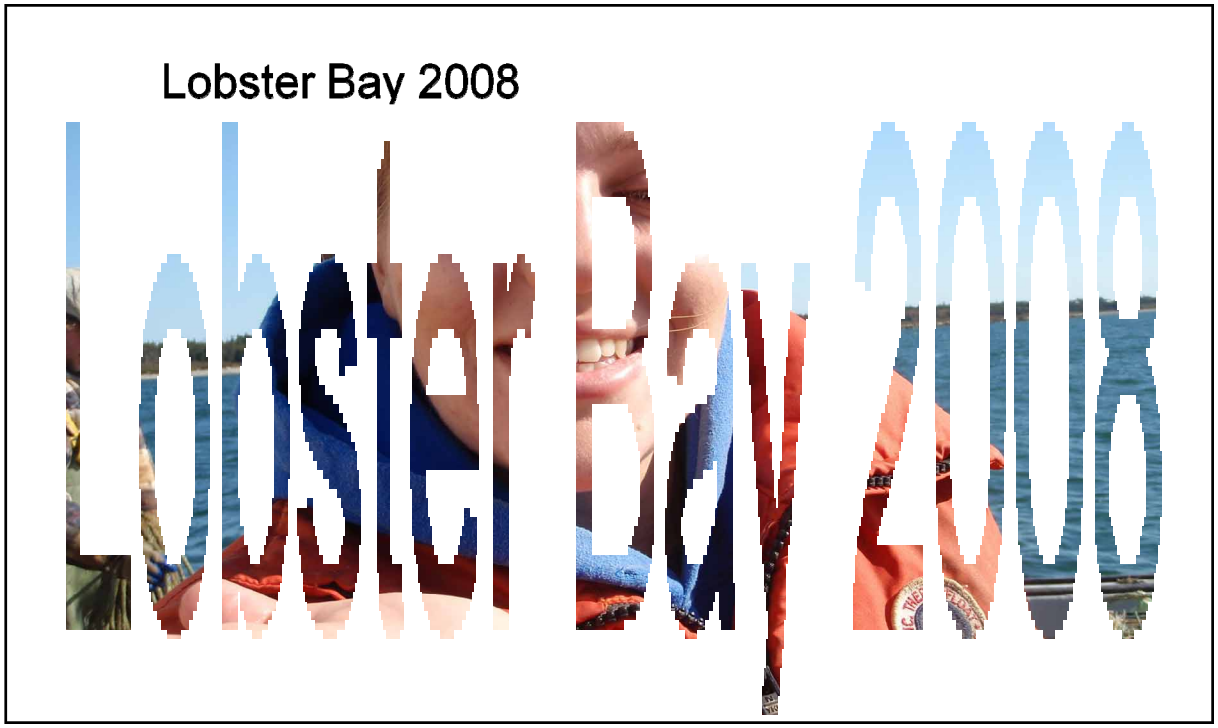
2008: No settlers less than 12 mm CL observed in suction samples

Collectors


Lobster Bay 2007

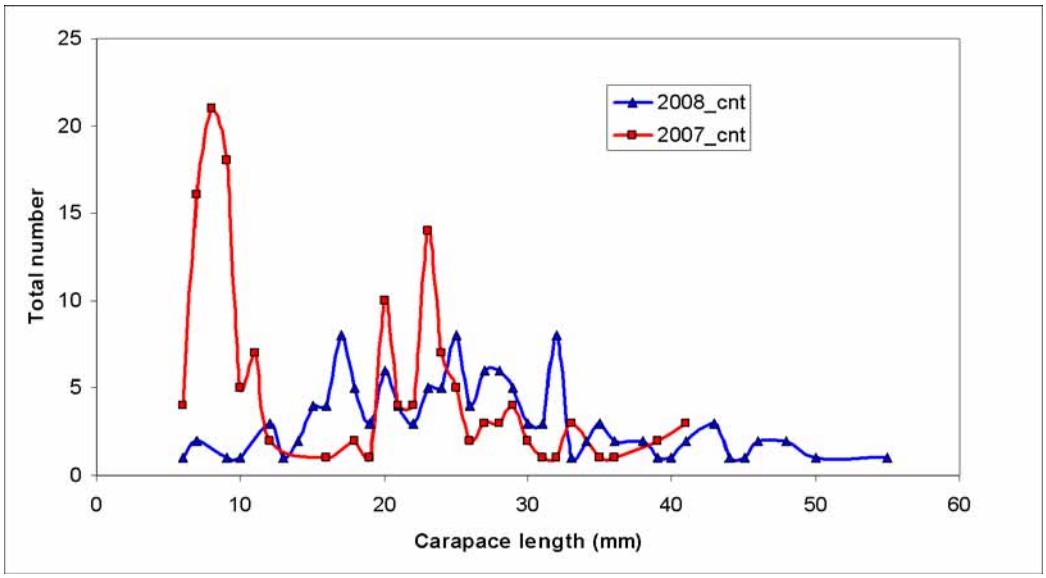

Lobster Bay 2007
Lobster Bay 2007


Lobster Bay 2008

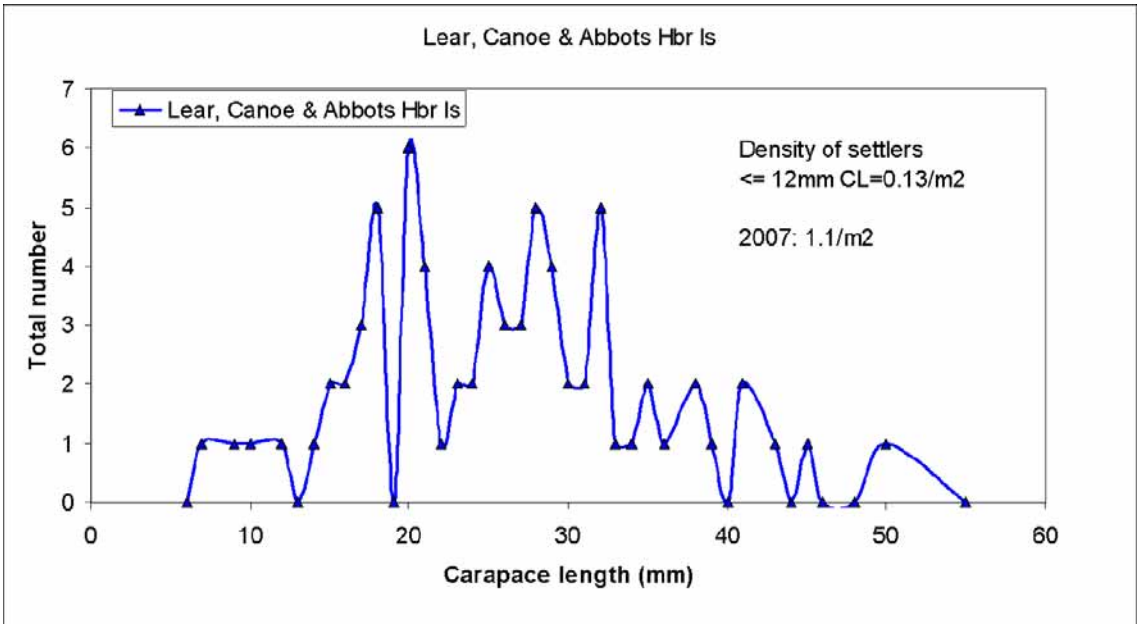

Lobster Bay 2008


2008_LobsterCollector_Biodiversity
DATE:
LOCATION:
Collector #:
Site#:
Description sample/habitat:
Collected by:

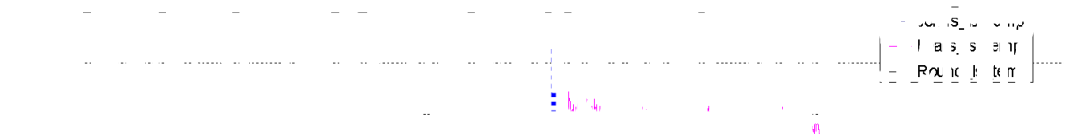

2008_LobsterCollector_Biodiversity
DATE:
LOCATION:
Collector #:
Description sample/ha
Collected by:



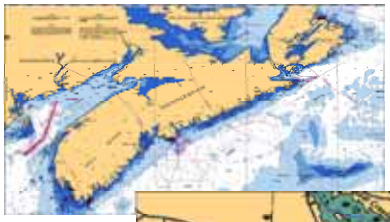
As in suction samples, few settlers < 12 mm CL

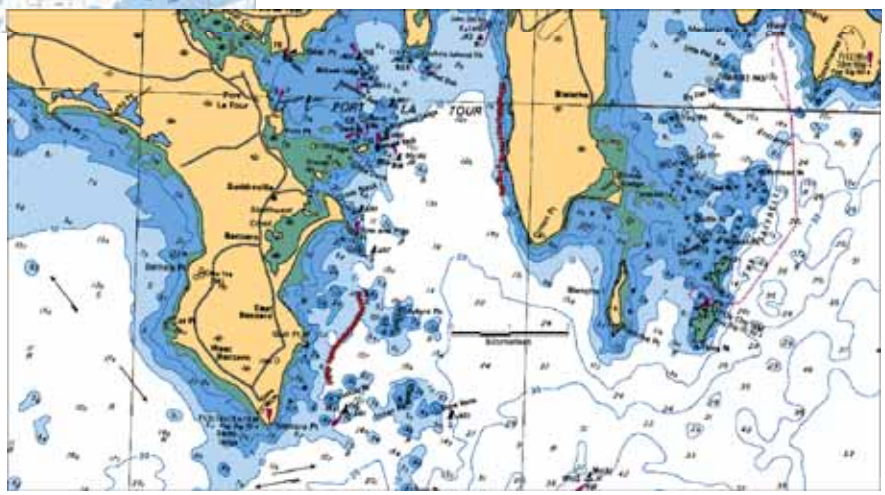


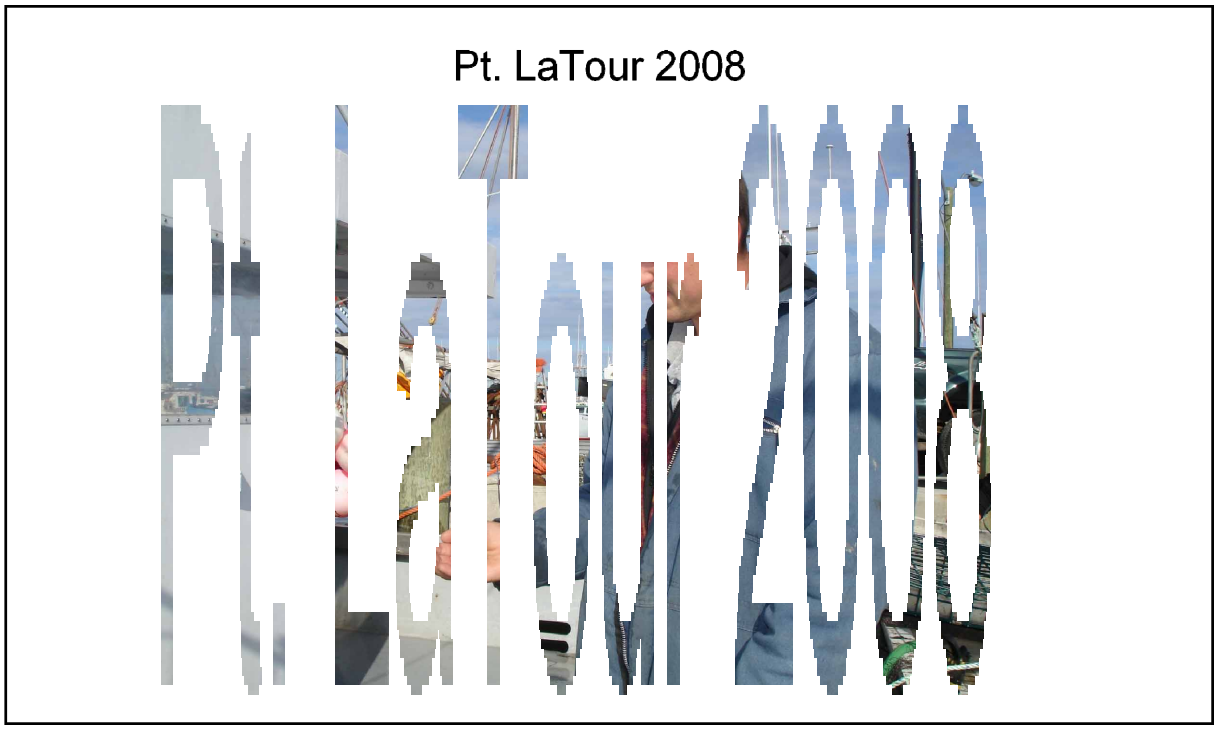
Lobster Bay bottom temperature

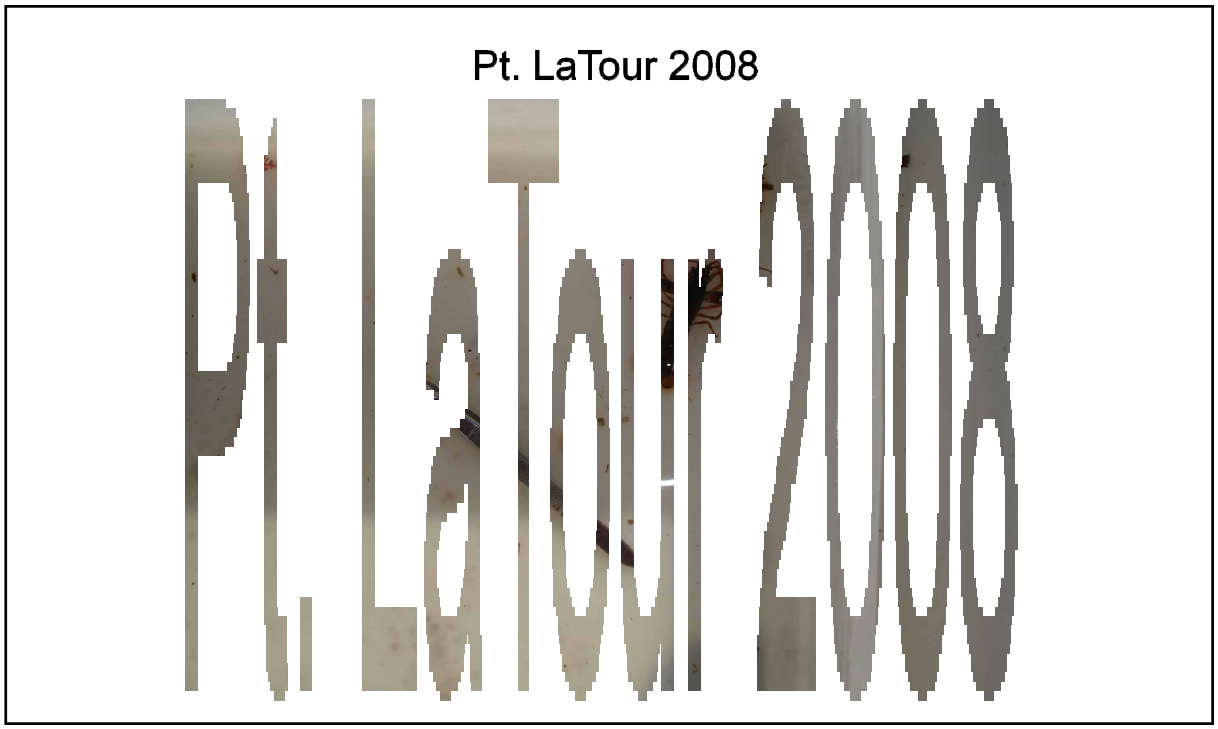


Port LaTour

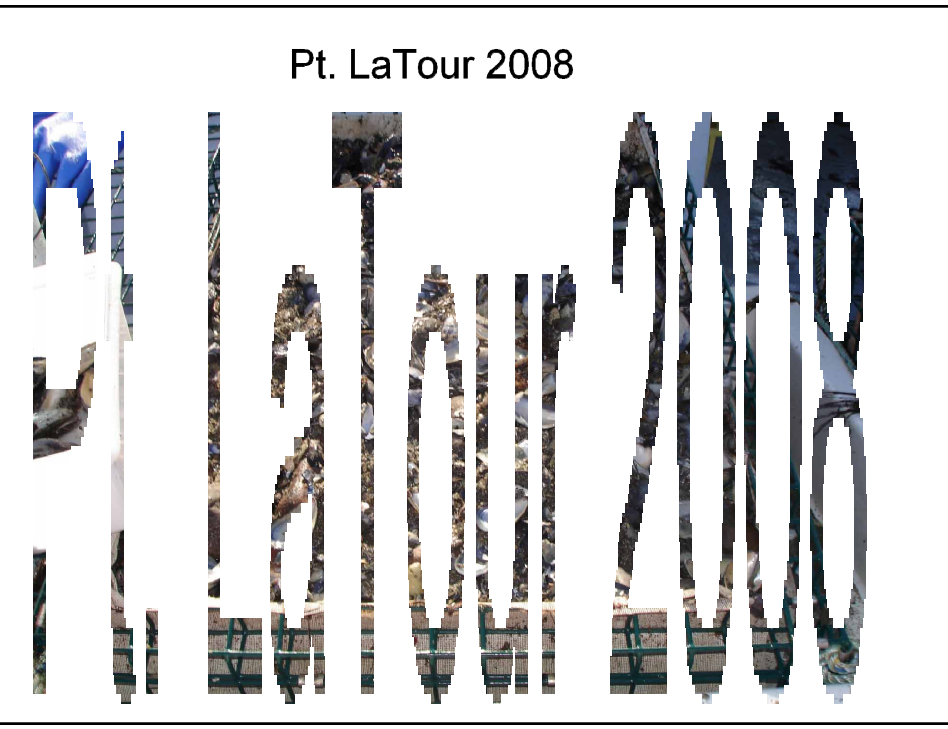


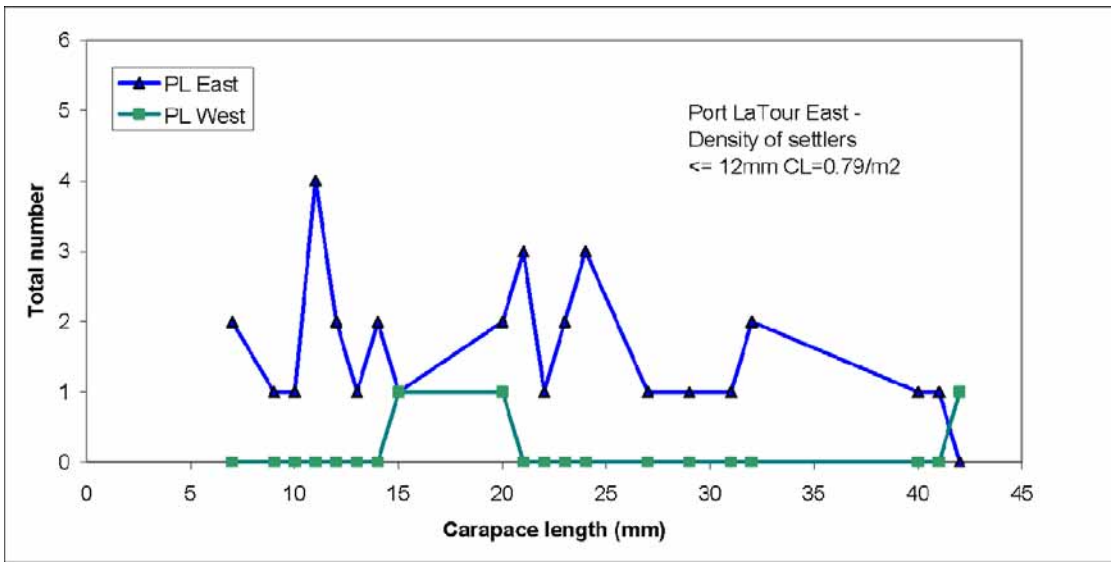


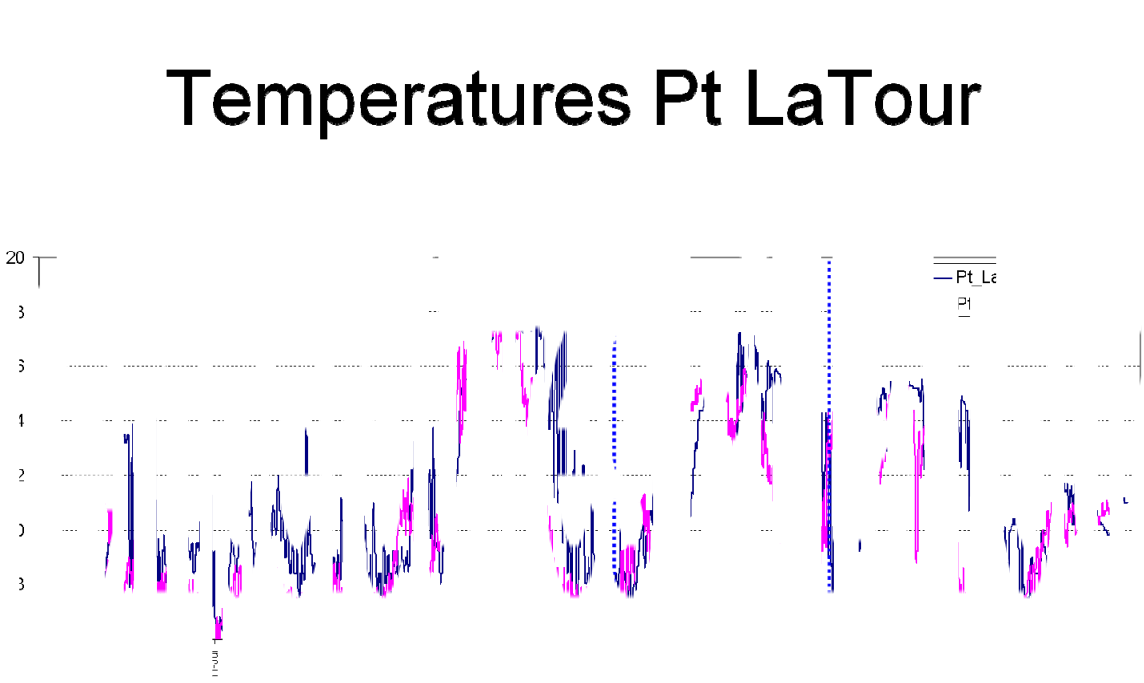

Pt. LaTour 2008
Pt. LaTour 2008

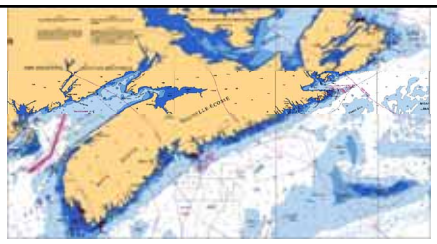

Pt. LaTour 2008
Pt. LaTour 2008


Pt. LaTour 2008

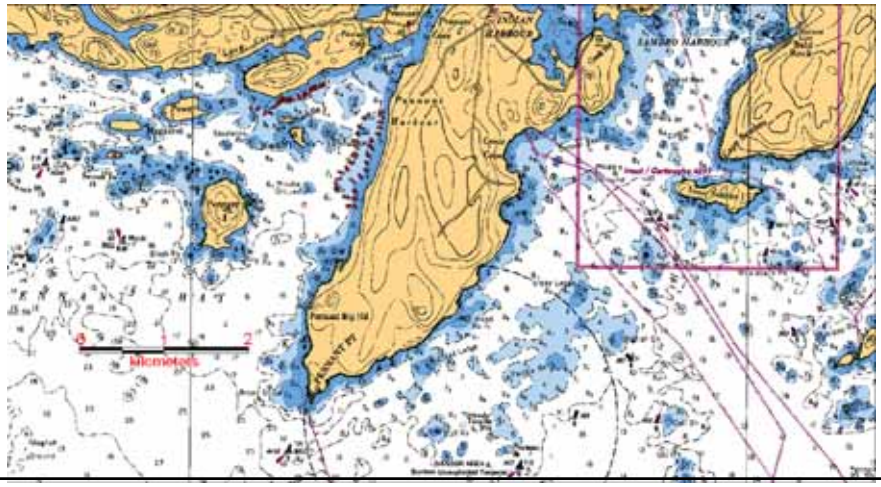

Pt. LaTour 2008


PL East
PL West
Port LaTour East -
Density of settlers
<= 12mm CL=0.79/m2
Total number
Carapace length (mm)
0
1
2
3
4
5
6
0
5
10
15
20
25
30
35
40
45

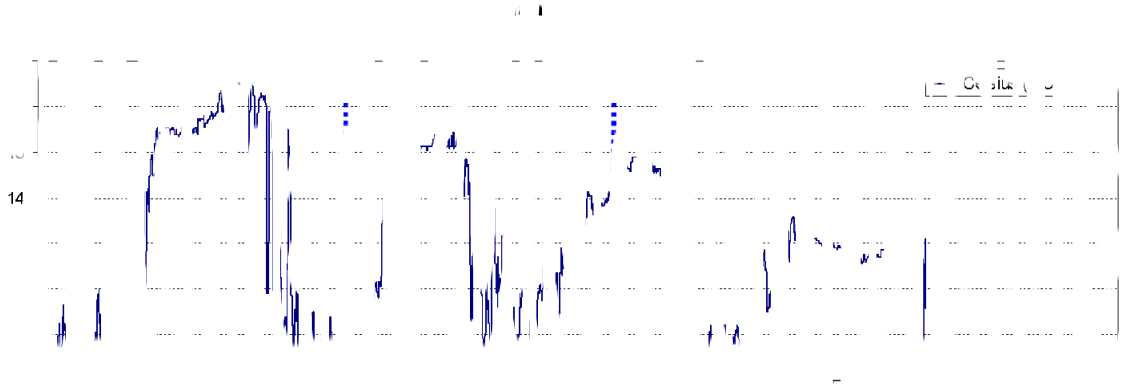

Temperatures Pt LaTour
20
Pt_La

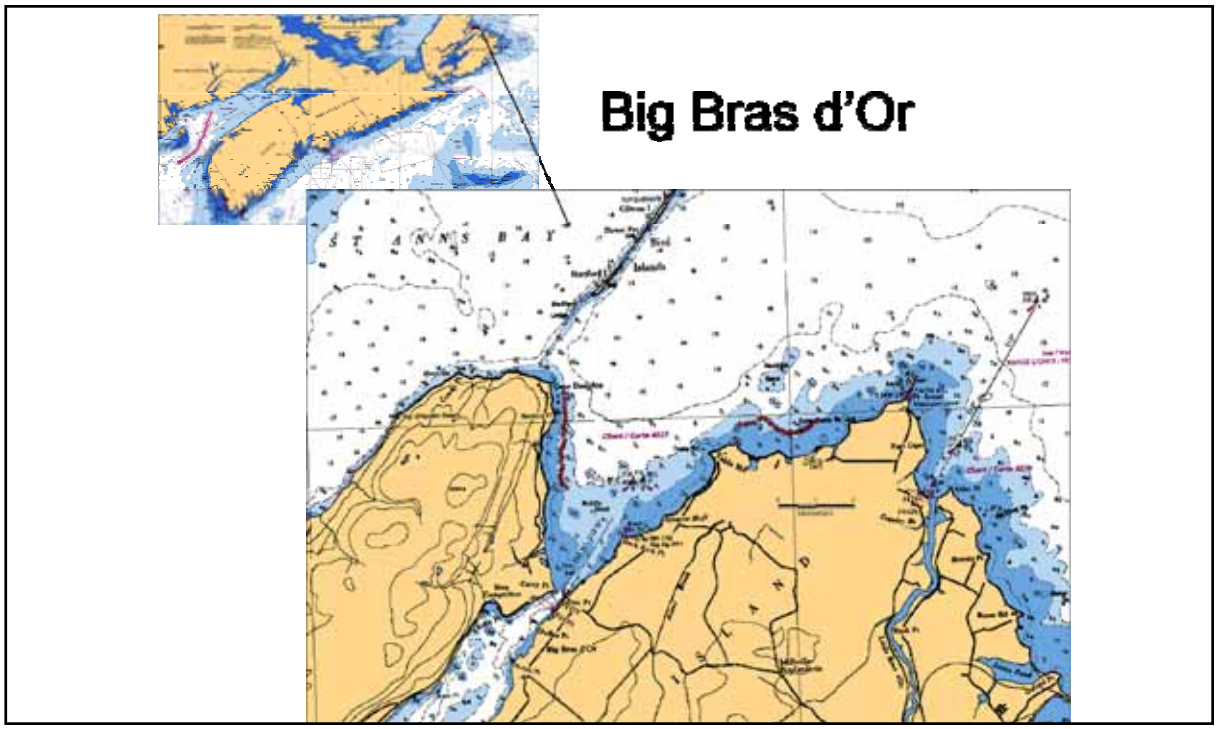


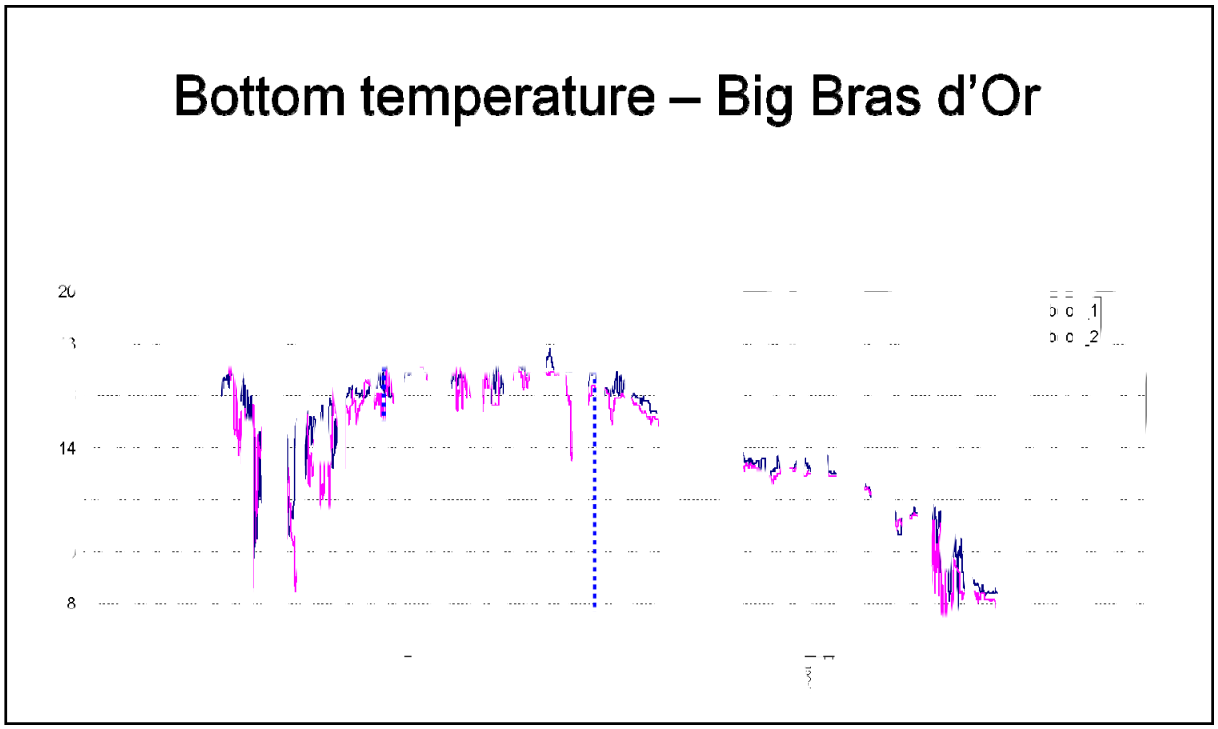
Pennant Pt

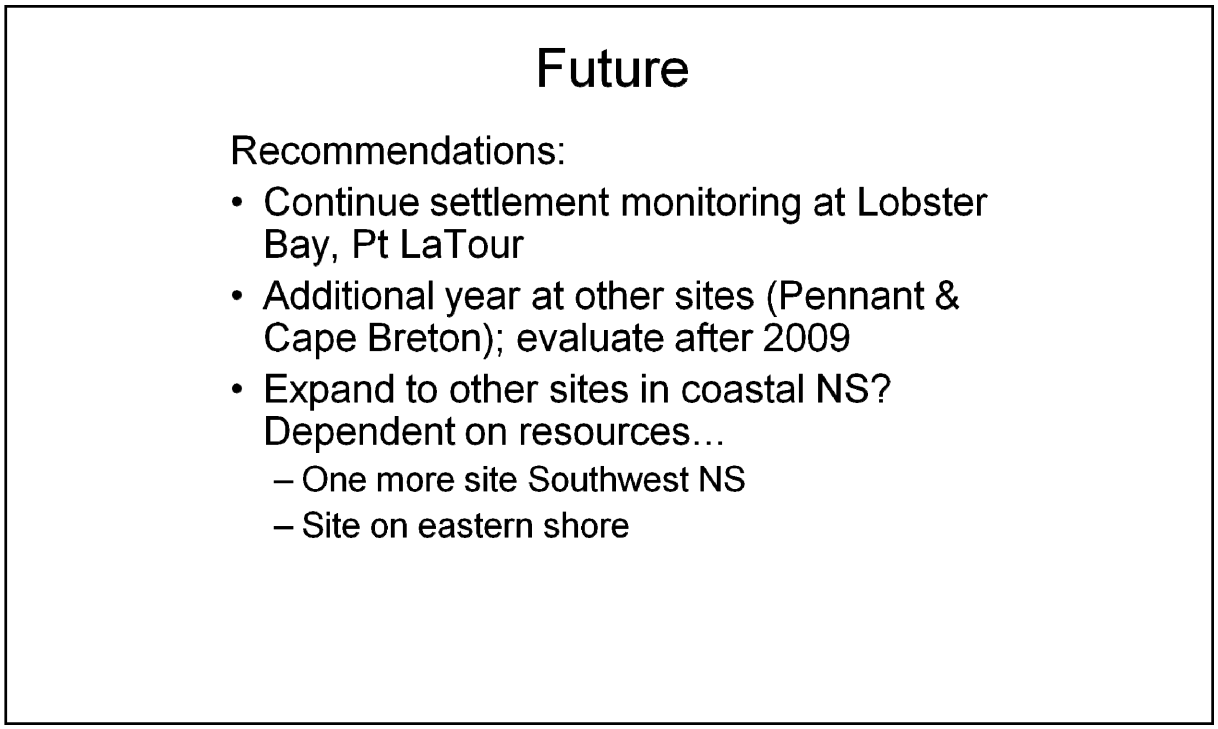


Pt Pennant bottom temperature




Big Bras d'Or
ST ANNS BAY


Bottom temperature – Big Bras d'Or
20
14
8



2.3.2 Summary

Written by Tricia Pearo, Fisheries Technician, FSRS

The Fall 2008 Issue of *Hook, Line and Thinker* (Issue 2008-4) featured an article on the Lobster Settlement Collector Project in 2008 by John Tremblay. The data from this project was presented at the Lobster Science Workshop in Truro on February 19, 2009. The following summarizes the presentation.

In the summer of 2008, a total of 288 collectors were deployed at certain locations along the coast of Nova Scotia in waters ranging in depth from 4 to 36 meters. 138 collectors were deployed in Lobster Bay (Lower Argyle) and 50 each in Port LaTour, Pennant Point and Big Bras d'Or, Cape Breton. At least one temperature gauge was attached to a collector per site. Collectors were retrieved in October until mid-November. A pullmaster winch, an overhead winch and an A frame were used in the deployment and retrieval of the collectors. Most importantly, this project could not be accomplished without the time and dedication from the volunteer fishermen.

Data was taken from each collector. This consisted of the size and sex of all lobsters and crabs, fish size, and a count of other taxa. The lobster data has been entered into a database, while the taxa data has not yet been entered.

Suction sampling was done in October, 2008 (Lobster Bay only) and fewer settlers were found compared to 2007. However, the suction sampling was done after a storm, so diving conditions were not the best.

The water temperatures varied for each location. In Lobster Bay, the temperatures were all above 12 degrees Celsius except for a period between late August and mid-September. For Port LaTour, the temperatures were lower. In early August, temperatures were below 12 degrees Celsius, where not much settlement would be expected. Temperatures around Pennant Point were more variable and lower. The bottom temperature dropped to 6 -7 degrees Celsius around September 9th to 19th. In Big Bras d'Or, Cape Breton, temperatures did not seem to be an issue since they were well above 16 degrees Celsius for the most part.

Retrieval of the collectors worked well overall. Out of the 288 collectors deployed at the 4 sites only 6 were left on the bottom. There were some difficulties in grappling in Port LaTour on the western site that was more exposed to the wind. The swells here may have caused the collector ground lines to move around. There were also challenges with retrieval in Big Bras d'Or.

Settlers were only found in Lobster Bay and Port La Tour and settlement in Lobster Bay was markedly lower compared to 2007. In Port La Tour settlement was observed on only the eastern side of the harbour in a more protected area. The low settlement on the western side of Port LaTour Harbour was likely related to low temperatures and possibly rougher sea state.

Whether the low settlement in Lobster Bay in 2008 was more typical than 2007, will require additional years of data. The Lobster Settlement Collector Project will continue in Lobster Bay and Port LaTour in 2009 and, if funding permits, Pennant Point and the Big Bras d'Or area will be sampled another year. The project may be expanded to other sites in the future given funding and interest from industry. Additional sites on the Eastern Shore and off southwest Nova Scotia should be considered. If this does happen, two teams would be needed for retrieval, as there is much time and effort to this project.

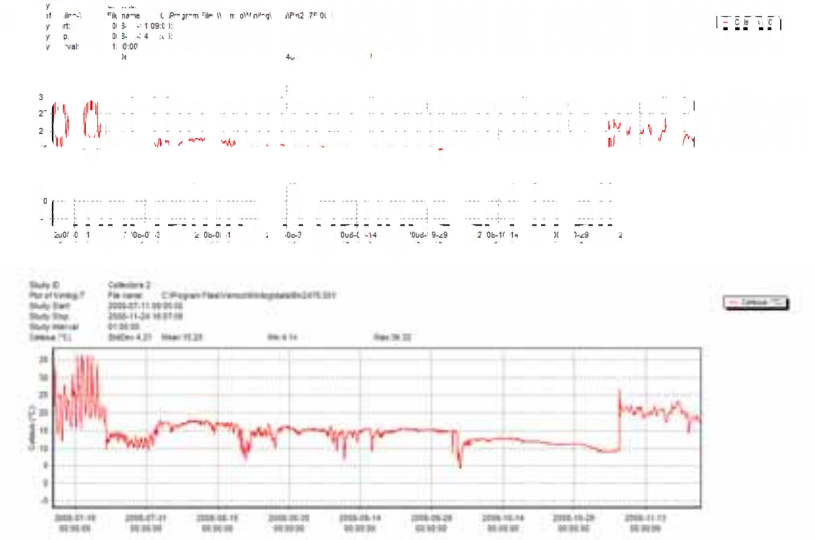
2.4 Regional Summary - GCIFA Artificial Collector Project - Canso, NS

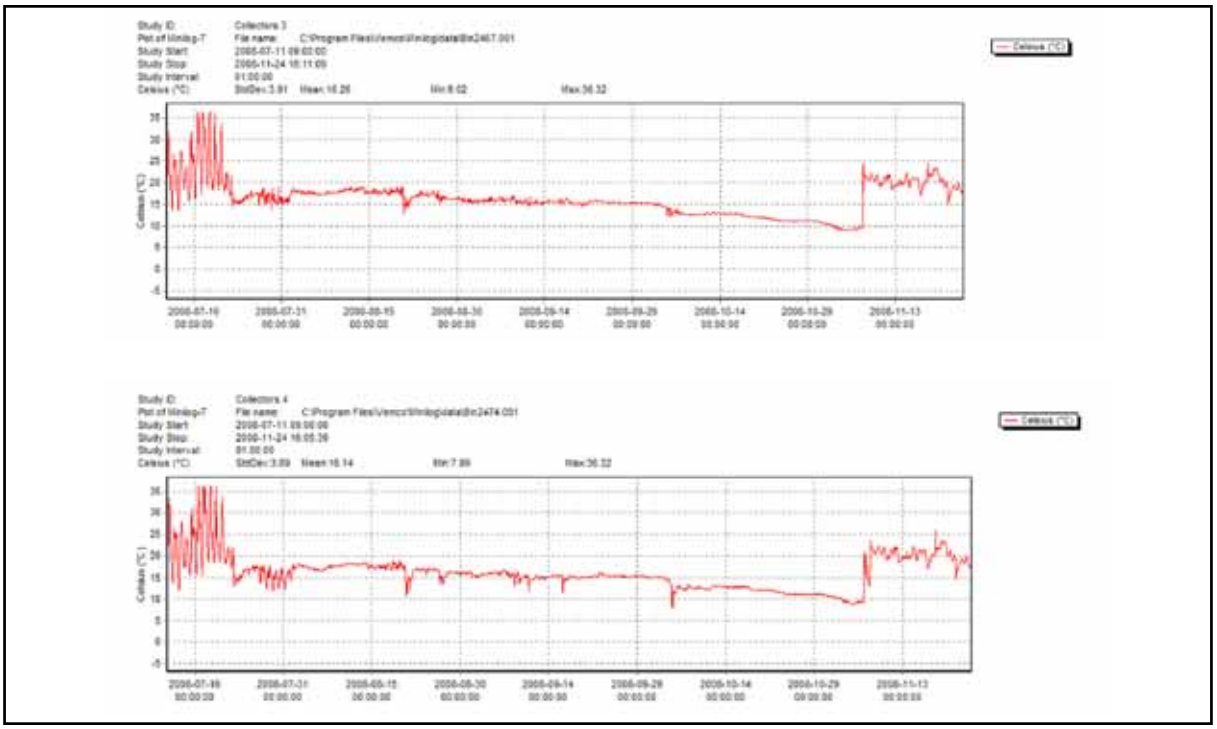
By Katherine Newell, GCIFA

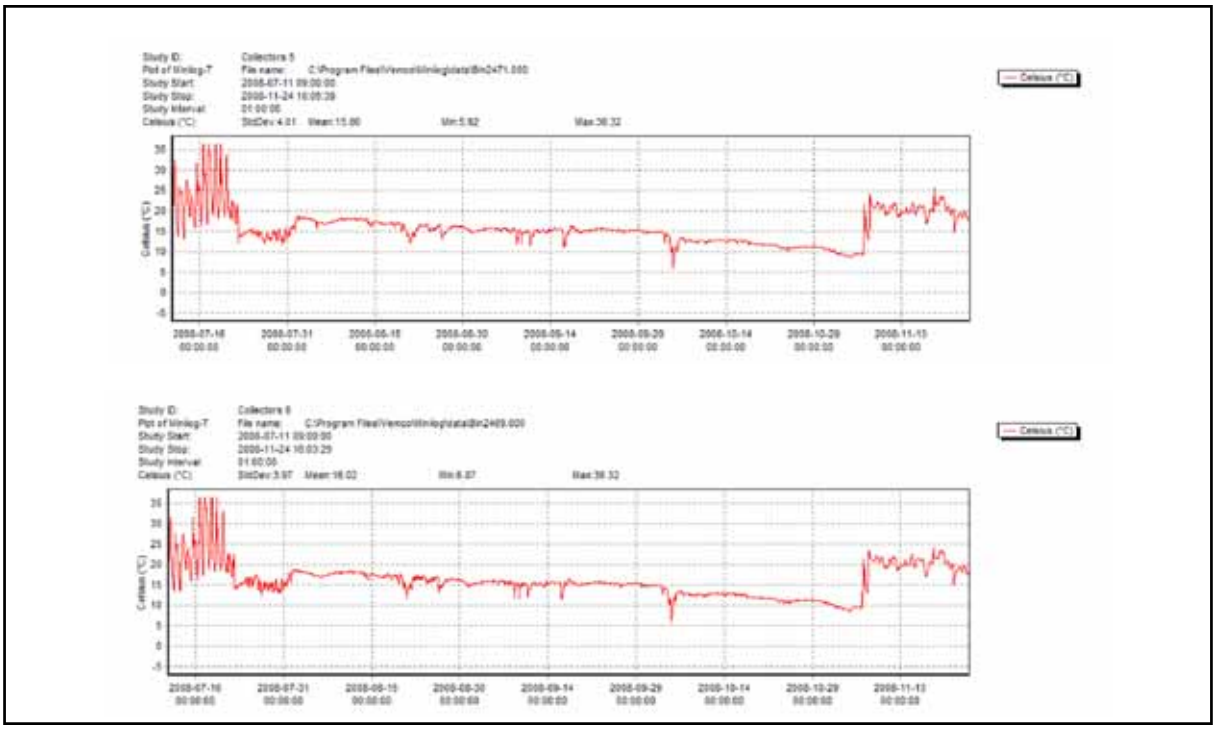
2.4.1 Presentation

- 2007 - 20 specially made collectors were purchased by the Association.
- 2008 - 31 more collectors, 50 in total
- 2009 - Add 10 more

- Temperature gauges set at each location to get the surface temperature and bottom temperature. 6 gauges set in all.





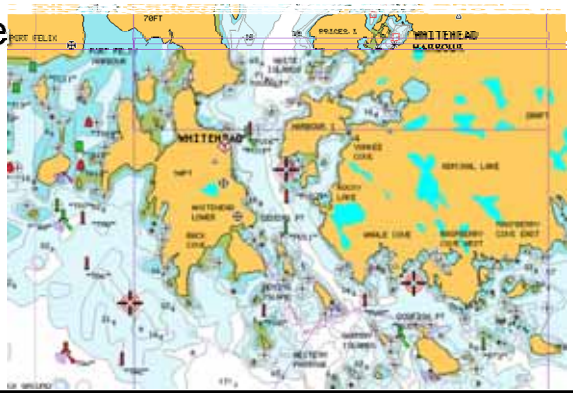


- 2 sites the same as 2007, one new sites was chosen.
- The collectors were set in July and stayed in the water until early November due to weather and wind problems.

- 2 sites the same as 2007, one new sites was chosen.
- The collectors were set in July and stayed in the water until early November due to weather and wind problems.

- In the past the Association was unable to find the amount of stage 4 lobsters that were in the water. With the collectors we hope that we will be able to round out our data.
- 2007 - One male lobster found measuring 9.8mm; 19 of the 20 collectors found. Also recorded approximately 39 other marine species

- Site 1 : Port Felix – Flying Point Shoal – 16 set in 6 ftm, rocky
- Site 2 : Whitehead – Raspberry – 10 set in 3-4 ftm, sandy/seaweed bottom
- Site 3 : Whitehead – Whitehead – 24 set in 3-6 ftm, cobble



- Found: sea urchins, shrimp of different types some were berried (3/4 inch), fish, 1 female lobster 10mm in size and was found almost at the exact same position as the lobster that was found last year.

- Added the extra rocks this year and still had the same amount of crabs as last year, also more star fish and sea urchins were in the collectors this year.
- Site 1 and 2 will be removed next year and 30 collectors in 31B and 30 collectors in 31A.

- The collectors were deployed by local fishermen using lobster fishing vessel.
- Added buoys so easier to find. Problem was had some upset.
- After the collectors were sorted the rocks were readded and taken to be stored using small truck.

- Data was taken back to BIO to be sorted, not yet completed. Using the data sheets that was provided to us.

• Data was taken back to BIO to be sorted, not yet completed. Using the data sheets that was provided to us.

- They are 2 ft by 3 ft and approximately 4 inches deep. They were lined with a fine mesh and an array of different size rocks were added to fill, weighing 250lbs. The rocks were no smaller than a fist and no larger than a grapefruit.

2.4.2 Summary

Written by Lindsay Butland, Fisheries Technician, FSRS

The Guysborough County Inshore Fishermen's Association (GCIFA) initiated an Artificial Collector Project in 2007, deploying 20 specially designed collectors from Canso, NS. In 2008, the total number of collectors deployed was increased to 50 and a further 10 collectors are to be deployed in 2009. In 2007, the collectors were deployed at two predetermined sites and in 2008 an additional site was added.

In 2008, sixteen collectors were set at Site 1, located between Port Felix and Flying Point Shoal in 6 fathoms of water in an area of rocky bottom. Ten collectors were deployed in 3-4 fathoms on a sandy/seaweed bottom at Site 2, located between Whitehead and Raspberry. Twenty-four collectors were positioned on a cobble bottom in 3-6 fathoms at Site 3, located at Whitehead. This was an increase of 30 collectors from 2007 and a further 10 collectors are to be set next year, increasing the total to 60. Temperature gauges were set at each location; temperatures ranged from 5^{o}C - 20^{o}C consistently. In 2009, Sites 1 and 2 will be removed and 30 collectors for both LFA 31A and LFA 31B will be deployed by local fishermen.

In 2007 there was one male lobster (9.8mm) and 39 other marine species. In 2008 they found sea urchins, one female lobster (10mm), various shrimp types (some were berried), fish, crab and starfish. Data was sent to the Bedford Institute of Oceanography to be sorted and analyzed. This process is still ongoing.

2.5 Regional Summary - Collectors to Evaluate Lobster Settlement and the Biodiversity of Species Settling in the Coastal Habitat - Southern Gulf of St. Lawrence

By Michel Comeau, Fisheries and Oceans Canada, Gulf Region

2.5.1 Presentation

Project funded under the Fisheries Science Collaborative Program

Partners:

Gulf Nova Scotia Bonifide Fishermen Association
Donnie and Allen MacAskill, Anthony "Chico" Gautreau (AC-HB)
David Crawford and Donnie Ross (Arisaig)
Michelle Thériault et al. (Sainte-Anne University)

Maritime Fishermen Union
Elmo Després (Shediac)

Prince Edward Island Fishermen **Association**
Robert Gallant (Bedeque) and Mervyn Misener (Covehead)

PEI Provincial Government
Robert MacMillan et al. (including AVC)

Collectors - lobster settlement and biodiversity

OBJECTIVES

1. **evaluate the level of yearly lobster postlarval settlement;**
2. **quantify the abundance (and in some instance the size-structure) of all species collected;**
3. **assess the physiological condition (RNA/DNA ratio, antioxidant, stress oxidant, genomics) of lobsters collected;**
4. **evaluate the level of postlarval lobster saturation for the collectors (end in spring 2009).**

DEPLOYMENT

22 May – 10 June 2008

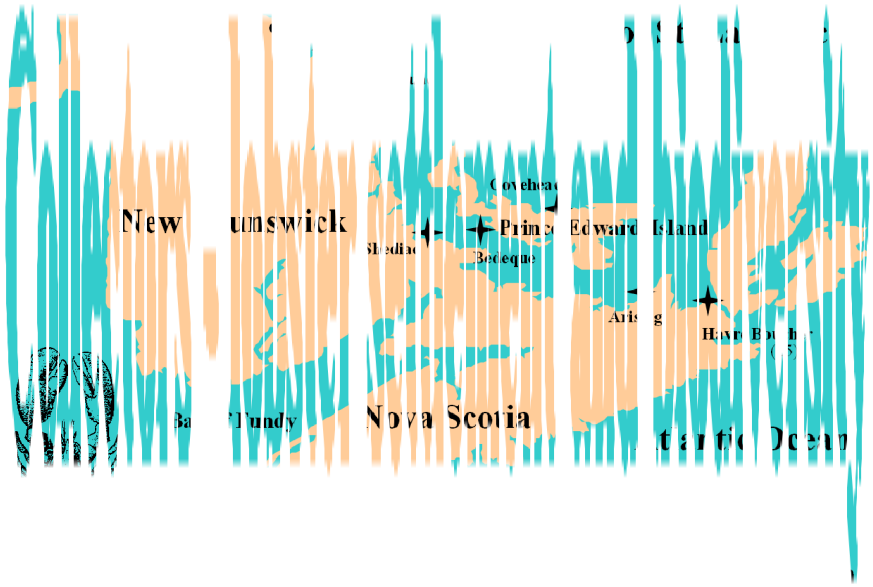
RETRIEVAL

01 October – 13 November 2008

Collectors - lobster settlement and biodiversity

Collectors - lobster settlement and biodiversity

Collectors - lobster settlement and biodiversity



Collectors - lobster settlement and biodiversity

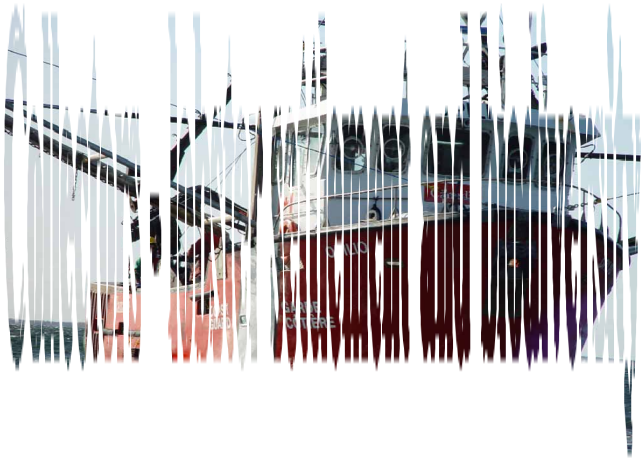
Deployed as a 5 X 6 grid.
Five collectors tied together with a buoy at each end.
Divers videotaped all collectors, verified their positioning and untied all ropes.

Collectors at the Havre-Boucher/Auld's Cove site were deployed individually with a single rope and buoy. The rope and buoy were remained attached to the collectors.

Flipped Collectors

HB/AC: 0%	**MS: 12%**	**CV: 27%**
	CR: 27%	**NG: 43%**
	SH: 20%	**BQ: 73%**

Collectors - lobster settlement and biodiversity



Divers tied each collector to an individual rope and buoy for retrieval. The condition of each collector was noted.

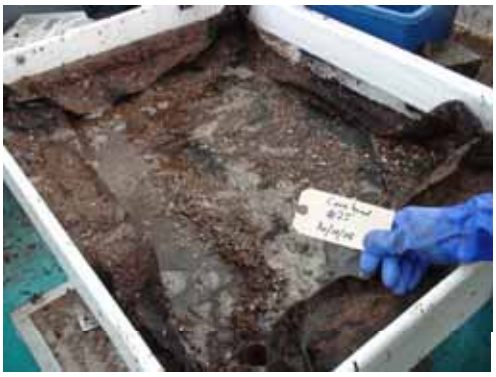
Collectors - lobster settlement and biodiversity

On Deck

All collectors were photographed
One rock was collected
Rocks were removed from collectors and cleaned with a brush

All lobsters were measured

Collectors - lobster settlement and biodiversity



On Deck

Pet screens were removed, cleaned and collected (frozen) to be observed at the laboratory.

Large fish and crustaceans were collected and frozen.

Some lobsters or lobster's parts were collected for various projects.

All species were filtered through the pet screen size strainer, collected and fixed with formaldehyde to be sorted and identified at the laboratory.

All rocks were discarded.

Collectors - lobster settlement and biodiversity

At the Laboratory

Frozen fish are measured and weighted.

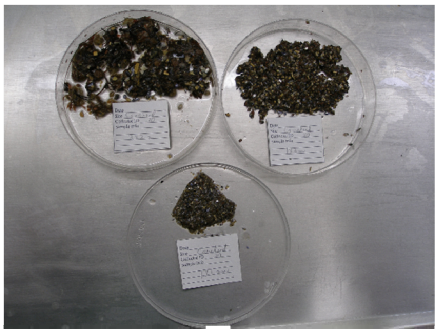
All rock crabs and mud crabs are measured and sexed.

For 6/sites
- **Species from each sample are sorted and identified**
- **Stomach contain from all fish are analyzed.**

As of February 18

Covehead, Neguac, Shediac; all 6 collectors
Bedeque, Arisaig and Caraquet; 1 collector

Collectors - lobster settlement and biodiversity



Samples fixed in formaldehyde are strained through (6/site)

(1) a 2x2 mm mesh, the entire sample is sorted and identified.;
(2) the pet screen (2x1 mm), the sample is weighted and a sub-sampled (20 g) is sorted and identified and;
(3) a 1x1 mm mesh, the entire sample is frozen.

Algae are frozen for later identification.

Collectors - lobster settlement and biodiversity

Pet screens are washed and the samples are processed similar to the formaldehyde samples.

Collectors - lobster settlement and biodiversity

Interesting Facts

Mud crab: Shediac and Bedeque
Mussels: +++ Caraquet and Neguac
Fish: cunner, radiated shanny, rock gunnel

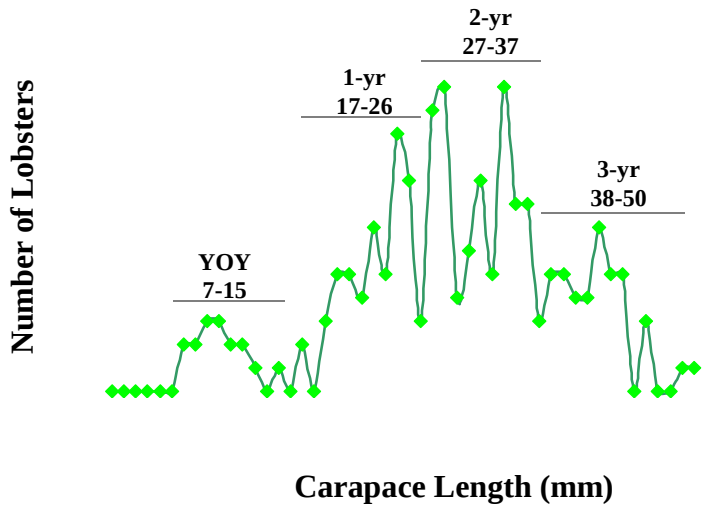
Broken shells: +++ Covehead, Shediac and Bedeque. Very few elsewhere.

Collectors - lobster settlement and biodiversity

density (ave/m^2)

Site	Set	Sampled
Neguac	30	30
Covehead	30	29
Arisaig	30	29
Maisonnette*	25	14
Caraquet	30	28
Shediac	30	30
Bedeque	30	30
Auld's Cove**	15	15
Havre Boucher**	10	9

Collectors - lobster settlement and biodiversity



Collectors - lobster settlement and biodiversity

	Lobster density (ave/m^2)		Temperature	
Site	**YOY**	**Y$^+$**	**DD**	**Ave T°C**
Neguac	0.42	4.25	1468	13.0
Covehead	0.37	2.48	1644	14.6
Arisaig	0.12	0.19	1809	16.0
Maisonnette	0.00	2.95	1624	14.4
Caraquet	0.00	2.24	1683	14.9
Shediac	0.00	0.24	1890	16.7
Bedeque	0.00	0.00	2033	18.0
Auld's Cove	0.00	0.00	1713	15.2
Havre Boucher	0.00	0.00	1819	16.1

Collectors - lobster settlement and biodiversity

To gravel or not to gravel

Site	#YOY	With gravel	Without gravel
Neguac*	8 (6,24)	3 (0.50)	5 (0.20)
Covehead	6 (5,24)	6 (1.20)	0
Arisaig	2 (5,24)	1 (0.20)	1 (0.04)
Total	16 (16,72)	10 (0.63)	6 (0.08)

FIN

2.5.2 Summary

Written by Katie McGrath, Fisheries Technician, FSRS

In the Southern Gulf of St. Lawrence, collectors were deployed by Fisheries and Oceans Canada, Gulf Region, in partnership with the Gulf Nova Scotia Bonifide Fishermen's Association (GNSBFA), Maritime Fishermen's Union, PEI Fishermen's Association and PEI provincial government, to evaluate lobster settlement and the biodiversity of species settling in the coastal habitat. The objectives of the project were to evaluate the level of yearly lobster postlarval settlement, quantify the abundance of all species collected, and assess physiological conditions of the lobsters collected, such as contaminant exposure, antioxidant, stress oxidant and genomics.

All of the 230 collectors that were deployed were filled at a local rock quarry using a standardized size of 4 - 6 inch rocks. Gravel was also added to some of the collectors (5 per location). The collectors were placed in 8 different locations: 30 collectors in Caraquet, Neguac, Shediac, Covehead, Bedeque, and Arisiag; 25 in Havre Boucher and Maisonnette. They were placed at a depth range of 5.5 - 7.5 meters in a 5 x 6 grid. For most of the locations, five collectors were tied together with a buoy at each end. The deployment was video taped by divers to verify their positioning; the divers untied all the ropes. In Havre Boucher/Auld's Cove, the collectors were deployed individually with a single rope and buoy that remained attached.

Mud crabs were found in Shediac and Bedeque. A lot of mussels were found in Caraquet and Neguac. Young-of-year lobsters were found only in Neguac, Covehead and Arisaig. The researchers found it odd not to find young-of-year lobsters in the Maisonnette and Caraquet areas since they are areas with a very good juvenile population, and a high number of walk-in (1- and 2-yr old) lobsters were observed in the collectors.

Funding has been requested in order to continue the project in 2009. The plan is to have collectors all around Prince Edward Island and to continue the collaboration with the GNSBFA from Nova Scotia.

2.5.3 Discussion

Written by Katie McGrath, Fisheries Technician, FSRS

Q: Did you find green crabs in any of your collectors?
A: No, only mud crabs in the Shediac and Bedeque areas and rock crabs in all locations.

Q: Can you describe where the gravel is in the collector?
A: Three small scoops of gravel are added to cover the bottom of the collector.

Q: Should the gravel be standardized or be left as a comparable tool?

A: Can be used as a comparable tool with proper knowledge. In the future we could look at the relationship with different amounts of sediment.

2.6 Regional Summary - Use of Lobster Collectors to Study the Growth of Seeded Stage IV Postlarvae in Gaspé (Grande-Rivière), Quebec

By Louise Gendron, Biologist, Maurice Lamontagne Institute, Fisheries and Oceans Canada, presented by Patty King, General Manager, Fishermen and Scientists Research Society

2.6.1 Presentation

Use of Lobster Collectors to Study the Growth of Seeded Stage IV Postlarvae in Gaspé (Grande-Rivière), Quebec

Presented on behalf of Louise Gendron
Biologist
Maurice Lamontagne Institute
Fisheries and Oceans Canada

Project Overview

- Collectors used during summer 2008 mainly as enclosures to follow growth of seeded stage IV postlarvae (PL) fed two different diets during their growth in a hatchery.
- Done in the Gaspé, off Grande-Rivière .
- Deployed a total of 24 collectors (12 per diet).
- Each collector seeded with 15 PL, at 5 m depth.
- Each collector covered with mesh to keep the PL inside.
- Also deployed 5 collectors, seeded them with PL but left them uncovered to see if the PL would remain in the collector.
- All collectors deployed 12 June and retrieved 8-9 October.

Results
Collectors

- Mosquito net was eaten by sea urchins and some of our PL went off...
- A number of enclosures (collectors) (at least 13) were displaced and some were overturned (6), possibly by lobster traps, and one was lost.

Results
Lobsters - collectors

- Some of the enclosures had lobsters.
- Impossible to distinguish the seeded from the wild lobsters.
- Kept all the YOY lobsters.
- PL also seeded in two enclosures kept in the lab (4 months) : 37 % survival
- May start some genetic work this year on those samples as well as tissue from the berried females that provided the larvae

Results
Natural settlement

- Know there is settlement in the area.
- Did a survey (June 2008) and found lobsters in 30 out of 33 stations (5 square meters/station) spread along 15 km of coast, for a total of 185 lobsters.
- 40 % were from the 2007 cohort and 30 % of the 2006 cohort.

No enclosure	Sediments	Quantity	Diet	state of encosure	Lobster-YOY	Lobster >1+	Lobster CL (mm)			Green Sea Urchin	Rock crab
1	shell-gravel	p *	2			1	37.14 F			9	11
2	shell-gravel	p	1	net 95 % OK	2		10.16	14.97 M		5	13
3	shell-gravel	p	2		1		12.4			20	20
4	shell-gravel	p	2		1	1	12.9	25.7 F		13	11
6	shell-gravel	p	1							18	25
8	shell-gravel	p	2							14	21
10	shell-gravel	p	1			3	19.77	36.1 M	46.2 M	16	18
14	shell-gravel	p	1			1	21.79			12	28
15	shell-gravel	p	1		1		11.19			25	28
17	shell-gravel	p	2		2		8.3	13.9		21	21
22	shell-gravel	p	1							8	18
24	shell-gravel	p	2	net 95 % OK						4	22
T1	shell-gravel	p	2							17	8
T2	shell-gravel	p	2		1		8.6			23	38
T3	shell-gravel	p	2		1	2	12	21.69 M	28.17 F	23	21
7	shell-gravel	p	1	moved						31	22
9	shell-gravel	p	2	moved						8	37
11	shell-gravel	p	2	moved	1		13.97 F			14	11
12	shell-gravel	p	1	moved						17	21
16	shell-gravel	p	1	moved		1	22.7 M			21	17
18	shell-gravel	p	2	moved						8	28
23	shell-gravel	p	1	moved						6	32
T5	shell-gravel	p	2	upside down		1	34.6 M			4	36
5	shell-gravel	p	1	upside down						6	33
13	shell-gravel	p	2	upside down		1	24.07 F			7	7
19	shell-gravel	p	2	upside down						12	17
20	shell-gravel	p	2	upside down						4	4
21	shell-gravel	p	1	upside down						0	4
T4			2	LOST							
	* 1/4-1/2" on the bottom				10	11					

2.6.2 Summary

Written by Eric Branton, Fisheries Technician, FSRS

The Use of Lobster Collectors to Study the Growth of Seeded Stage IV Postlarvae in Gaspé (Grande Rivière), Quebec project was conducted in 2008 from June until October. There were 24 collectors deployed off the coast of the Gaspé Peninsula near the town of Grande Rivière. The collectors were divided into two groups of 12. The difference between the two was the diet that the postlarvae lobsters were being fed while in a lobster hatchery. Each collector contained 15 seeded stage IV lobsters; the collectors were set at a standard depth of 5 meters. Each of the collectors was covered with a mesh lining in order to keep the lobsters within the collectors. There were also 5 collectors placed without the mesh lining to see if the lobsters would stay within the collectors. All of the collectors were placed out on June 12, 2008 and retrieved on October 8-9, 2008. There were also two collectors kept in a laboratory enclosure during the same period of time, seeded with 37% of the postlarvae lobsters.

When the collectors were retrieved there were many unforeseen problems. The netting used to cover the collectors had been eaten by sea urchins and some of the lobsters had left. Furthermore, at least 13 of the collectors had been displaced, 6 overturned, and one was lost completely.

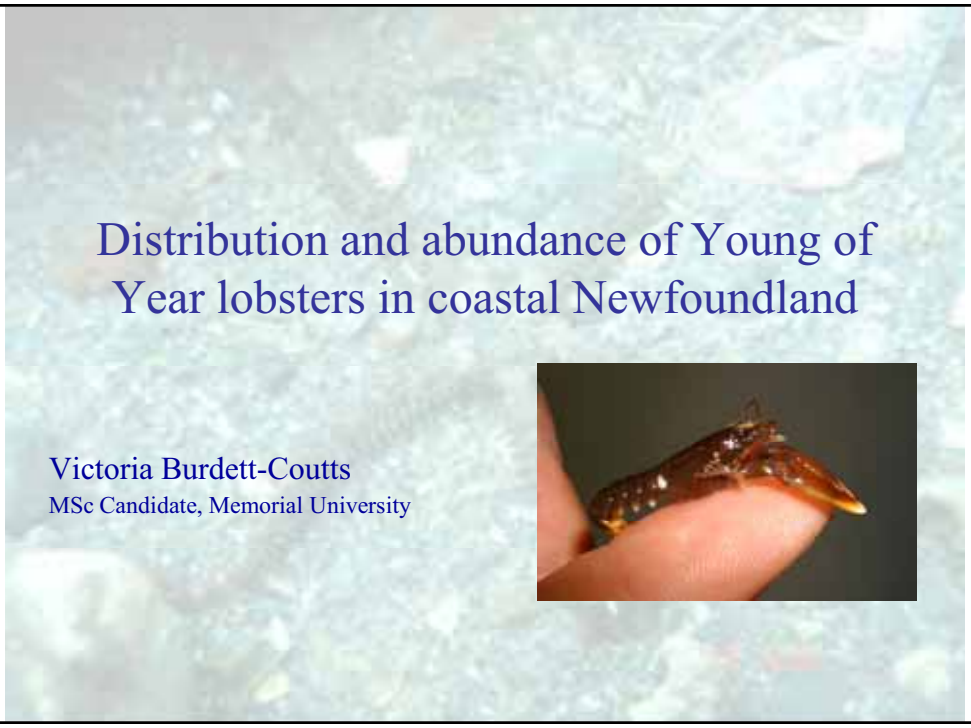
They collected all of the stage IV lobsters within the collectors but there was no way to tell the difference between the wild and seeded lobsters. There is a plan to compare the lobsters from the collectors to the ones kept in the lab and to tissue samples from the females that were used to provide the seeded lobsters. This would be done in order to figure out if the lobsters found in the collectors were wild or seeded.

The area sampled with the lobster collectors was an area of known settlement. A survey was done in June 2008. They sampled 33 stations that were 5 meters squared and spread out 15 km off the coast, and found lobsters in 30 of the stations, with a total of 185 lobsters. Out of the 185 lobsters collected, 40% were from the 2007 cohort and 30% from the 2006 cohort.

2.7 Regional Summary - Bonne Bay, St John Bay and Bonevista Bay, NL

By Victoria Burdett-Coutts, MSc Candidate, Memorial University

2.7.1 Presentation



Overview

- methodology
  - collectors
  - suction sampling
  - visual surveys
- regions
- results
- the next step

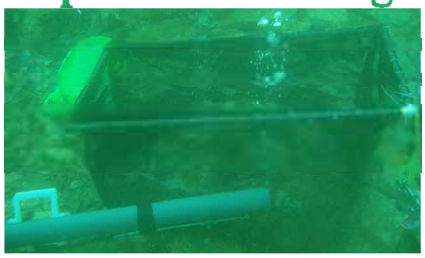
Experimental design

- collector design
  - ½ m^2
  - ~150 lbs
  - lobster wire, vexar, petmesh
- deployment
  - 3 regions
    - 2007-2008
  - 120 trays
  - local fishermen

Experimental design

- other methodology
  - Suction sampling
    - ½ m²

Experimental design



- diver visual surveys
  - 1 m²

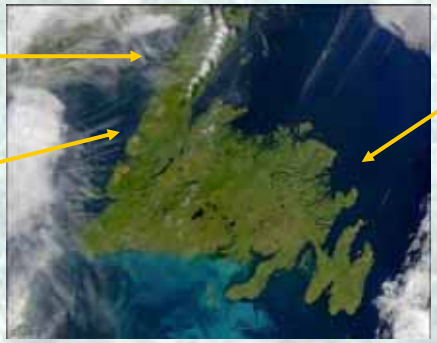
Regions

St John Bay

- collectors (2)

Bonne Bay

- collectors (5)
- suction (3)
- visual surveys (9)



Eastport

- collectors (5)
- suction (5)

Rationale

St John Bay

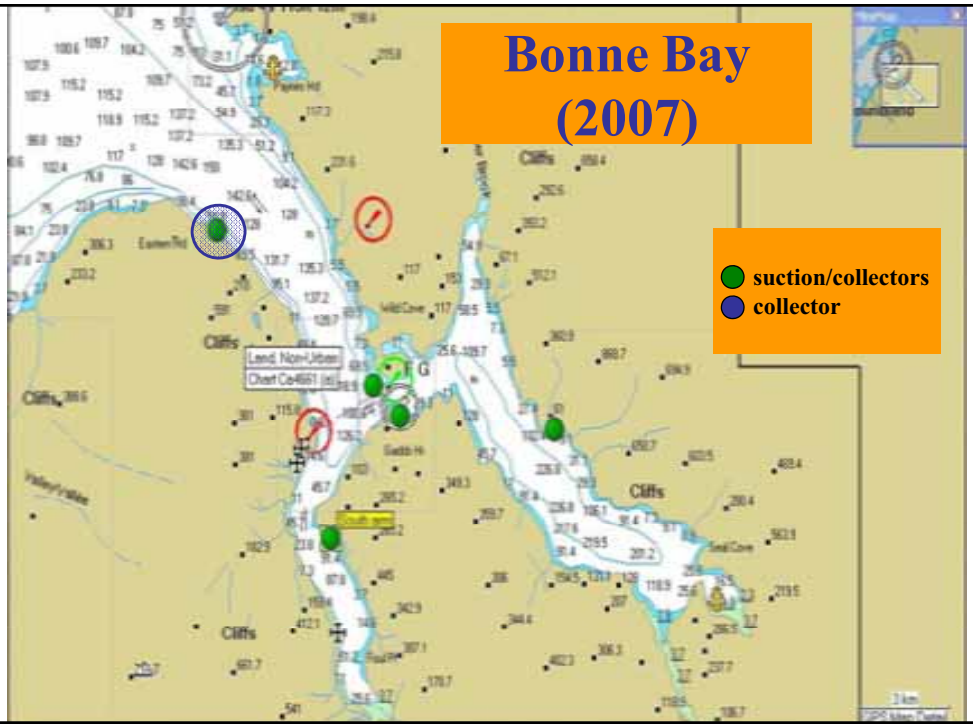
- **LFA 14B**
- **2008 - 256,272 kilos (8.4%)**
- **fisher interest**

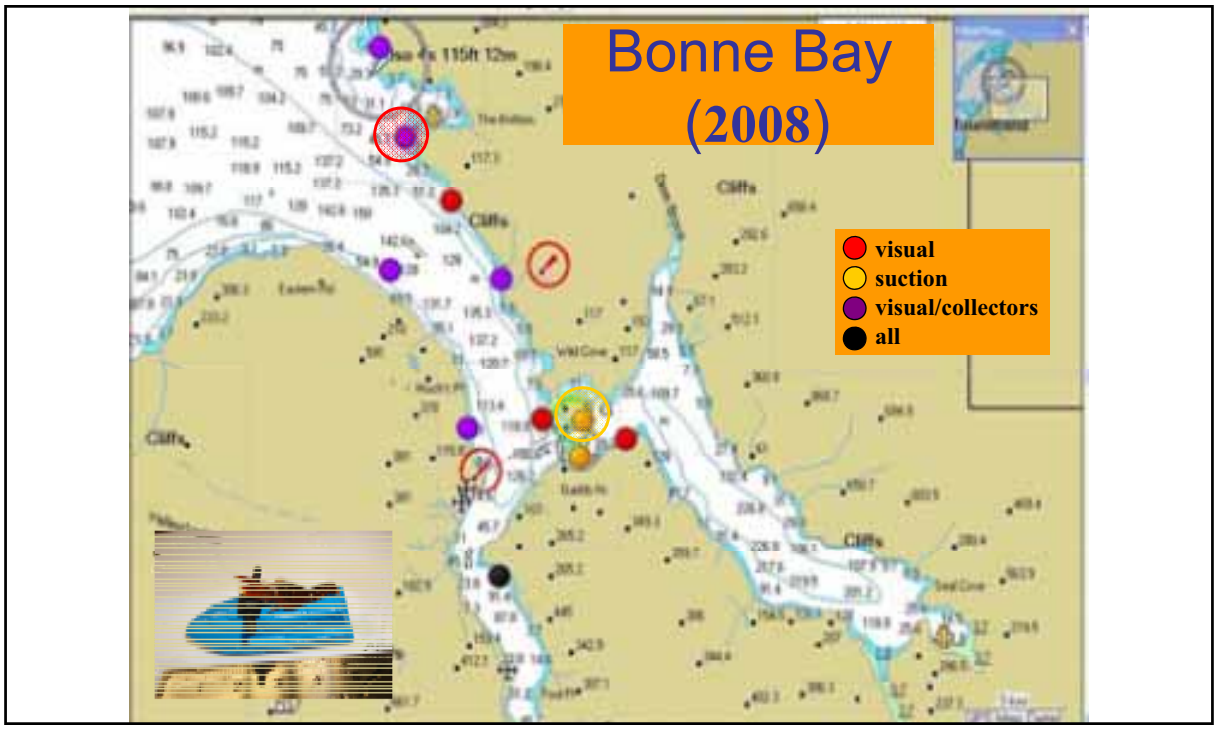
Bonne Bay

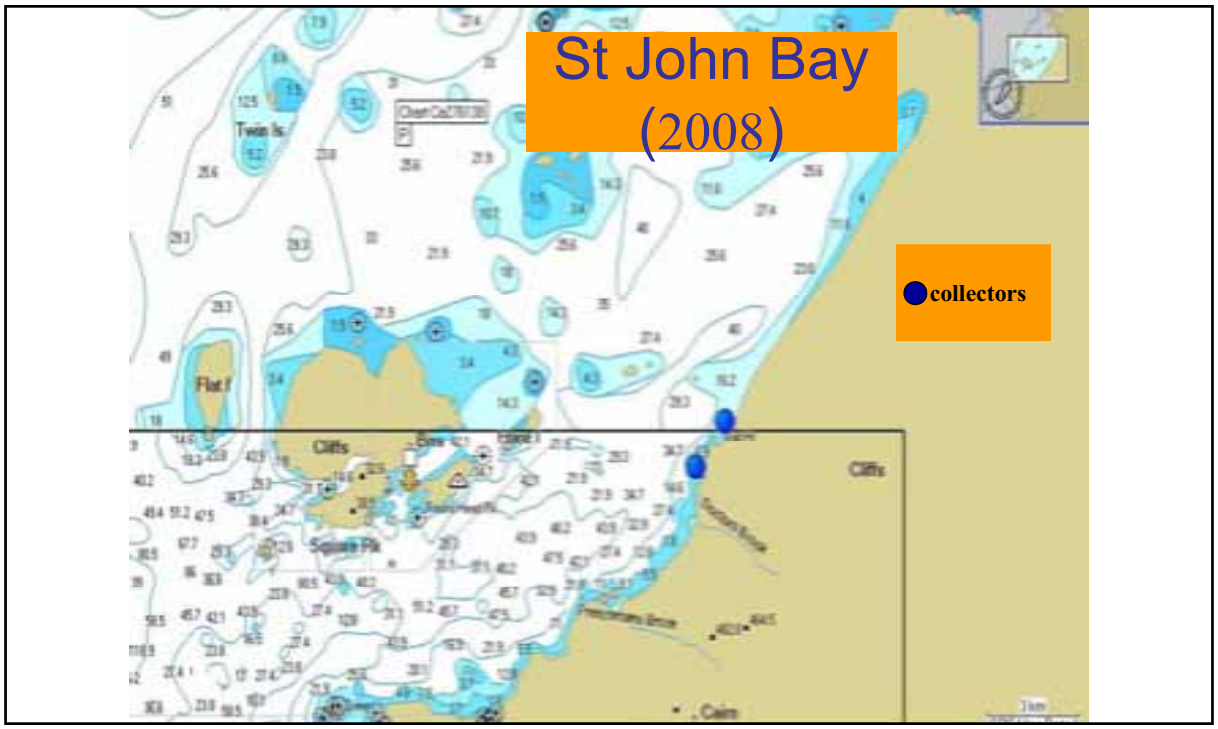
- **LFA 14A**
- **2008 - 322, 017 kilos (10.5%)**
- **marine station**

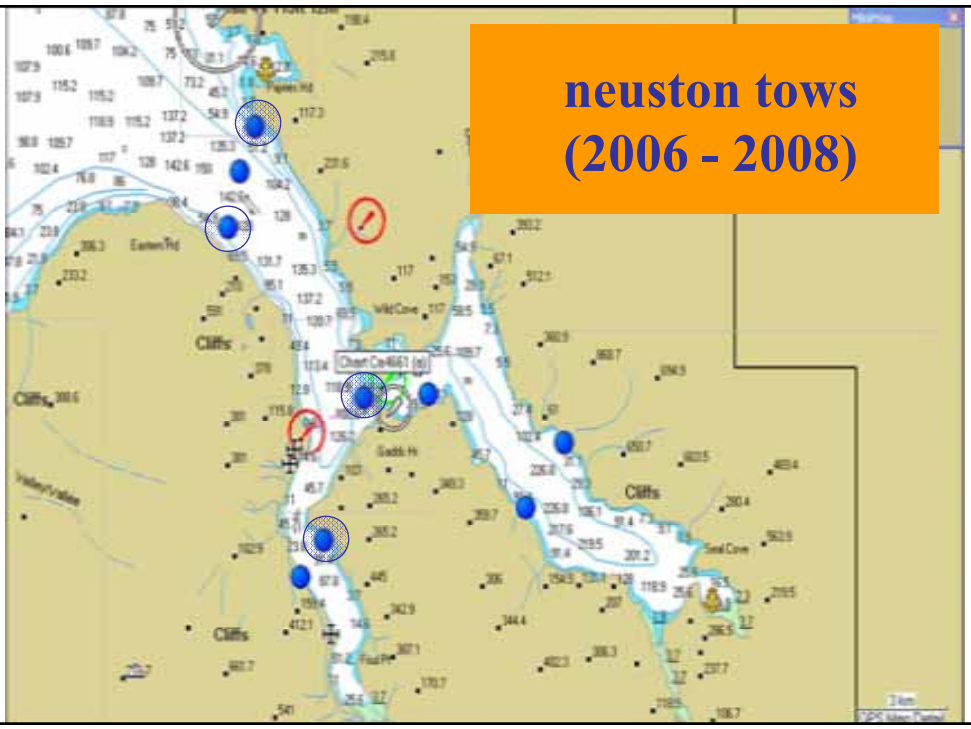
Eastport

- **LFA 5**
- **2008 – 84, 420 kilos (2.8%)**
- **MPA**




Bonne Bay
(2008)
visual
suction
visual/collectors
all
Cliffs

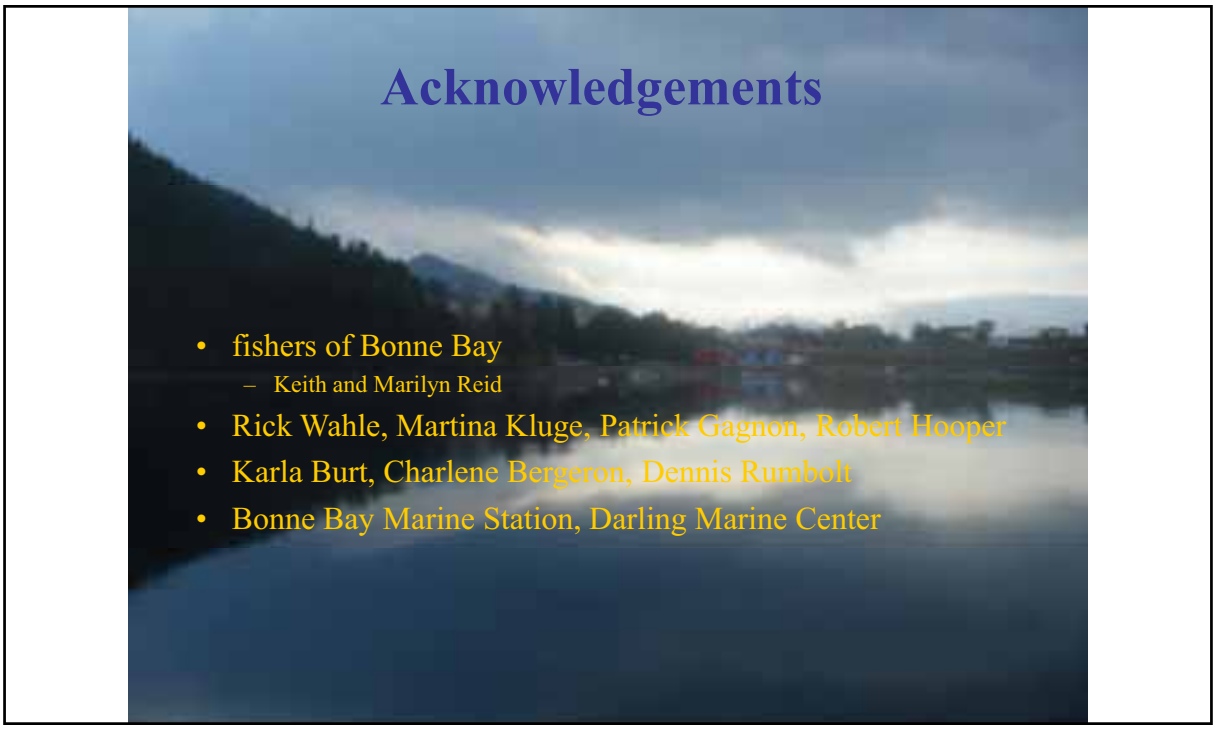

St John Bay
(2008)
collectors
Cliffs



Newfoundland Summary

- early life stages of American lobster in low abundances in Nfld
  - Needle In Haystack theory (NIH)
- studies on biographic limits of a species may be beneficial for climate change research
- interesting for regional studies of lobster distribution
- incorporation of LEK may provide jumping points for research


Hazards & Virtues of
Field work


Acknowledgements
• fishers of Bonne Bay
– Keith and Marilyn Reid
• Rick Wahle, Martina Kluge, Patrick Gagnon, Robert Hooper
• Karla Burt, Charlene Bergeron, Dennis Rumbolt
• Bonne Bay Marine Station, Darling Marine Center

2.7.2 Summary

Written by Miriam Morgan, Assistant Data Analyst, FSRS and Victoria Burdett-Coutts, MSc Candidate, Memorial University

In 2007 and 2008, Memorial University of Newfoundland (MUN) graduate student Victoria Burdett-Coutts evaluated the abundance and distribution of the early life stages of the American lobster in coastal Newfoundland (Bonne Bay, St John Bay, Bonevista Bay). This research consisted of neuston tows to sample the planktonic stages and a variety of methodologies to sample the Young-of-Year (YoY) settlers. In 2008 three different methodologies were utilized to obtain this objective; diver based suction sampling and visual surveys, and the deployment of collector trays. The collectors were of general design, covered in petmesh; each was filled with rocks that had been collected from surrounding beaches. Collectors were deployed by fishermen, with 5 sites in Bonne Bay, 2 sites in St. John Bay, and 5 sites in Bonevista Bay. Each site had between 8 to 10 collectors and all trays were deployed in 5 – 10 m below Mean Low Water (MLW). Suction sampling was carried out by using well established protocol with 3 sites in Bonne Bay and 5 sites in Eastport. SCUBA visual surveys occurred at 9 sites in Bonne Bay.

In 2008 three YoY settlers were found in Bonne Bay, one at the mouth of the Bay and two inside the Bay. No settlers were found in St John Bay or Eastport Neuston sampling in Bonne Bay from 2008 revealed significant numbers of all larval stages, with the highest numbers at the mouth of the Bay. Previous years of planktonic sampling have only revealed high numbers of stage I lobsters.

Overall it was found that early life stages of American lobster are in low abundances in Newfoundland, which is not surprising given the northern limit of this species. The potential benefits of research on the fringe of a species range may provide clues to impacts from environmental effects such as climate change. Additionally, the American lobster fishery is very important to the fishers of the province and a better understanding of its recruitment dynamics is important. Therefore there is validity in studying the northern limit of lobster.

2.7.3 Discussion

Written by Miriam Morgan, Assistant Data Analyst, FSRS

Q: How is suction sampling done?
A: Two diver process where one diver operates the suction sampler while the second diver removes rocks.

Q: Were water temperatures observed in the study?
A: Two trays per site had temperature loggers; each tray had one logger at the surface and one on the bottom. Temperature loggers were located at each site, one for bottom temperature and one for surface temperature.

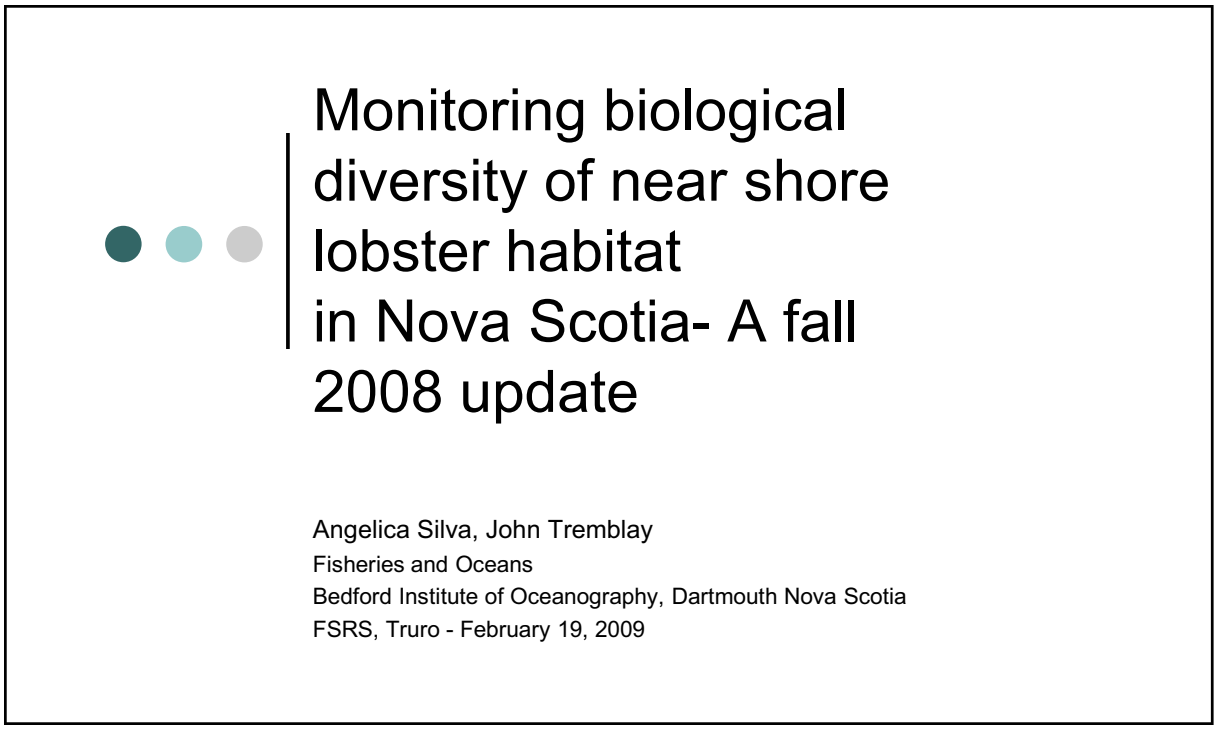
Q: Are smaller berried females due to warmer weather?

A: This has not been studied in Newfoundland, although some fishers believe that there are increasingly higher numbers of berried females and that they are berried at a smaller size.

2.8 Monitoring Biological Diversity on Nearshore Lobster Habitat in Nova Scotia

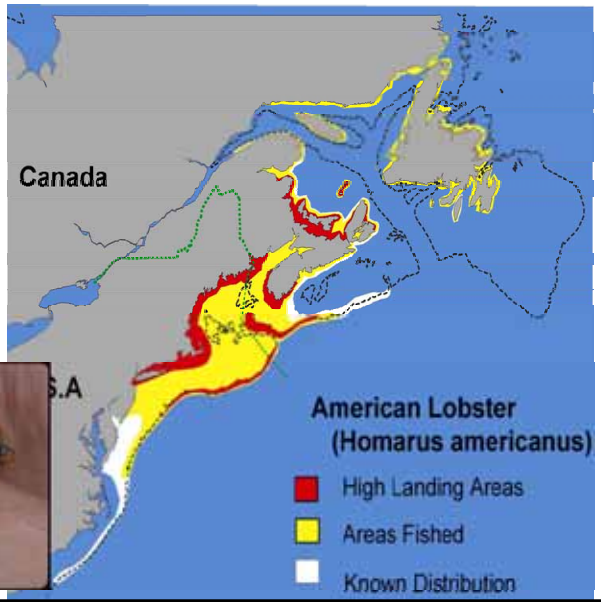
By Angelica Silva, Research Scientist, Fisheries and Oceans Canada

2.8.1 Presentation



Homarus americanus

American lobster / Canadian lobster/ Maine lobster



Background

- Scarcity of information about biological factors that might influence habitat selection by new lobster settlers in Nova Scotia
- Limited sampling of natural habitat by diving (e.g. suction sampling) to estimate associated biological diversity
- Fishing regulations protect ovigerous females and 82.5 mm as MLS for most of Nova Scotia (Maritimes region)
- Complex life history, ovigerous females release larvae after 9 months, 3-10 weeks planktonic larvae, up to 1 year on first selected bottom type, juvenile more mobile, sexual maturity within 5-12 years

Canadian Lobster Fishing Areas (LFA)

Lobster Life Cycle

Planktonic phase = 3 to 10 weeks

Stage I

Stage II

Stage III

Planktonic Phase

Stage IV Post Larvae

Benthic Phase

Early Benthic

Adolescent or Juvenile

Reproductive
(carries eggs 10-12 moths)

Juvenile lobsters become sexually mature after 6 to 12 years of growth

(D.S. Pezzack, Modified from 1995 FRCC "A Conservation Framework for Atlantic Lobster")

Why Artificial collectors for biological diversity?

- New settlers select cobble during settlement (Whale *et. al*)
- Evidence from suction sampling in Nova Scotia (Tremblay *et al*)
- Artificial collectors as additional nursery area?
- Artificial collectors a consistent sampling unit
- Monitoring window (after 3 months) could be repeated to establish baseline
- Potential as a valuable tool for long term monitoring of biological diversity with adequate protocol
- 1st year information useful to determine feasibility

Objectives 1st and 2nd year

- Define standard protocols and methods to collect information on biological diversity data for Nova Scotia project
- Identification of organisms to lowest taxa possible
- Establish baseline information for long term monitoring
- Recognize importance of broad collaboration and support from various groups and organizations
- Evaluate preliminary results to assess the value of collectors as a tool to monitor biological diversity.

- **Collaboration**

2007 /2008 Lobster Bay, Nova Scotia

– main project with 140 collectors - John Tremblay

- A joint collaboration by DFO, FSRS, Lower Argyle Fishermen. Partly funded by the Province of Nova Scotia and DFO.
- An extension of New England Lobster settlement index study from Rhode Island to Maine.

2007/2008 Others in Nova Scotia

- Sambro Glyn Sharp -/ 2008 East Pennant John Tremblay
- Whitehead - Guysborough County Inshore Fishermen`s Association – E. O'Leary
- 2008 Cape Breton – John Tremblay

- Temporal scale

- Deployment during month of July 2007/2008

- Retrieval during mid to end of October 2007/October November 2009

- Window July- October –expected lobster settlement

- Spatial scale 2007 / 2008

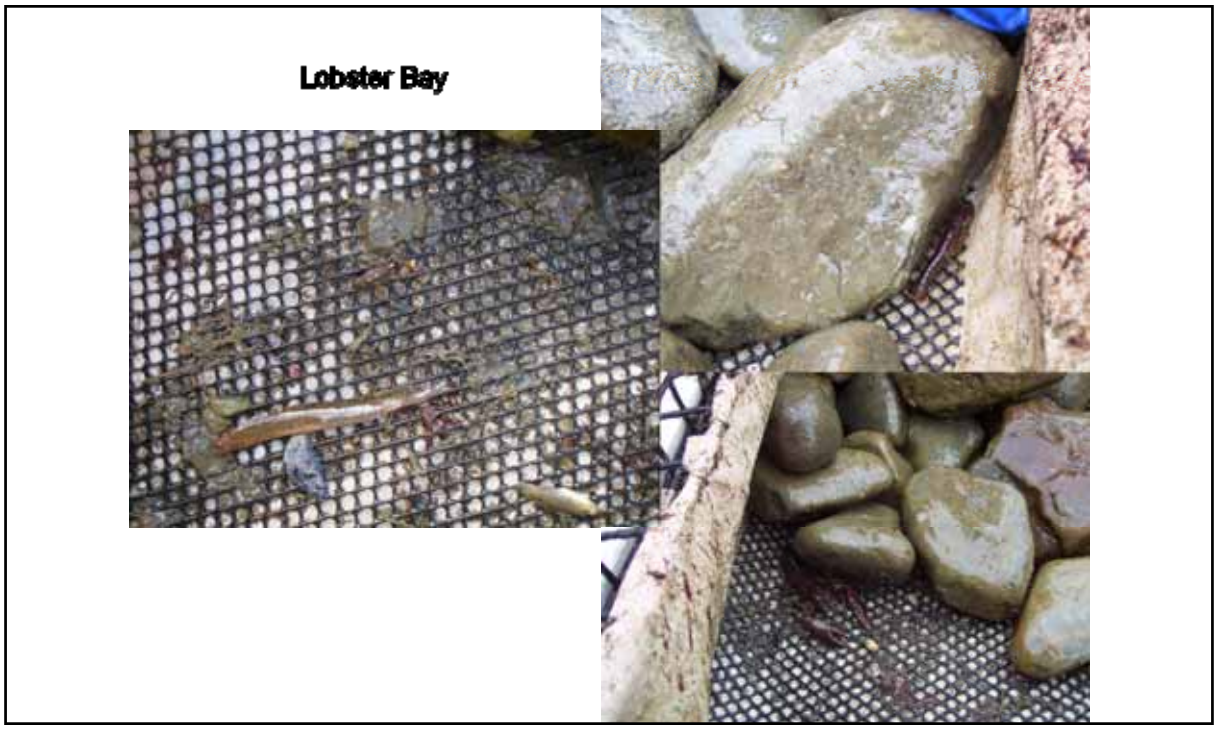
- 140 collectors Argyle (West Pubnico)/ 140 Argyle

- 40 collectors Sambro/ 40 East Pennant

- 20 collectors Whitehead / 50 (Whitehead, Raspeberry,Port Felix)

Preliminary results: from 2007

- Lobster Bay: 138/140 collectors hard substrate
  - 71 settlers <12 mm (68 at shallow sites)
  - 133 lobsters < 30 mm
  - 147 lobsters < 42 mm
  - 15 species crustaceans
  - 15 species of fish
- Whitehead : Two sites, sandy soft (10) and hard substrate (10)
  - 1 settler <10 mm in 9 collectors over hard substrate (1 lost collector)
  - Mostly juvenile stages of invertebrates and fish
    - 33 species invertebrates (24 v/s 20)
    - 5 species of fish (4 v/s 2)
    - 6 species algae, eelgrass (4 v/s 2)
- Sambro: 40 collectors
  - 1 settler in 40 collectors
- Observed: colonization of mostly mobile organisms, counted all organisms, measured only larger crabs on each collector if larger that 30 mm, recorded number of all others, fish (length).


Lobster Bay


Sorting and collecting
individual specimens

- Preliminary results
  - Argyle : 4 areas
    - Lear's Island; Canoe Island; Abbott's Harbour and Jones Island – 39 biological samples
  - East Pennant: 2 areas – no biological samples
  - Whitehead: 3 areas – 50 biological samples
  - Cape Breton: 1 area (?) – no biological samples

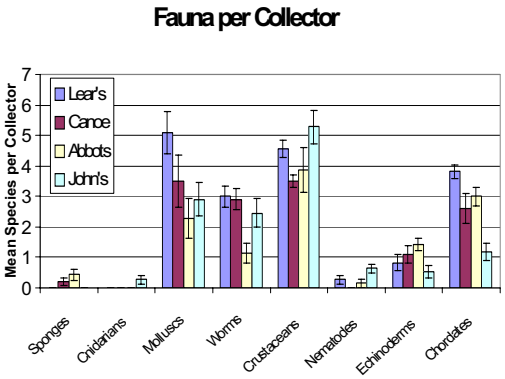
Argyle

-Biological data collected in the field for all

-Kept all fauna from 39 collectors

-All samples sorted, biomass and some identification pending

-Lears's



	John's	Canoe	Lear's	Abbot's
#species	41	39	41	31
#collectors	11	10	7	11
Molluscs	70			<10
Crustaceans	30	30	12	40
Worms	60	<30	<25	<10
Echinoderms			30	
Other phyla	250			
Fish	3	<2	<2	<0.5

A comparison of abundance of most conspicuous individual phyla At Argyle locations. Most phyla were most abundant at John's.

Whitehead

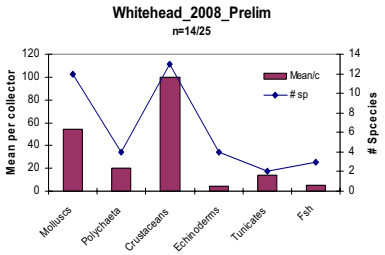
- All fauna kept, no field data collection (time limiting factor)

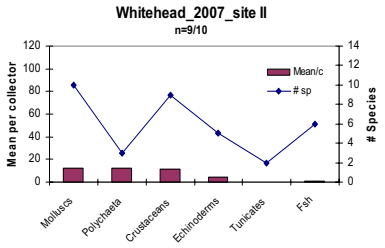
-14 samples from Whitehead analyzed to date (prelim)

- Port Felix and Raspberry yet to be analyzed

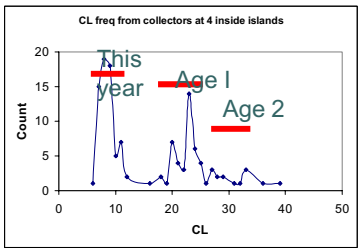
-2008 slight increase number of species, similar trend

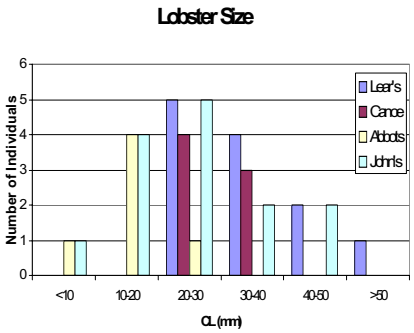
- 2008 large increase in





Size and age





2008 distribution of lobster carapace length shows that different size lobsters are found at every location, settlers were preferentially found at Abbot's.

Summary

- Preliminary results only (work in progress)
- Field collected data versus detailed sample analysis, different sources of information
- Detailed analysis will reveal baseline biological information for long term monitoring
- Uniformity of cobble is required for adequate comparisons
- Settlement of lobsters, molluscs, worms, other crustaceans, echinoderms and some invasive species (tunicates) vary with location
- Argyle sites, the most successful for lobster settlement and immigrants (Whitehead, 1 settler)
- A minimum of 3 years of data is necessary to establish a baseline.

Acknowledgements

- FSRS: Trish Pearo, Eric Brampton
- DFO: Steve Nolan, Alan Reeves, Megan Veinot
- Argyle Fishermen: Ashton Spinney, Carl Spinney
- GCIFA: Eugene O'Leary, Katherine Newell
- Dalhousie University: Kelly Haussler

2.8.2 Summary

Written by Shannon Scott-Tibbetts, Acting Research Biologist, FSRS

Angelica Silva, a research scientist from the Department of Fisheries and Oceans, gave a presentation outlining using the postlarval collectors as a biodiversity tool. There is a scarcity of information about biological factors that might influence habitat selection by new lobster settlers in Nova Scotia. There is limited sampling of natural habitat by diving to establish associated biological diversity. Postlarval collectors provide a consistent sampling unit that provides a summary at the end of a three month period.

Lobsters have a complex life cycle: berried females release eggs after 9 months, larvae remain in planktonic stage for 3-10 weeks and may be settlers for 6 months - 1 year. Lobsters reach sexual maturity within 6-12 years depending on geographic location. Since the window for lobster settlement is July-October, the collectors were deployed during July and retrieved in October/November.

Objectives for the first and second year of study were to define standard protocols and methods to collect information on biological diversity data for Nova Scotia, identify organisms to the lowest taxa possible, establish baseline information for long term monitoring, recognize the importance of broad collaboration and support from various groups and organizations, and evaluate preliminary results to assess the value of collectors as a tool to monitor biological diversity.

With help from others, DFO personnel and FSRS technicians retrieved the collectors and examined the contents. Every species in the collectors was recorded on a data sheet. Everything was washed into a net and samples were collected from 39 collectors and taken back to BIO for further examination.

Some preliminary results from 2007:

- Lobster Bay - 138 collectors on hard bottom, 71 settlers found (<12 mm), 133 lobsters (<30mm), 147 lobsters (<42 mm), 15 species of crustaceans, 15 species of fish.
- Whitehead - 10 collectors on sandy bottom, 10 on hard bottom, 1 settler (<10 mm), mostly juvenile stages of invertebrates and fish, 33 species of invertebrates, 5 species of fish, 6 species of algae/eelgrass.
- Sambro - 40 collectors, 1 settler found.

Results from 2008:

- 39 biological samples collected from 4 areas in the Argyle region (Lear's Island, Canoe Island, Abbott's Harbour, and Jones Island.
- No biological samples were collected from East Pennant or Cape Breton area.
- 50 biological samples were collected from 3 areas in the Whitehead region.

In the Argyle region, all samples were sorted but biomass and some identification is pending. Species of sponges, cnideria, molluscs, worms, crustaceans, nematods, echinoderms and chordates were found. In the Whitehead area, 14 samples have been analyzed to date.

In 2008, collectors showed an increase in the number of species per collector from 2007. This is preliminary work only. Detailed analysis will reveal baseline biological information for long term monitoring. Settlement of lobsters, molluscs, worms, echinoderms and some invasive species vary with locations. A minimum of three years of data is necessary to establish a baseline.

2.8.3 Discussion

Written by Shannon Scott-Tibbetts, Acting Research Biologist, FSRS

Q: Any plans on expanding the sampling?
A: All depends on funding for the next year. We would like to continue with the current areas to get more information.

2.9 Using Life Cycle Assessment to Understand Global Environmental Impacts of Lobster Fishing in the Gulf of Maine

By Catherine Boyd, Dalhousie University

2.9.1 Presentation

Using Life Cycle Assessment (LCA) to understand global environmental impacts of lobster fishing in the Gulf of Maine

Catherine Boyd
Dalhousie University
FSRS/GOMLF Joint Science Meeting
Truro February 19, 2009

Food Sustainability

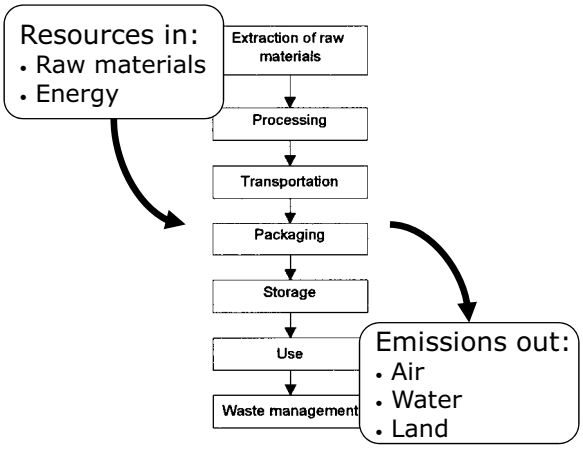
Growing Concerns

- Climate Change
  - CO_2 emissions and Carbon Footprint
- Consumer expectations, market demands
- Industry relies on natural resources in coastal areas.

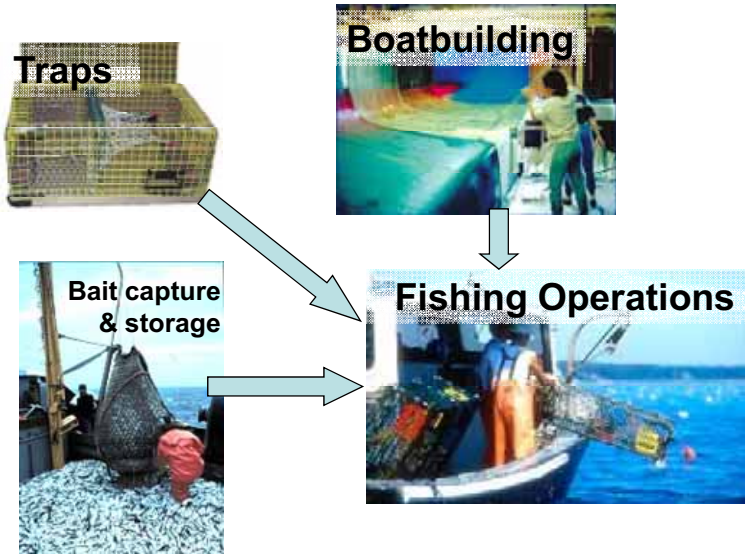
- How do we address these concerns?

Life Cycle Assessment (LCA)

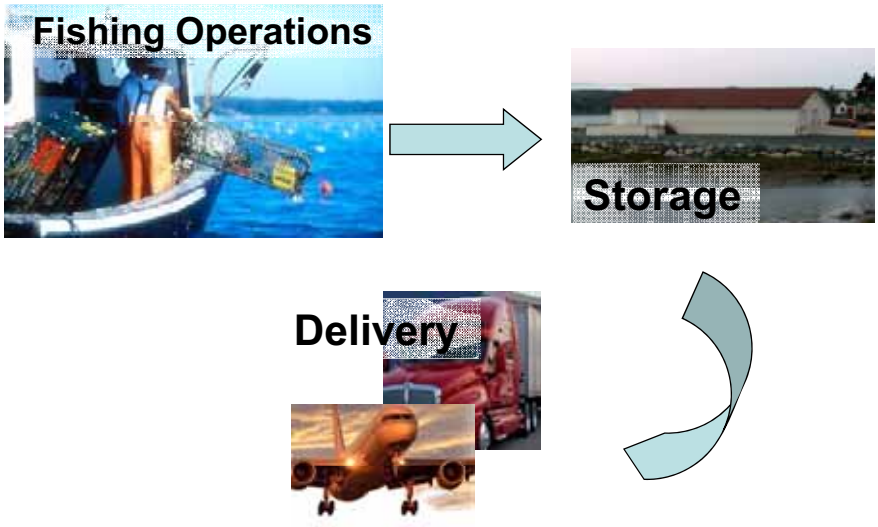
- **International Organization for Standardization (ISO)**
- **Where can we improve?**
- **Upstream and downstream changes**



What is LCA?



What is LCA?



Resources In

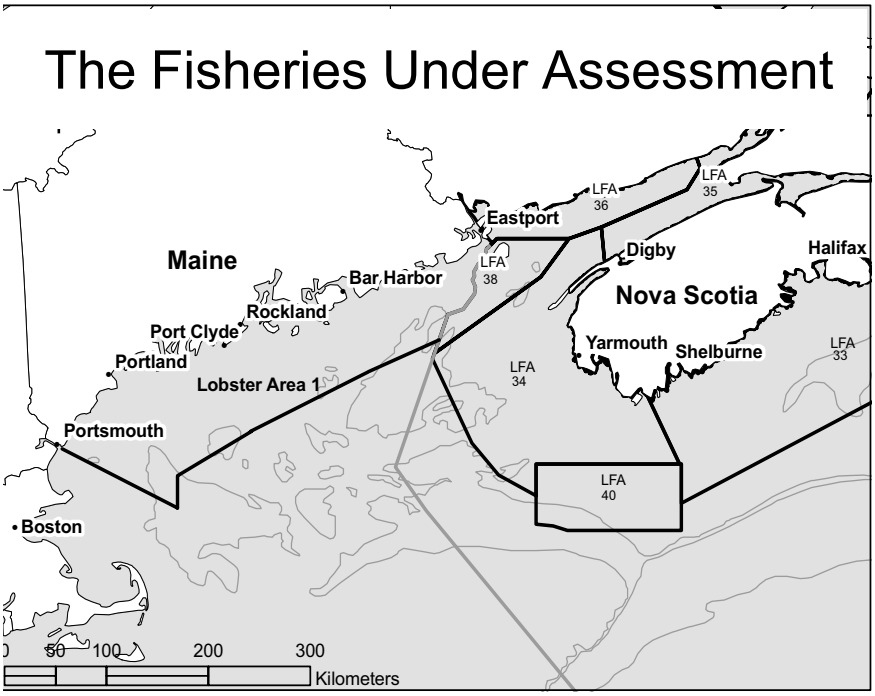
- Diesel
- Bait
- Traps (steel, PVC)
- Boats
- Electricity (Storage)
- Packaging (Styro)
- Delivery to market (air, road)

LCA Software

Emissions Out

- Climate change
- Acid rain
- Ozone layer depletion
- Energy use (MJ)
- Depletion of natural resources
  - Living
  - Non-living

The Fisheries Under Assessment



Different Management

Management Measure	LFA 34	Maine
Season	Nov-May	Year-round
Trap limit	375-400	800
# of licences (2006)	967	5,764
Limited entry	Yes	Yes
MLS	82.5 mm	82.5 mm
V-notching females	Voluntary	Mandatory
Retention of V-notch	Prohibited	Prohibited

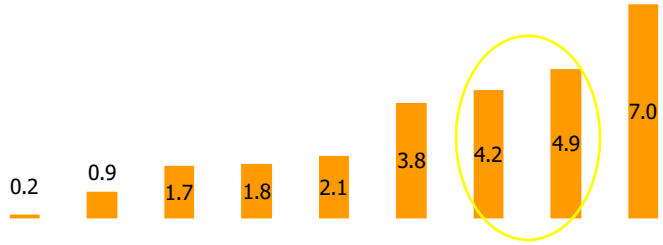
Different Operations

Operational input	LFA 34	Maine	M:34
Fuel (l/t)	1026	991	0.97
Sea days (days/t)	3.7	11.4	3.08
Bait			
Amount (t/t)	1.06	2.97	2.80
Variety	Fresh frozen	Salt	n/a

Different Carbon Footprint

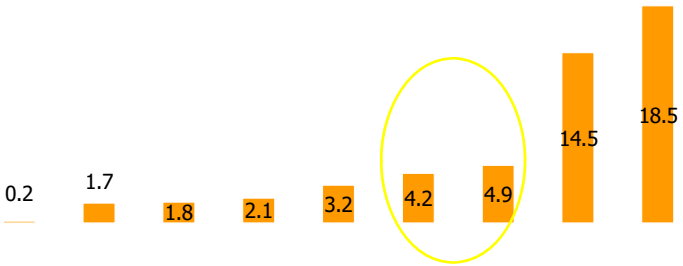
kg CO_2 eq	LFA 34	Maine
Boat & Traps	100	160
Bait	725	1,580
Diesel	3,342	3,230
Total	4,168	4,913

How do other fisheries compare?



Sources: Ayer & Tyedmers (2006), Hospido & Tyedmers (2005), Ziegler (2006), Ziegler et al (2003)

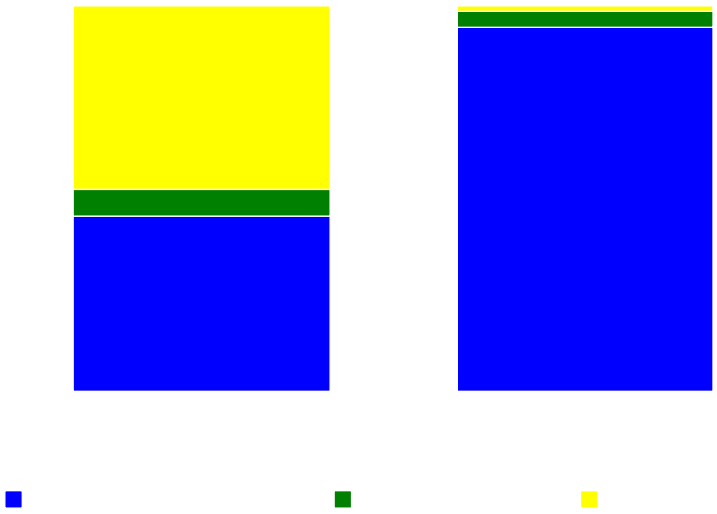
How do other foods compare?



Sources: Tyedmers et al (in press), Ayer (2006), Ziegler (2006), Nemry et al (2001)

Carbon Footprint

1 tonne live lobster delivered



Final Thoughts

- Consideration of broader environmental implications
- Striving for efficiency:
  - Shift away from fossil fuels (all phases)
  - Move away from live options
- Challenges:
  - Multi-jurisdictional
  - Many individual players

Thank you

Without the participation of many fishermen and industry participants this research would not have been possible.

Natural Sciences and Engineering Research Council of Canada

DALHOUSIE UNIVERSITY
Inspiring Minds

Discussion & Questions

Photo: Emma Point

2.9.2 Summary

Written by Eric Branton, Fisheries Technician, FSRS and Catherine Boyd, Dalhousie University

A life cycle assessment (LCA) is a study of the resource inputs and environmental repercussions (such as a Carbon Footprint) of the entire life cycle of a product, through any resource extraction, processing, transport, use and waste treatment phases. When undertaking an LCA of the lobster industry, an assessment must include an evaluation of the construction of lobster boats and traps, fishing for the directed species and any species used as bait, as well as storage and transportation of animals once they are landed at the wharf. All of these industry components must be taken into account because they all require natural resources and have impacts on the environment. This study compared the different impacts associated with lobster fisheries in the state of Maine and in Canada's Lobster Fishing Area (LFA) 34. These two fisheries were compared because both take place within the Gulf of Maine, and target the same lobster biomass. However, the two fisheries are very different in some respects. For example, the Maine fishery is open all year while LFA 34 is open during the last week of November until the end of May. Maine has a trap limit of 800 while LFA 34 has a trap limit of 375 for part of the season and 400 for the remainder. Although both fisheries are limited entry, there are far fewer licensed fishermen in LFA 34 (967) than in Maine (5764).

To compare differences in operations of each fishery, inputs for both areas were quantified and compared. Table 1 compares operational inputs to the fisheries in relation to a tonne of lobster landed to the dock:

Table 1: Comparison of operational inputs to the lobster fisheries in Maine and LFA 34

Operational input		LFA 34	Maine	Maine : LFA 34
Fuel l/t		1026	991	0.97
Sea days (days/t)		3.7	11.4	3.08
Bait	Amount (t/t)	1.06	2.97	2.80
	Variety	Fresh frozen herring	Salt herring	

Fishing operations in both Maine and LFA 34 used about the same amount of fuel in order catch one tonne of lobster. The Maine fishermen used almost three times more bait and spent approximately three times as many days at sea as the fishermen in LFA 34. The reasons for these efficiency differences in fuel, bait, and days at sea are not fully known. However the different management measures - such as season closures and trap limits – as well as different fishing strategies – such as distances traveled from port to the fishing grounds - could account for operational differences.

Different environmental impacts can be measured once the operational inputs are taken into account. The remainder of the presentation focused on how operational inputs could be translated into a carbon footprint – a measure to indicate the level of greenhouse gases attributable to a product or system. Table 2 gives the amount of greenhouse gases attributed to each stage of the fishing operations measured in kilograms of carbon dioxide equivalents.

Table 2: Greenhouse gases associated with different aspects of lobster fishing in LFA 34 and Maine measured in carbon dioxide equivalents (CO_2 eq)

Kg CO_2 eq	LFA 34	Maine
Boat/Trap	100	160
Bait	725	1580
Diesel	3342	3230
Total	4168	4913

Differences in the carbon footprints of the two fisheries are largely attributable to the amount of direct and indirect fossil fuel inputs to the system. In the case of boats and traps, it is the energy used to extract the raw materials and construct the boat and gear. With respect to bait it is both the fuel consumed during the collection of the fish as well as any electricity used in processing and storage that contribute greenhouse gases. The direct diesel inputs to the lobster fishing activity have the greatest contribution to the carbon footprint.

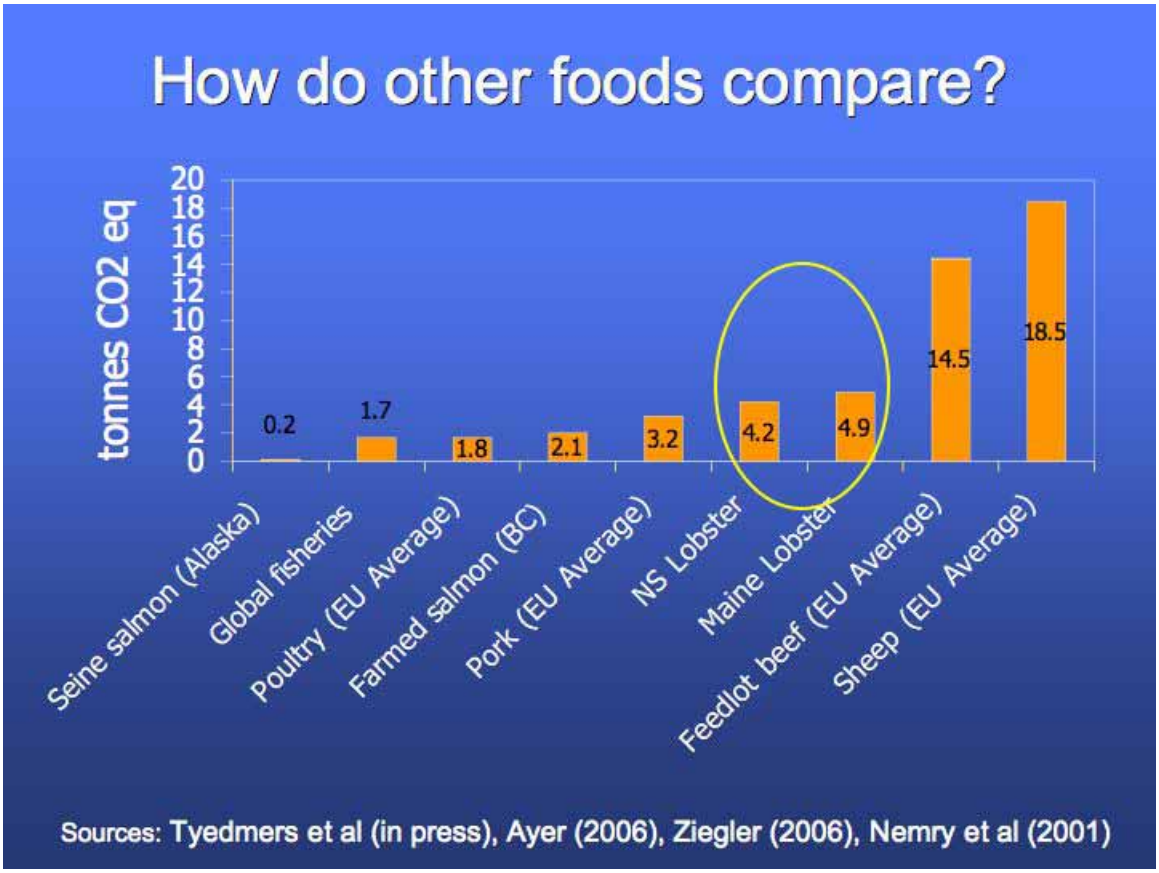


Figure 1: A comparison of the carbon footprints of different food production systems. All products are measured in terms of 1 tonne of unprocessed animals delivered to farm gate or fishing wharf.

Figure 1 contextualizes the carbon footprints of lobster fishing in both LFA 34 and Maine by comparing them to the carbon footprints of other food production systems. As the figure indicates, lobster fishing has a higher carbon footprint than some foods, but less than others. The differences are attributable to the vastly different production systems unique to each food type.

Life cycle assessments attempt to take into account the broader environmental implications of and the opportunities for improvements to a product or process through all stages. In the lobsters fisheries of both LFA 34 and Maine, improvements in efficiency can be achieved by shifting away from fossil fuels in all phases of production.

2.9.3 Discussion

Written by Eric Branton, Fisheries Technician, FSRS and Catherine Boyd, Dalhousie University

Comment: The use of tonne, weight of lobster, does not take into account the economic benefit or the amount of useable meat.

Q: How much of the CO_2 emissions are made by government regulations?
A: This is very hard to measure but it definitely exists. For example, due to government regulations, boats in LFA 34 are length restricted. This has resulted in a trend to increase deck space by building very wide boats that are not very fuel efficient.

Q: What is the meat yield of each type of food in the comparison?
A: The lobsters have a meat yield of 35% while salmon have a yield of 60%.

Q: Why do Maine fishermen have more sea days but lower fuel consumption?
A: Not sure why there is a difference. One theory is that Maine has a longer season and fishermen have more opportunities to go to sea, however trap saturation may limit the ability of each fisherman's catch rates. LFA 34 fishermen may go to less crowded fishing grounds further from shore but need more fuel to get there.

Q: What impact does the LCA have on MSC certification?
A: LCA is not currently part of the MSC certification process. MSC certification assesses the health of the stock, the impacts of the fishery on the benthic environment and non-target species, and the fishing management system.

Q: Was it a tonne of usable meat or just product in total?
A: It was just a tonne of shell-on lobster landed to dock.

Q: Why do sheep and cow production systems have larger carbon footprints than lobsters?
A: There are many reasons depending on the system under analysis. LCAs of sheep and cow production systems must take into account the feed given to the animals (and the associated crop growing inputs) as well as the treatment of manure.

2.10 Trapped in Maine: Studies on the Impacts of Trap Density on Catch

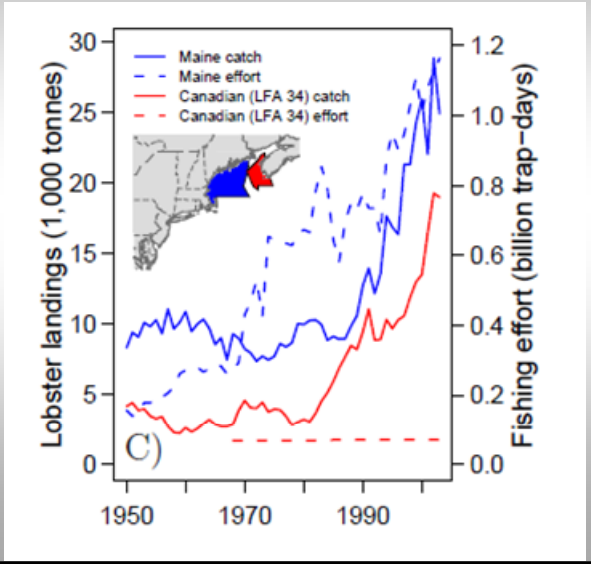
By Carl Wilson, Biologist, Maine Department of Marine Resources

2.10.1 Presentation

The FRCC recommends that each LFA, DFO and industry establish mechanisms to adjust fishing effort to achieve ecological and economic sustainability objective

(2007) FRCC Sustainability Framework for Atlantic Lobster

Comparison of US/CA Gulf of Maine Lobster Fisheries



Meyers et. al (2007)
Current Biology 17(1)

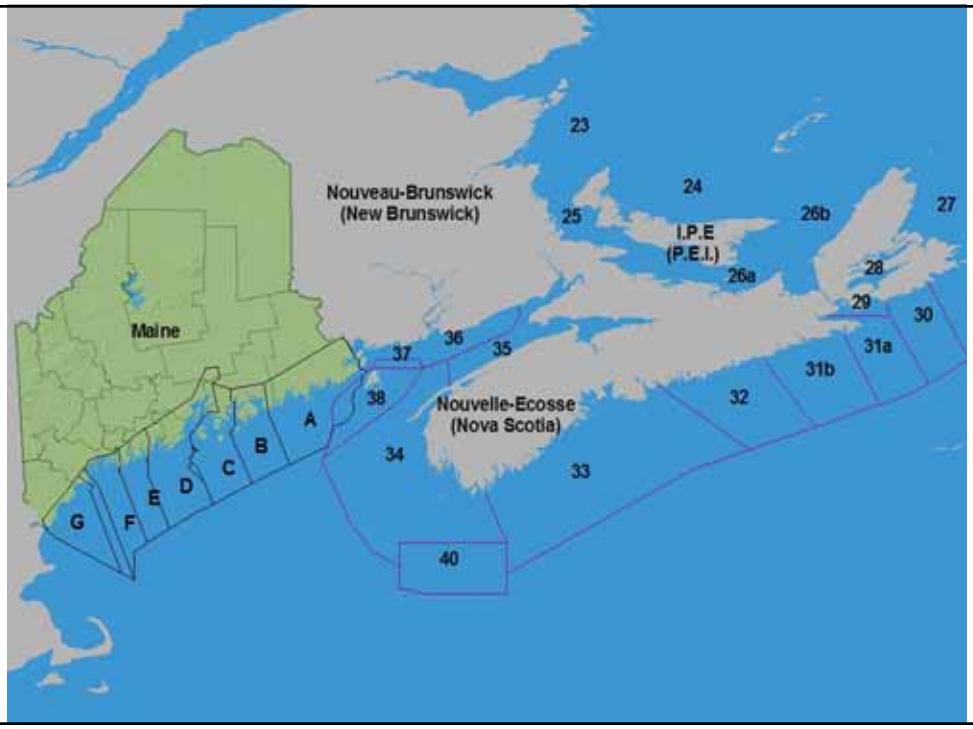
"… Maine has about 30% higher catches than LFA 34, a year-round season, and 8-9 times more traps in the water at any given time, we derive that the number of traps used in Maine is 13 times greater than in LFA 34 to harvest the same catch

…Canadian fishing effort is ~4 times that required for maximum biological yield and the fishing effort in the Gulf of Maine may be 50 times above what is required."

Meyers et. al (2007) **Saving endangered whales at no cost** Current Biology 17(1)

'… further evidence that fishing pressure is too high based on estimates of 50% of traps are empty over the season.."

Comeau, M. et. al (2008)
Framework for Assessment for American Lobster, *Homarus americanus*, Fisheries in the Southern Gulf of St. Lawrence: LFA 23, 24, 25, 26A and 26B


Nouveau-Brunswick
(New Brunswick)
I.P.E
(P.E.I.)
Maine
Nouvelle-Ecosse
(Nova Scotia)
23
24
25
26a
26b
27
28
29
30
31a
31b
32
33
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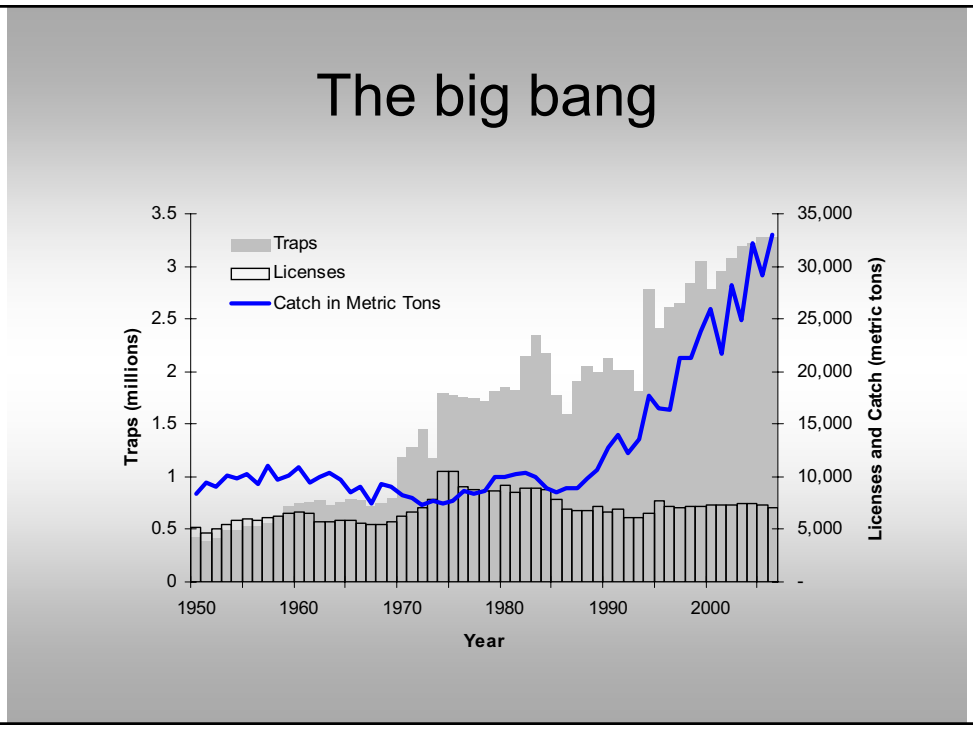
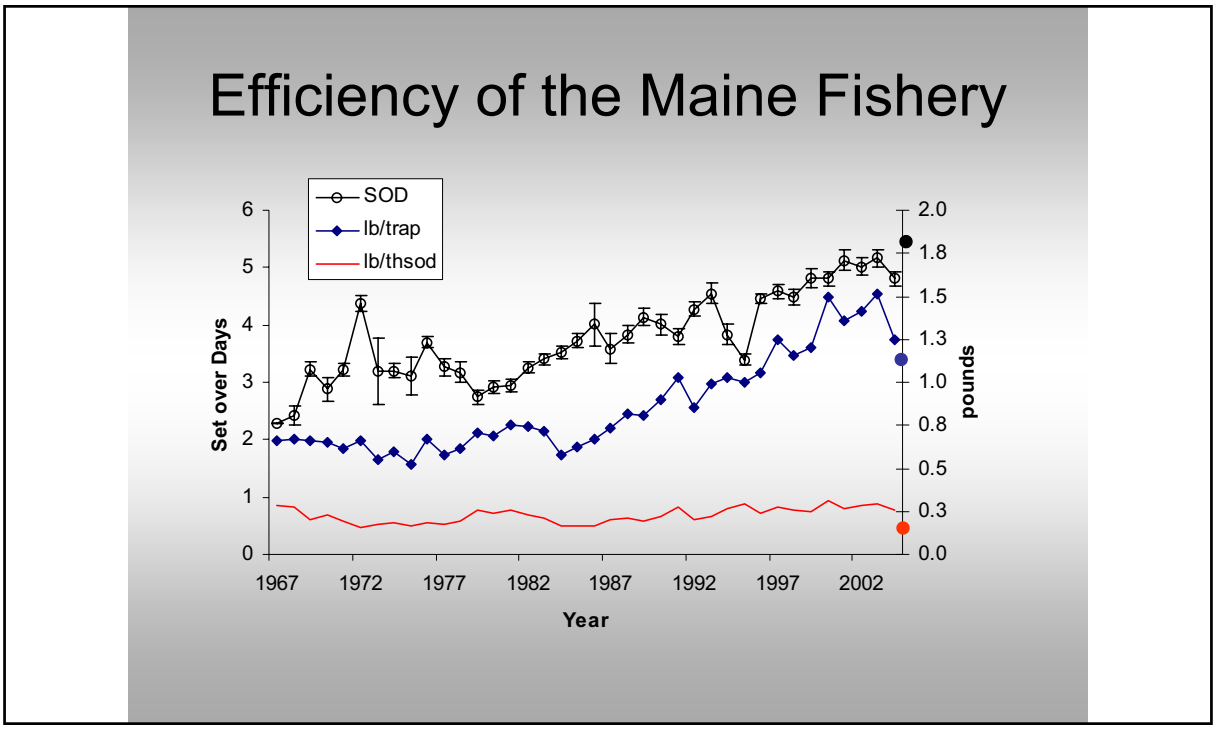
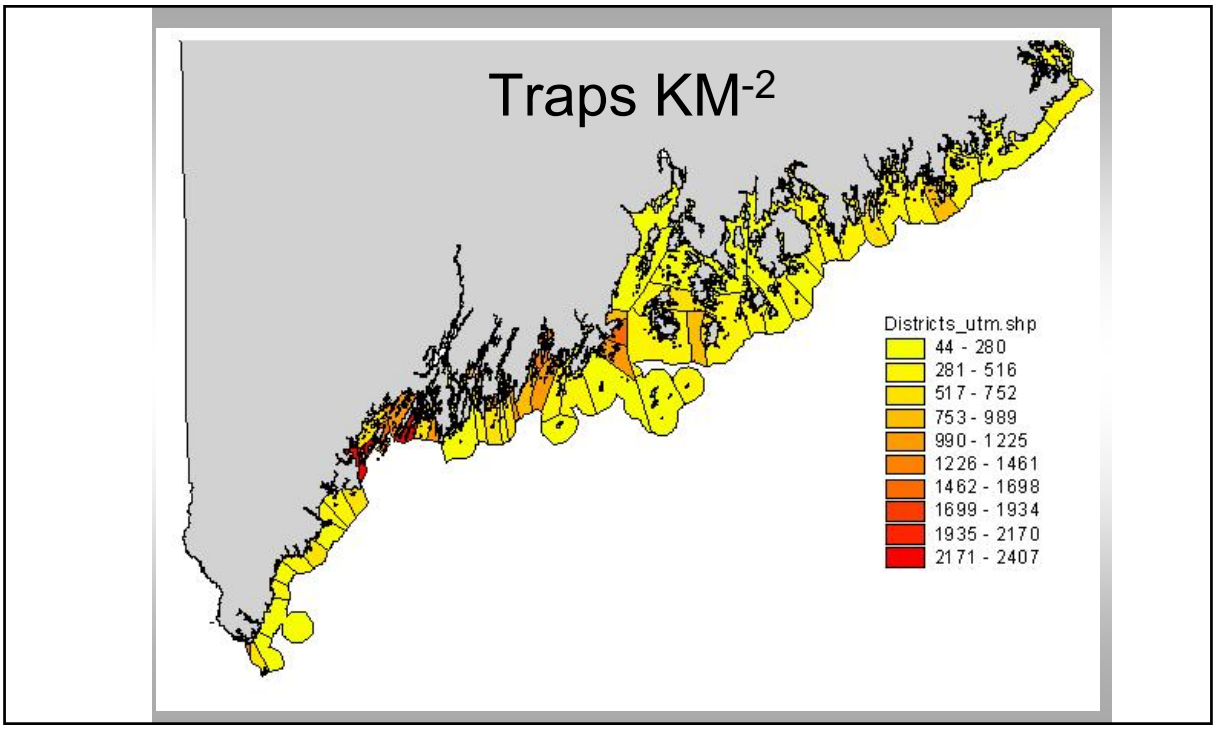
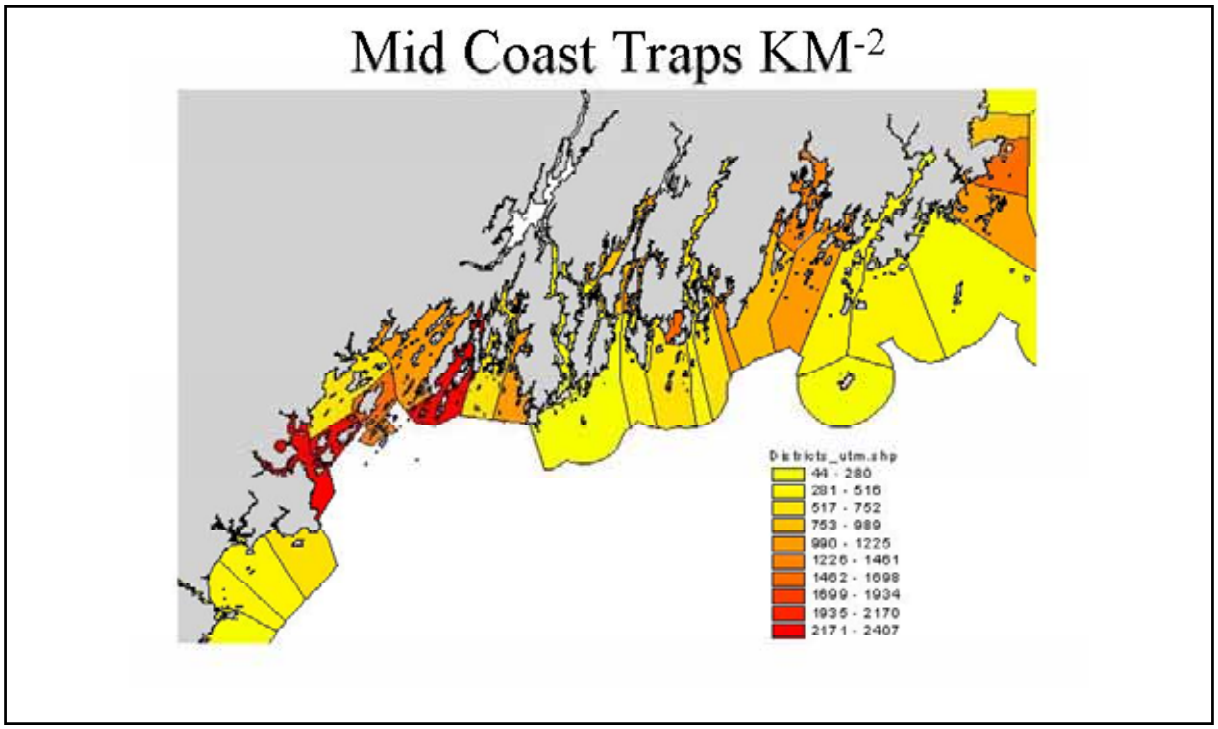
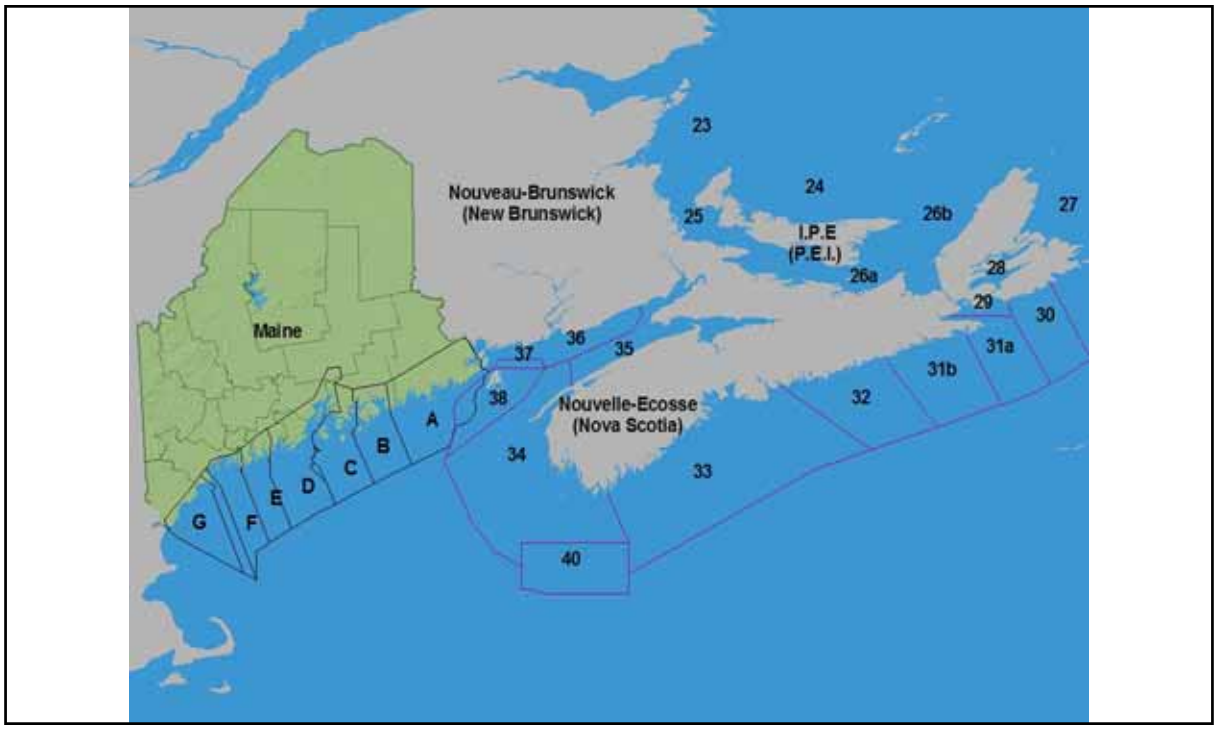
35
36
37
38
40
A
B
C
D
E
F
G


The big bang
Traps
Licenses
Catch in Metric Tons
Traps (millions)
Licenses and Catch (metric tons)
Year
3.5
3
2.5
2
1.5
1
0.5
0
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
1950
1960
1970
1980
1990
2000


Efficiency of the Maine Fishery
SOD
lb/trap
lb/thsod
Set over Days
pounds
Year
0
1
2
3
4
5
6
0.0
0.3
0.5
0.8
1.0
1.3
1.5
1.8
2.0
1967
1972
1977
1982
1987
1992
1997
2002


Traps KM-2
Districts_utm.shp
44 - 280
281 - 516
517 - 752
753 - 989
990 - 1225
1226 - 1461
1462 - 1698
1699 - 1934
1935 - 2170
2171 - 2407


Mid Coast Traps KM-2
Districts_utm.shp
44 - 280
281 - 516
517 - 752
753 - 989
990 - 1225
1226 - 1461
1462 - 1698
1699 - 1934
1935 - 2170
2171 - 2407


Nouveau-Brunswick
(New Brunswick)
I.P.E
(P.E.I.)
Maine
Nouvelle-Ecosse
(Nova Scotia)
23
24
25
26b
27
26a
28
29
30
31a
31b
32
33
34
35
36
37
38
A
B
C
D
E
F
G
40

Lobster Effort Survey

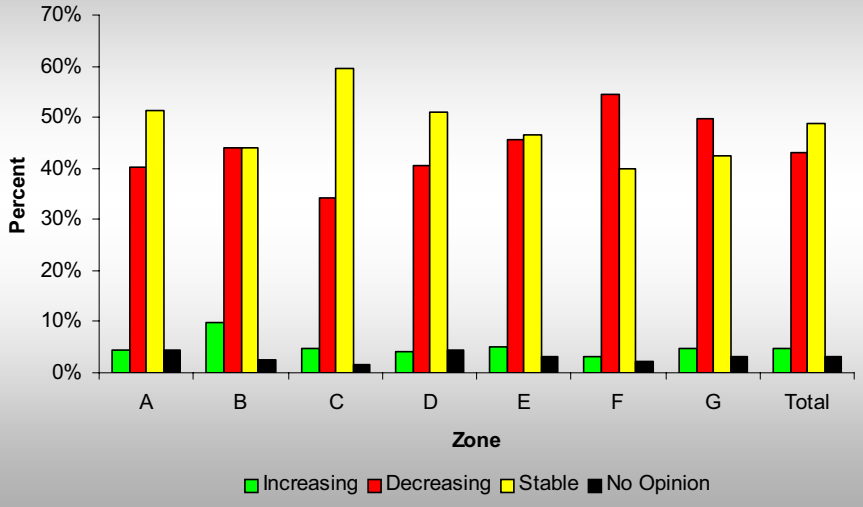
- The questionnaire was sent to 6,832 license holders and 2,381 responded, a 35% return rate.

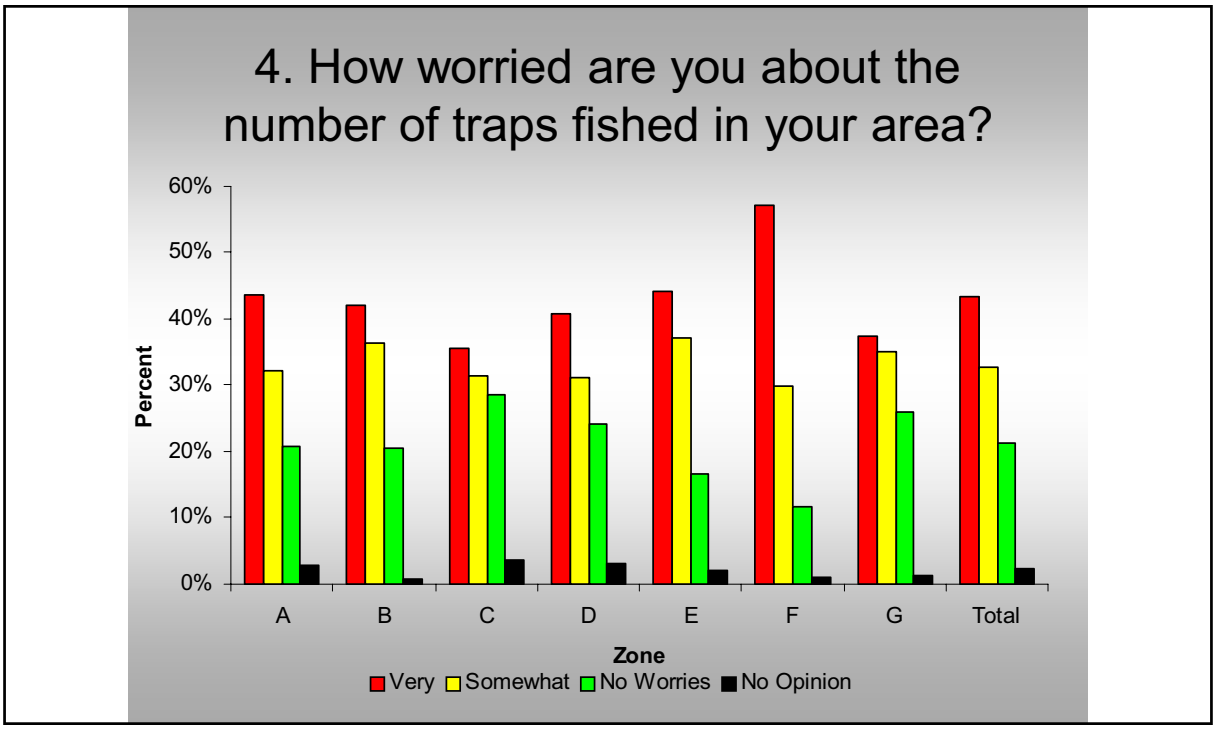
		Increasing	Decreasing	Stable	No Opinion
1	Based on your fishing experience do you feel the lobster resource is:	5%	43%	49%	3%

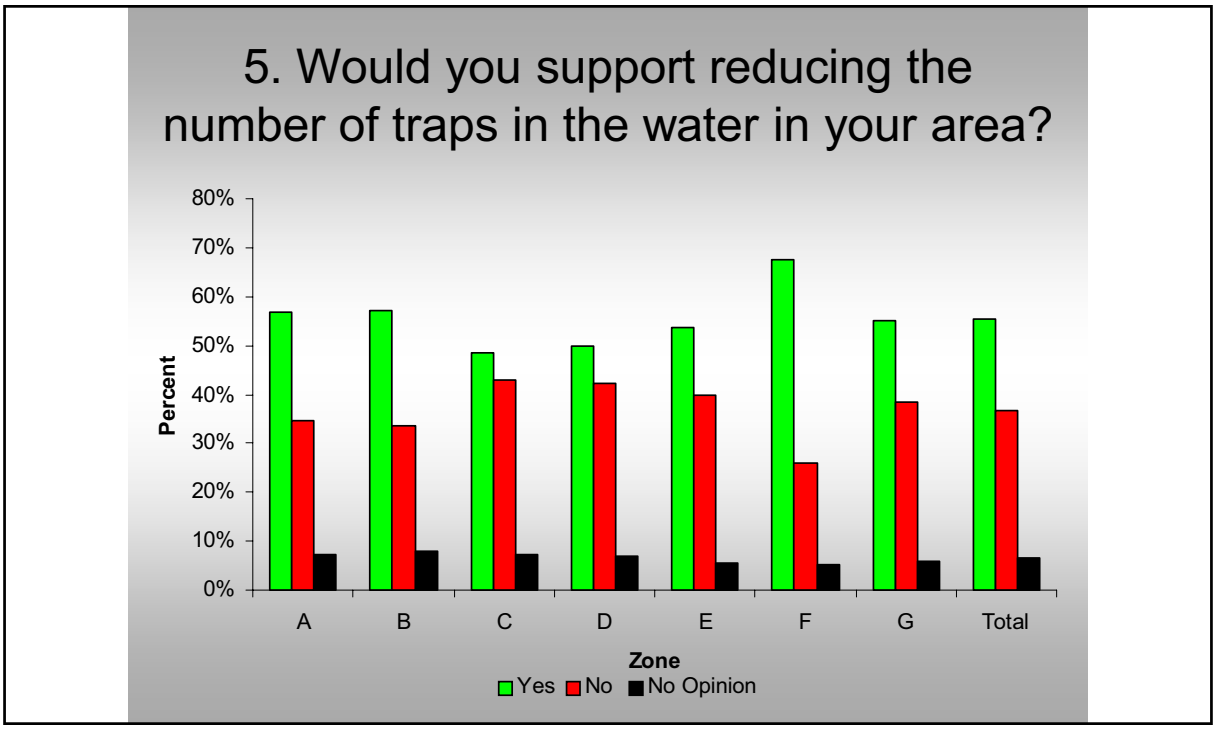
		Very Much	Somewhat	Not Much	No Opinion
2	How concerned are you that the cost associated with the amended Atlantic Large Whale Take Reduction Plan (ALWTRP) could impact how you fish?	55%	23%	19%	3%
3	Could the supply or price of herring for bait impact your decisions on how to fish?	58%	32%	8%	1%

		Very	Somewhat	No Worries	No Opinion
4	How worried are you about the number of traps fished in your area?	43%	33%	21%	2%

1. Based on your fishing experience do you feel the lobster resource is:

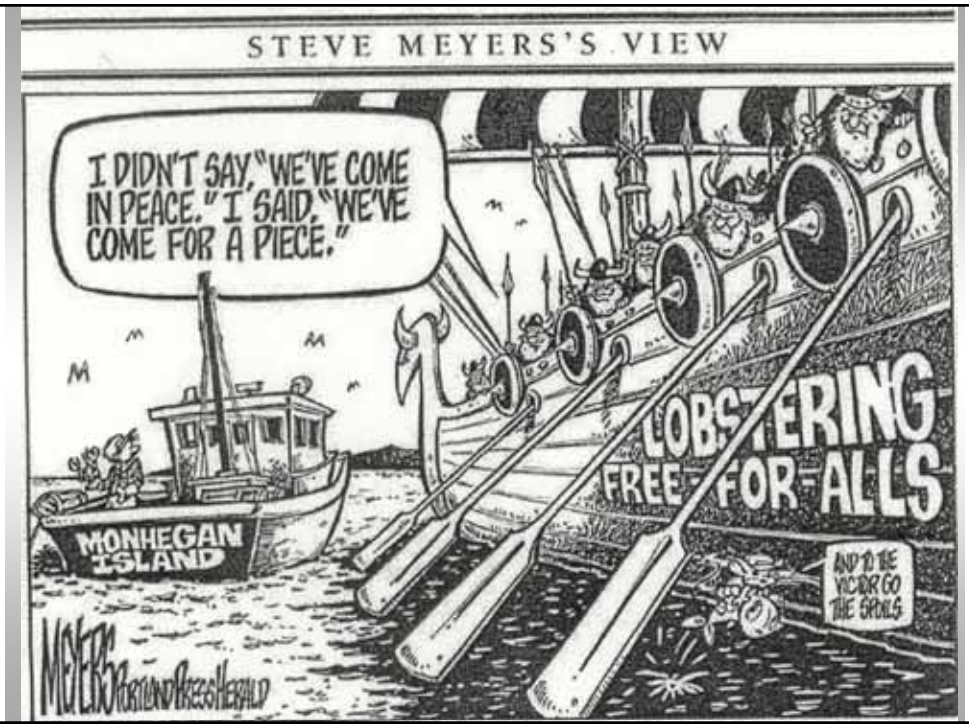


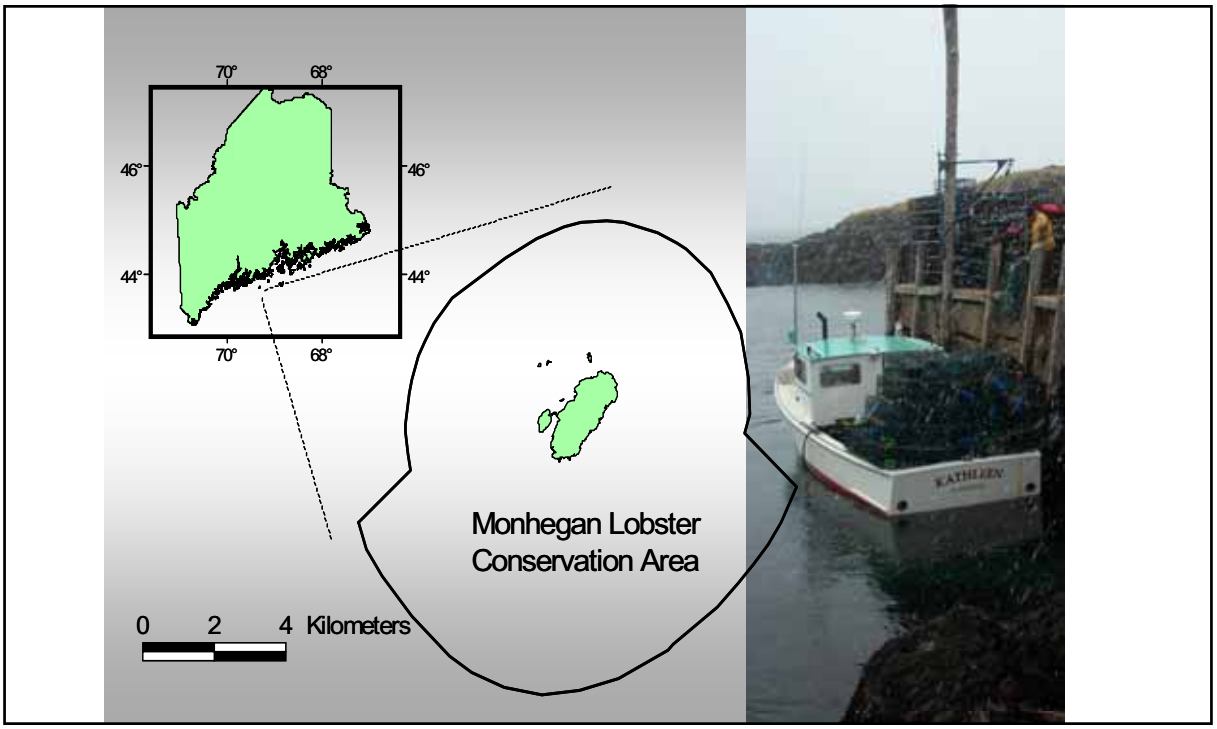

4. How worried are you about the number of traps fished in your area?
60%
50%
40%
30%
20%
10%
0%
Percent
A
B
C
D
E
F
G
Total
Zone
Very
Somewhat
No Worries
No Opinion

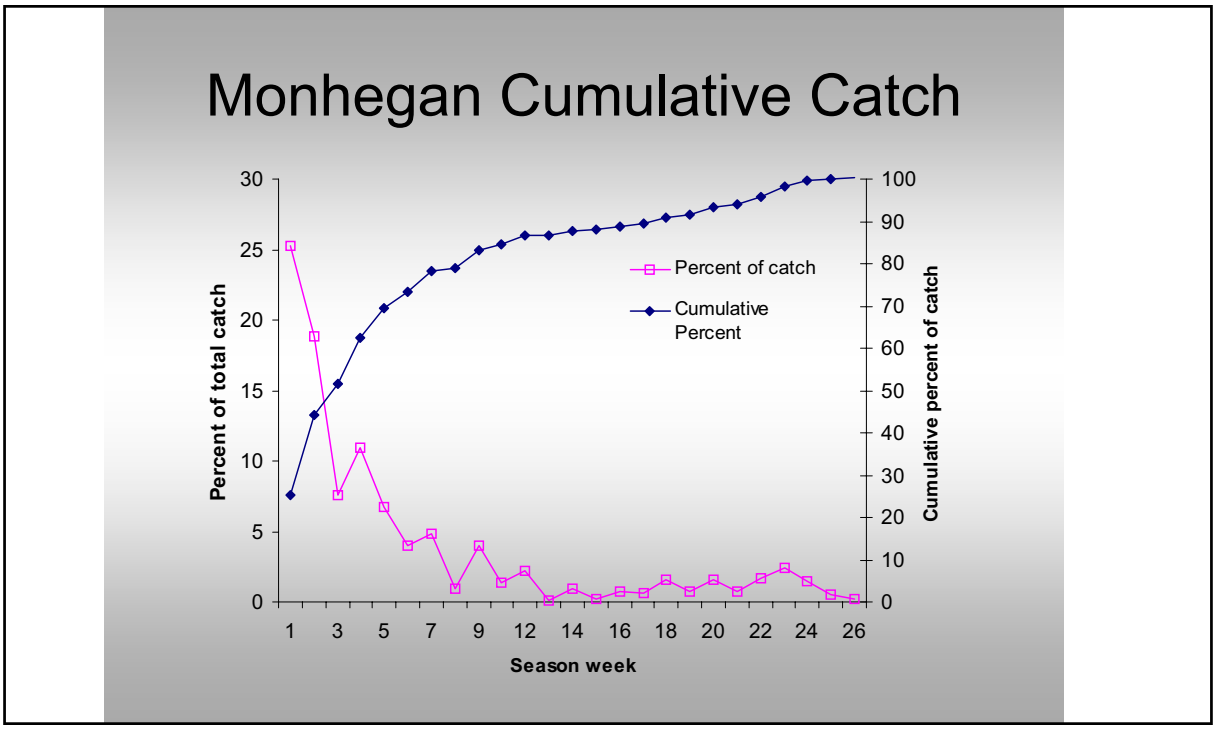

5. Would you support reducing the number of traps in the water in your area?
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent
A
B
C
D
E
F
G
Total
Zone
Yes
No
No Opinion

"…minimal response to [1995 FRCC] recommendations related to reductions in fishing effort for most LFAs, except for areas in Quebec… smaller areas enabled participants to work more closely together."

(2007) FRCC Sustainability Framework for Atlantic Lobster



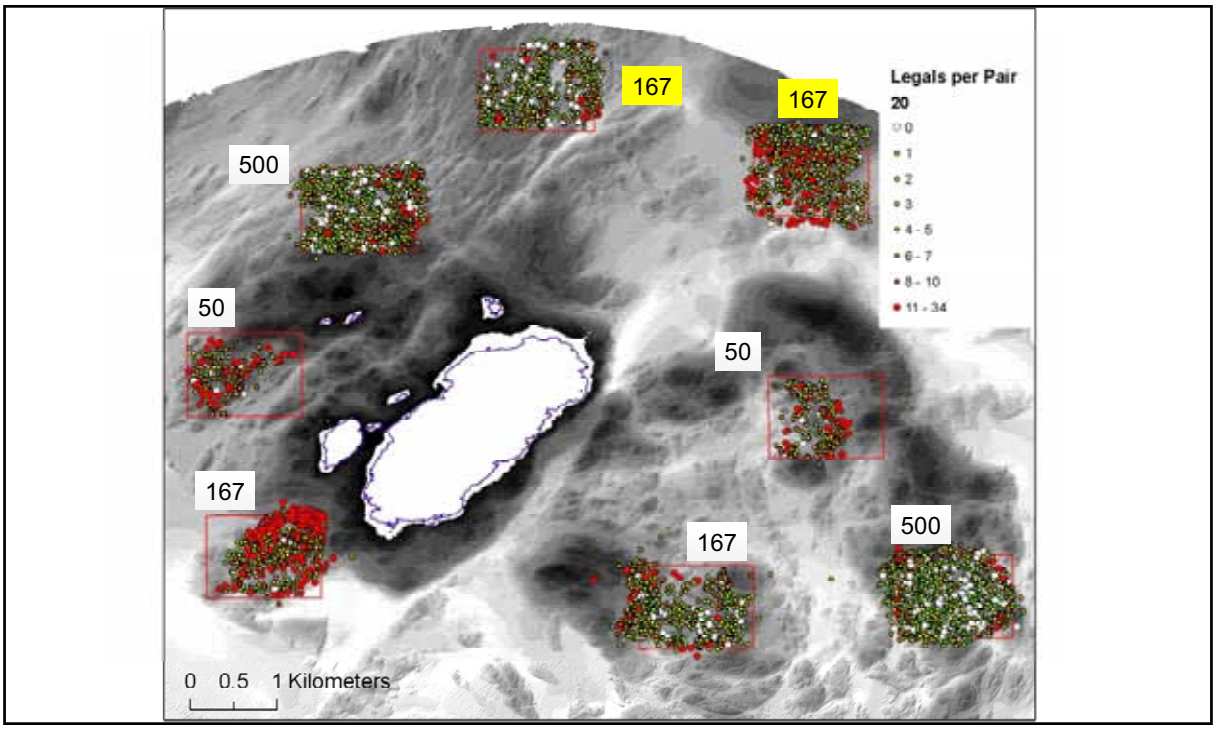

70°
68°
46°
44°
Monhegan Lobster
Conservation Area
0 2 4 Kilometers

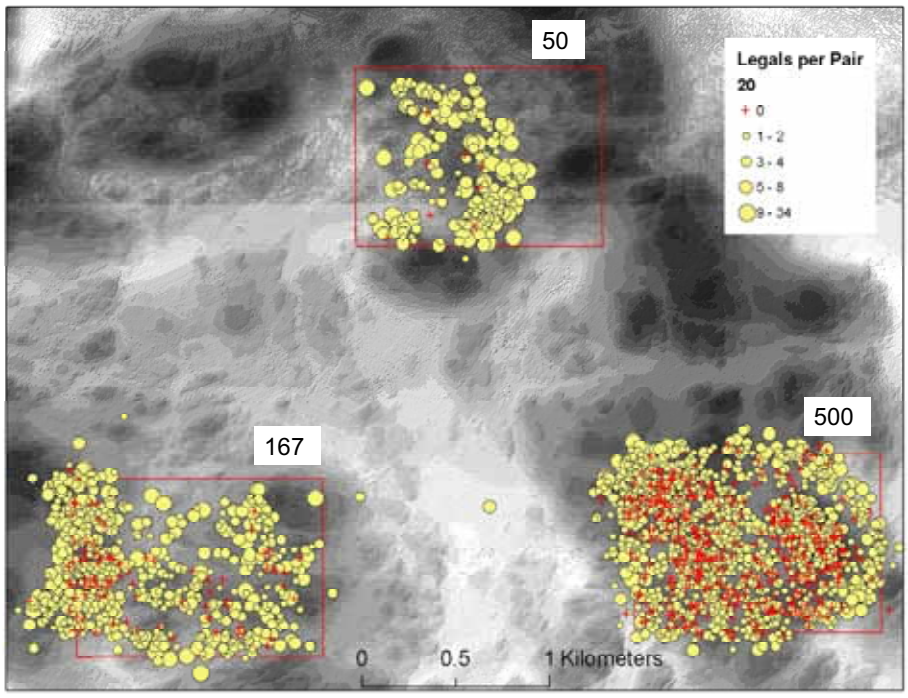

Monhegan Cumulative Catch
Percent of total catch
Cumulative percent of catch
Season week
Percent of catch
Cumulative Percent
30
25
20
15
10
5
0
100
90
80
70
60
50
40
30
20
10
0
1 3 5 7 9 12 14 16 18 20 22 24 26

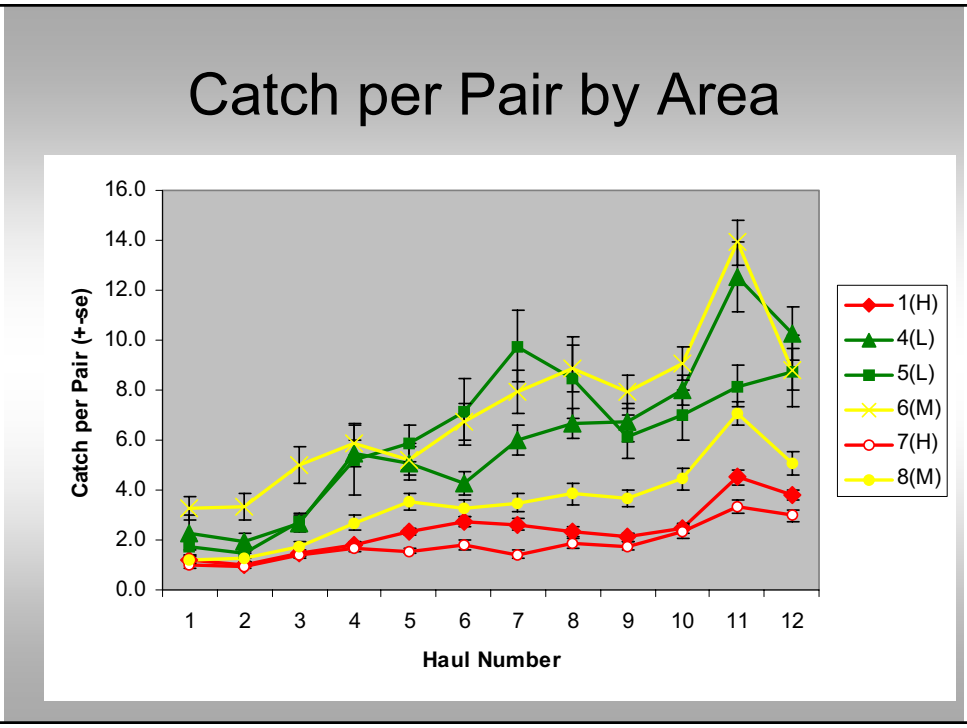
To test the impacts of trap density

Cooperative experiments

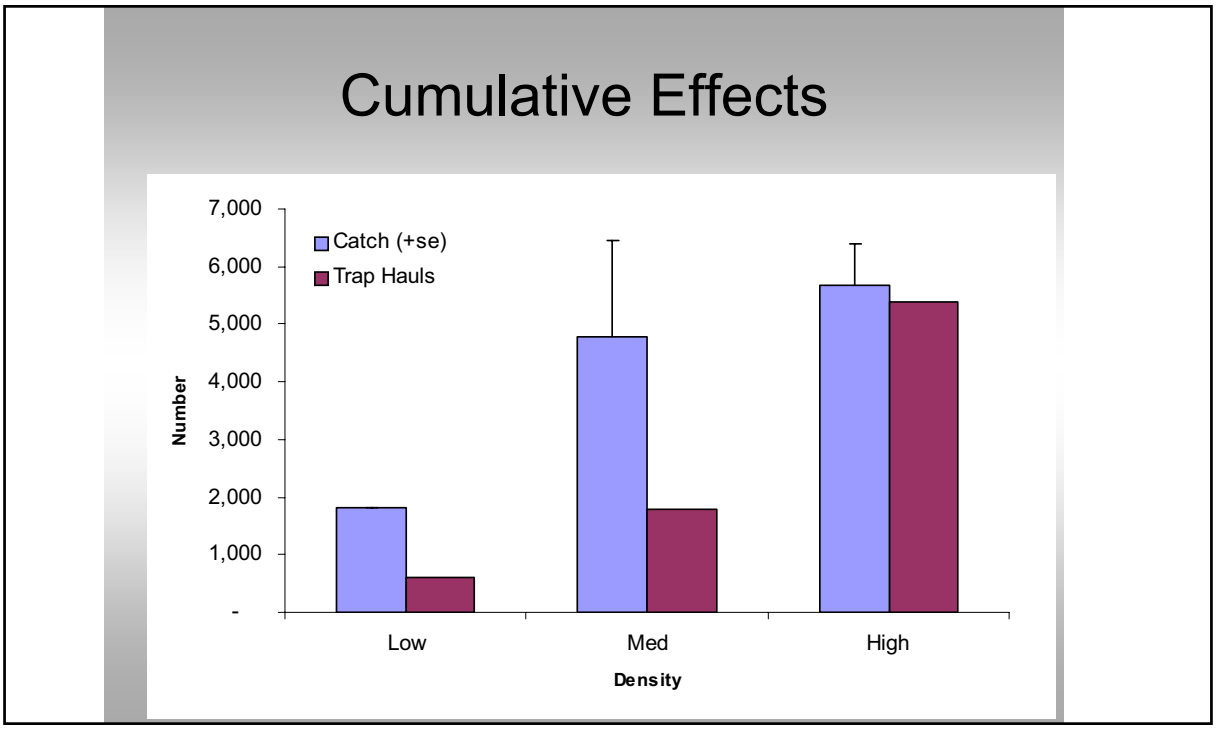
- September through October 2005
- Each lobster was batch tagged
- Legal lobster removed from area
- Recaptured lobster recorded tagged
- 2007 Experiment to further investigate soak times on catch

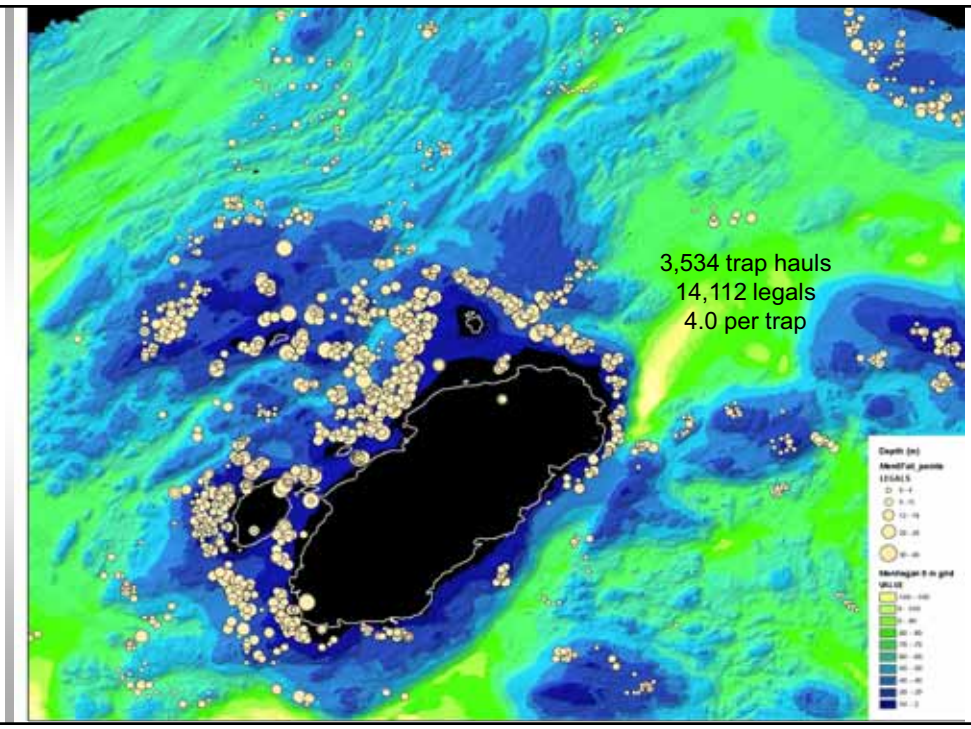

167
167
500
50
50
167
167
500
Legals per Pair
20
0
1
2
3
4 - 5
6 - 7
8 - 10
11 - 34
0 0.5 1 Kilometers

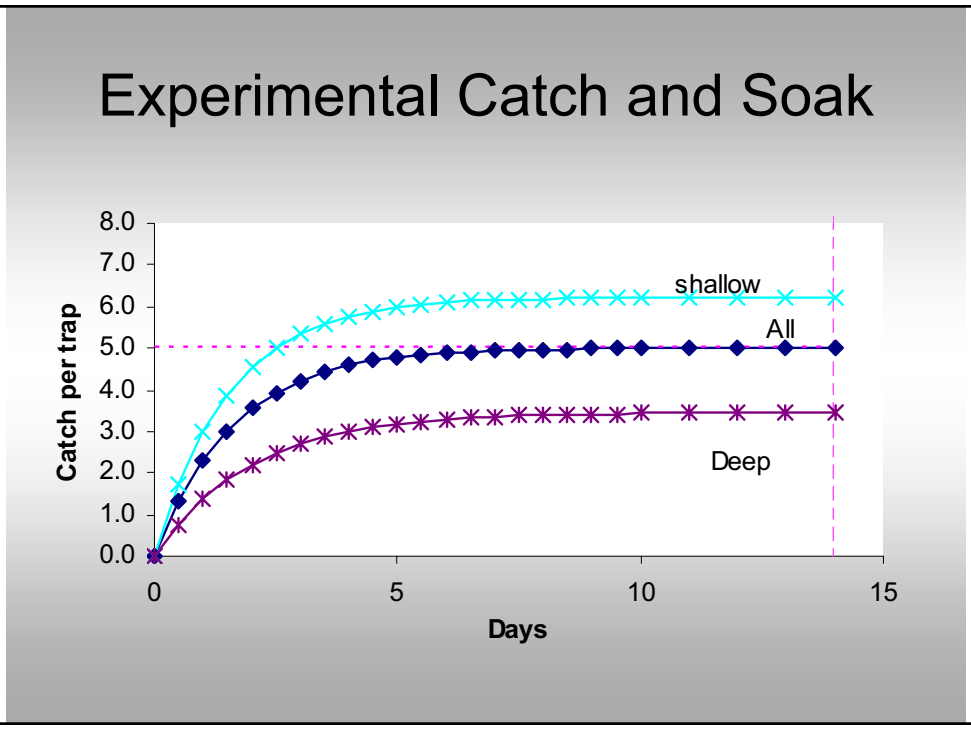

50
Legals per Pair
20
0
1 - 2
3 - 4
5 - 8
9 - 34
167
500
0
0.5
1 Kilometers


Catch per Pair by Area
Catch per Pair (+-se)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1
2
3
4
5
6
7
8
9
10
11
12
Haul Number
1(H)
4(L)
5(L)
6(M)
7(H)
8(M)


WESMAR


Cumulative Effects
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
Number
Catch (+se)
Trap Hauls
Low
Med
High
Density


3,534 trap hauls
14,112 legals
4.0 per trap

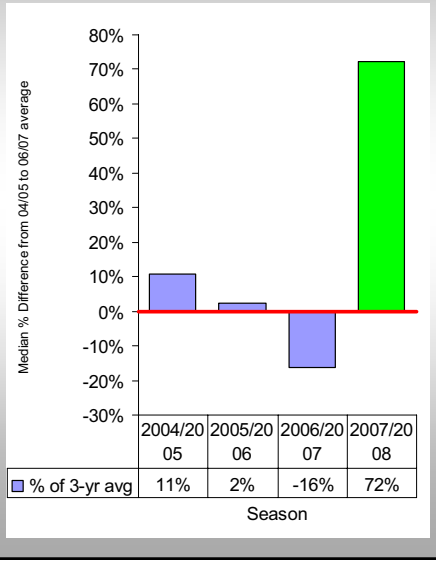

Experimental Catch and Soak
Catch per trap
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0
5
10
15
Days
shallow
All
Deep

Experimental Results

- Local Impacts on Catch Rates
- Migration > Depletion
- Lower Trap Densities = Higher Catch Rates
  - Not all areas were created equally
- **Cumulative impacts are about the same**
- **Catch is impacted by soak**
- $$$ savings potential with reducing traps
  - Biological impacts would be neutral

Changes to Monhegan Area

- Spring 2007 went to State Legislature
- Changed Statute
- Reduced traps to gain days
- Increased season 2-months, half the traps
- 07/08 72% increase
- 08/09 $$ disaster



2.10.2 Summary

Written by Katie McGrath, Fisheries Technician, FSRS

The Maine Department of Marine Resources is conducting studies to evaluate the impact of trap density on the amount of lobsters caught using comparisons between the Nova Scotia and the Maine lobster fisheries. At first glance it would appear that lobster fishermen in Maine have better catch rates than their counterparts in Nova Scotia since their catch rate is approximately 30% higher than the fishermen in LFA 34. These numbers are deceiving and it must be noted that the Maine fishermen set their traps year round and have 8 to 9 times more traps in the water at any give time than the fishermen in LFA 34. In LFA 34 the lobster season starts on the last Monday of November and ends May 31, approximately a six month season. This means that lobstermen in Maine use 13 times more traps than are used in LFA 34 to catch the same number of lobster.

There are seven lobster management areas along the coast of Maine identified by the letters A-G. Each area has a trap limit of 800 traps per boat with the exception of Area E. Area E opted to reduce their trap numbers to 600 per boat. In Casco Bay, the most populated bay (known to fishermen as the bay of pigs), there are over 2000 traps per square kilometer. Line tangles in this bay can reach upwards of 40 traps. As in Nova Scotia, 50 % of the annual catch is caught within the first few weeks of the start of the fishing season.

In an effort to better understand the views and concerns of the Maine lobster fishermen, a poll was conducted asking lobster fishermen various questions about their fishery. Of the 6,832 surveys sent to license holders, 35% responded. Of those respondents 57% were in favour of reducing the number of traps as was done in Area E.

From September through October 2005, cooperative experiments were performed to test the impacts of trap density in the lobster fishing areas off the coast of Maine. As part of the study, each lobster was batch tagged, legal size lobsters were removed from the area and the tags of any recaptured lobsters were recorded. In 2007 an experiment was conducted to further investigate the impact of soak times on a catch. It was discovered that there were some local impacts on catch rates, that migration is greater than depletion, and that overall the lower the trap densities the higher the catch rate. It should be noted that the cumulative impacts remain about the same and the catch is impacted by the amount of soak time given. It was concluded that there could be cost savings potential with reduced trap numbers and the biological impacts would be neutral.

In the spring of 2007, lobster fishermen in the Monhegan Bay area went to the State Legislature and had the statute changed to decrease their season by two months and cut the number of traps per boat in half. The results from the 2007 to 2008 season showed a 72% increase in catch. For 2009, funding has been applied for to look at the Tennants Harbour area to see if results there would be similar to those in Monhegan Bay.

2.11 What is the Bait to Catch Ratio in the Nova Scotia Lobster Fishery?

By Luke Harnish, former School for Resources and Environmental Studies student, Dalhousie University
Presented by Patty King, General Manager, Fishermen and Scientists Research Society

2.11.1 Presentation

What is the Bait to Catch Ratio in the Nova Scotia Lobster Fishery?

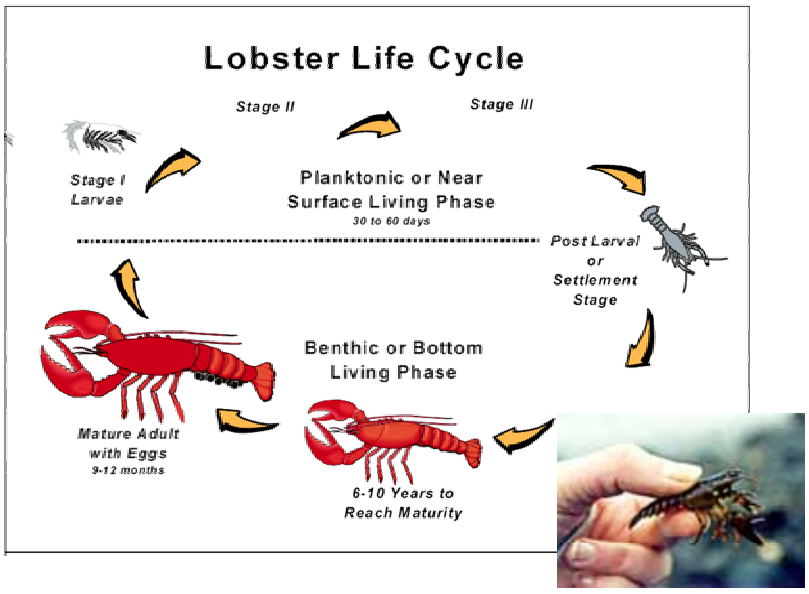
Presented by: Luke Harnish

Supervisor: Dr. Martin Willison, Department of Biology and SRES

Presentation Outline

- Introduce Premise of Project
- Lobster Biology and Fishery Background
- Methods
- Results
- Significance
- Questions

The Common Bait Stereotype



Natural Lobster Diet

- Rock Crab (*Cancer irroratus*)
- Brittle Star (*Ophiomusium lymani*)
- Mussels (*Mytilus edulus*)
- Lobster (*Homarus americanus*)

- Various other echinoderms, m eans, polycaetes, algae even in some cases tea bags, iron nails, rubber, plastic and wood

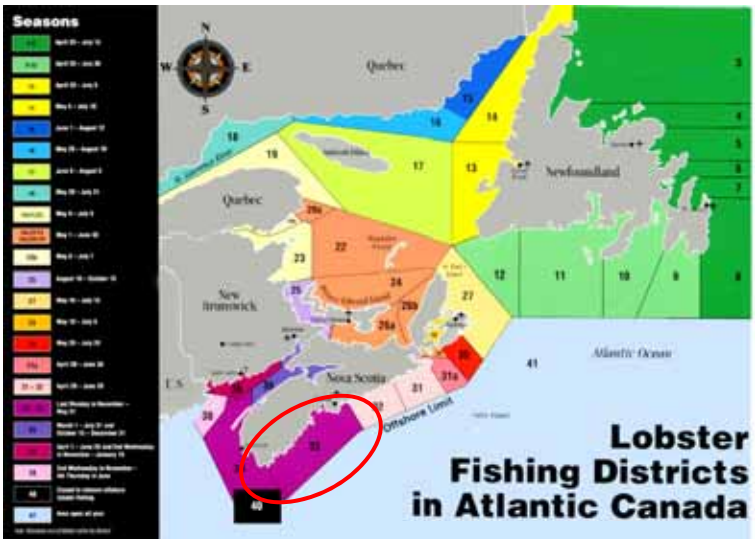
How to Catch a Lobster

Lobster Visual

Types of Bait

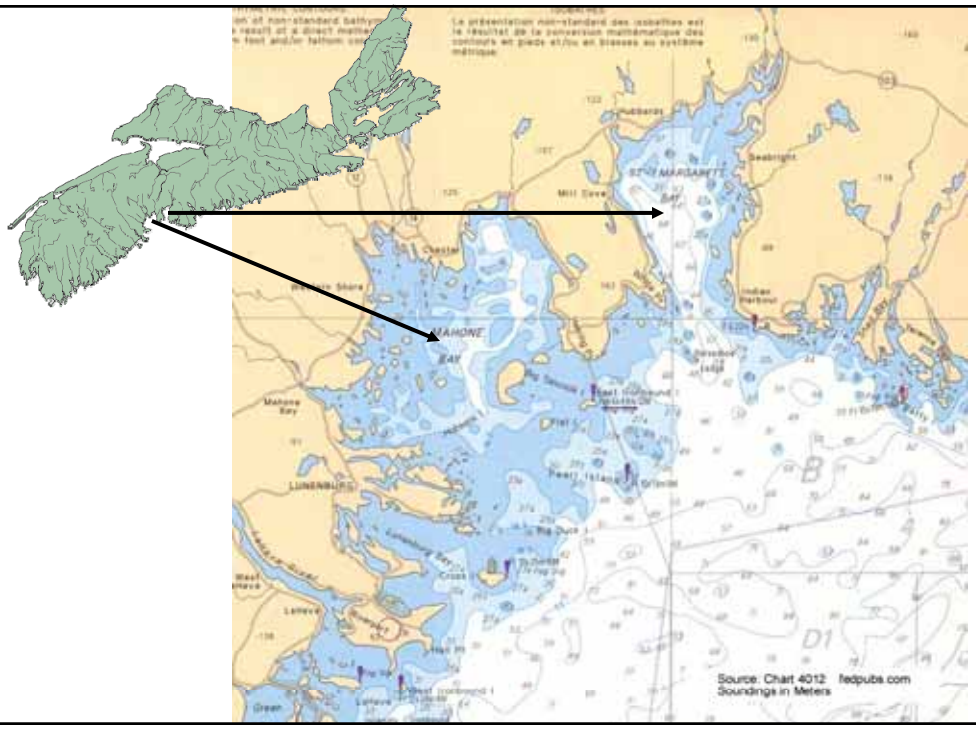
- Mackerel (*Scomber Scombrus*)
- Herring (*Clupea harengus harengus*)
- Redfish (*Sebastes marinus*)
- Haddock (*Melanogrammus aeglefinus*)
- Sculpin (*Artediellus atlanticus*)
- Rock Crab (*Cancer irroratus*)

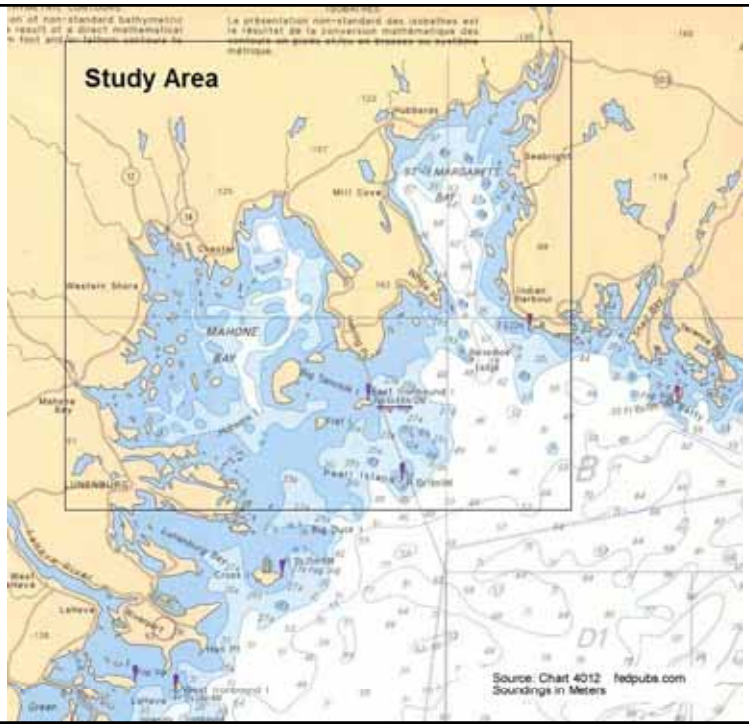
Lobster Fishing Areas (LFA)



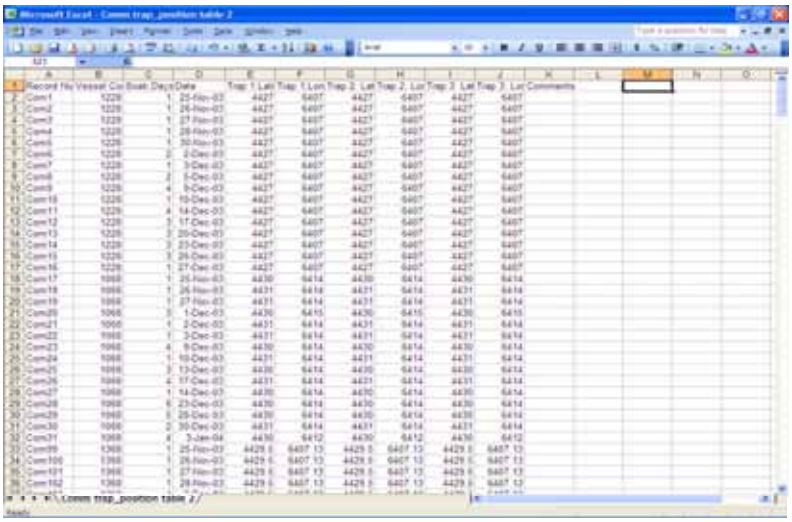
LFA 33 Season: Last Monday November – May 31

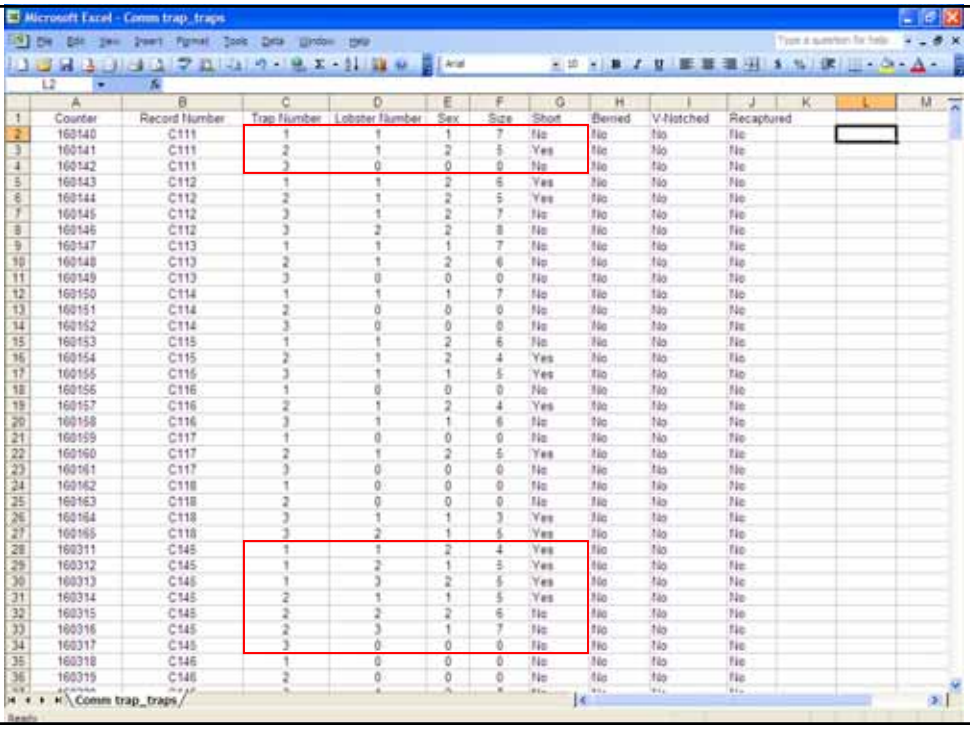

Google


MAHONE
Source: Chart 4012 fedpubs.com
Soundings in Meters



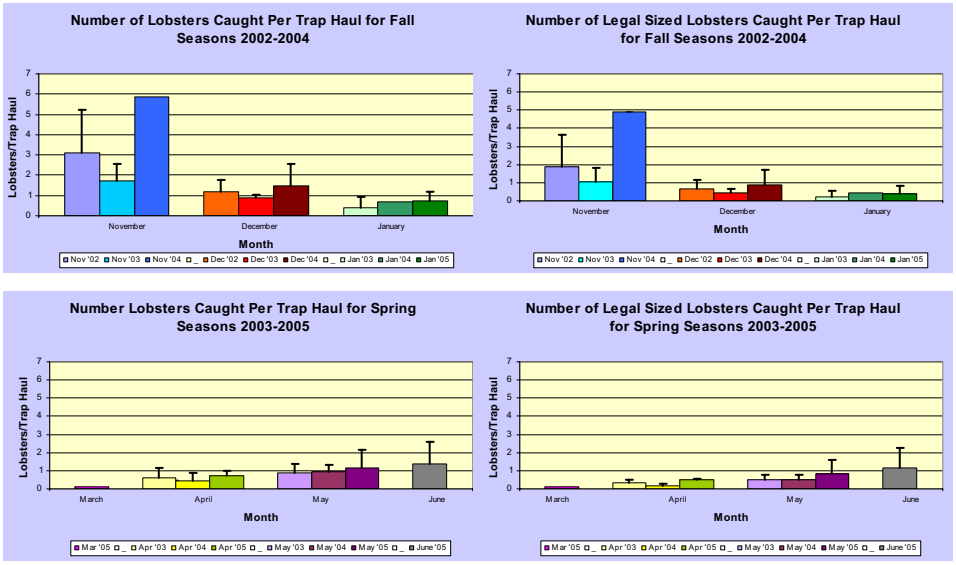
FSRS Lobster Recruitment Project – Trap Haul Data





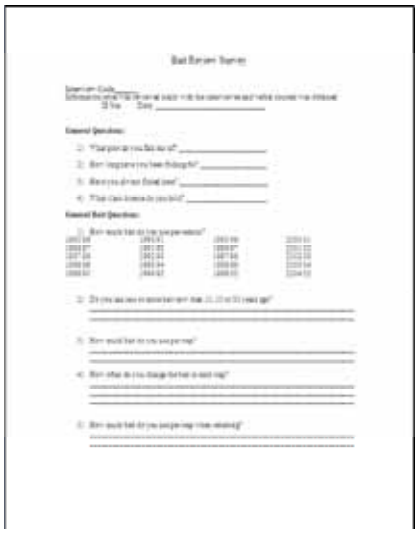
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Counter	Record Number	Trap Number	Lobster Number	Sex	Size	Short	Berried	V-Notched	Recaptured			
2	160140	C111	1	1	1	7	No	No	No	No			
3	160141	C111	2	1	2	5	Yes	No	No	No			
4	160142	C111	3	0	0	0	No	No	No	No			
5	160143	C112	1	1	2	6	Yes	No	No	No			
6	160144	C112	2	1	2	5	Yes	No	No	No			
7	160145	C112	3	1	2	7	No	No	No	No			
8	160146	C112	3	2	2	8	No	No	No	No			
9	160147	C113	1	1	1	7	No	No	No	No			
10	160148	C113	2	1	2	6	No	No	No	No			
11	160149	C113	3	0	0	0	No	No	No	No			
12	160150	C114	1	1	1	7	No	No	No	No			
13	160151	C114	2	0	0	0	No	No	No	No			
14	160152	C114	3	0	0	0	No	No	No	No			
15	160153	C115	1	1	2	6	No	No	No	No			
16	160154	C115	2	1	2	4	Yes	No	No	No			
17	160155	C115	3	1	1	5	Yes	No	No	No			
18	160156	C116	1	0	0	0	No	No	No	No			
19	160157	C116	2	1	2	4	Yes	No	No	No			
20	160158	C116	3	1	1	6	No	No	No	No			
21	160159	C117	1	0	0	0	No	No	No	No			
22	160160	C117	2	1	2	5	Yes	No	No	No			
23	160161	C117	3	0	0	0	No	No	No	No			
24	160162	C118	1	0	0	0	No	No	No	No			
25	160163	C118	2	0	0	0	No	No	No	No			
26	160164	C118	3	1	1	3	Yes	No	No	No			
27	160165	C118	3	2	1	5	Yes	No	No	No			
28	160311	C145	1	1	2	4	Yes	No	No	No			
29	160312	C145	1	2	1	5	Yes	No	No	No			
30	160313	C145	1	3	2	5	Yes	No	No	No			
31	160314	C145	2	1	1	5	Yes	No	No	No			
32	160315	C145	2	2	2	6	No	No	No	No			
33	160316	C145	2	3	1	7	No	No	No	No			
34	160317	C145	3	0	0	0	No	No	No	No			
35	160318	C146	1	0	0	0	No	No	No	No			
36	160319	C146	2	0	0	0	No	No	No	No			

Average Lobsters Per Trap Haul 2002 – 2005



How Much Bait?

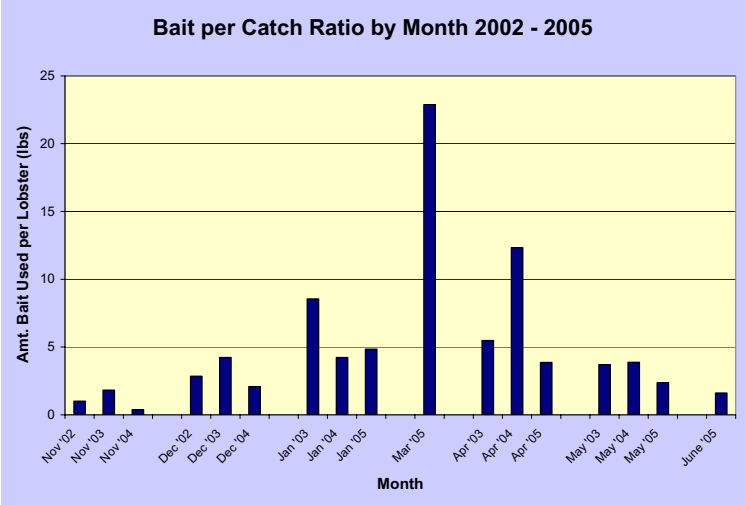
- Semi-structured voluntary interview with fishermen
- Open and closed ended questions
- Qualitative and quantitative questions
- Important source of Local Ecological Knowledge
- Interviewees held completely anonymous



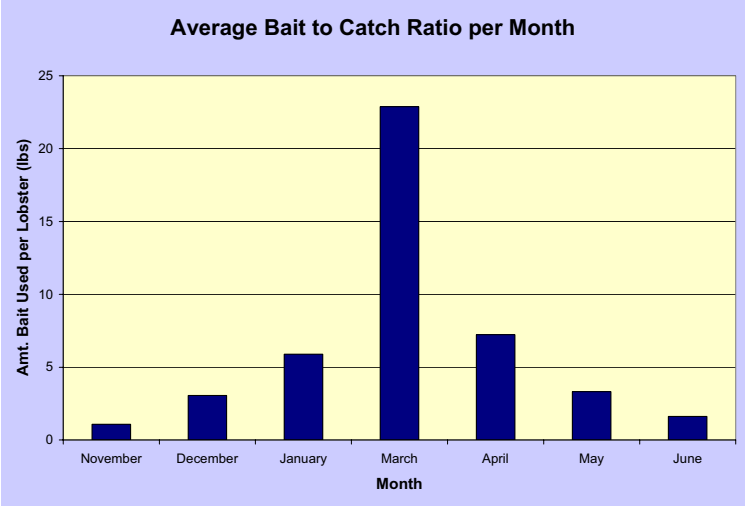
Interview Results

- Average amount of fall and spring bait used by fishermen: 11 500 lbs (Range 5000 – 16 000 lbs)
- Average amount used per trap haul 1.9 lbs (Range 1.25 – 3 lbs)
- All fish maximum amount of traps
- Sea fleas (*Gammarellus angulosus*) increase the amount of bait usage with colder waters

Ratio



Ratio Trend



Significance of Study

- First look into amount of bait usage ever in the Nova Scotia lobster fishery
- More organic material is added to the bays than taken out
- Most fish used for bait are migratory
- Bait likely to contribute to lobster diet, but unlikely that it is enough for aquaculture

Future Research

- Various research groups interested in these results (SRES, FSRS, and DFO)
- To strengthen ratio results FSRS Lobster Recruitment Project could record bait usage
- Examine stomach contents of lobsters for amount of bait food
- Calculate amount of carbon added to ecosystem via bait
- Cost of fishing a lobster economically and environmentally

Acknowledgements

- Dr. Martin Willison, Biology and SRES
- Dr. Peter Tyedmers, SRES
- Dr. Robert Miller, DFO
- Carl MacDonald, FSRS
- Patty King, FSRS
- Catherine Boyd
- The Fishermen of St. Margaret's Bay and Mahone Bay

Disclaimer: Results and interpretation of said results are not necessarily those of FSRS

2.11.2 Summary

Written by Tricia Pearo, Fisheries Technician, FSRS

You may have heard the common bait stereotype that a little bait will catch a lot of fish. Luke Harnish, a former School for Resources and Environmental Studies (SRES) student at Dalhousie University, decided to take the first look ever into the amount of bait usage in the Nova Scotia Lobster Fishery.

Harnish looked into some of the bait types used in the Lobster Fishery: mackerel, herring, redfish, haddock, sculpin and rock crab. He focused on two locations within Lobster Fishing Area (LFA) 33: St. Margaret's Bay and Mahone Bay. The LFA 33 season is open from the last Monday in November to May 31st each year.

Voluntary Bait Review Surveys were handed out to fishermen within Mahone Bay and St. Margaret's Bay to determine how much bait was used for each trap haul, as well as for the season. Bait and trap haul information was also collected from the Fishermen and Scientists Research Society's Lobster Short Term Recruitment Index Project from 2002 to 2005.

Based on interview results, the average amount of bait used in the fall and spring was 11,500 lbs, ranging from 5,000 to 16,000 lbs. The average amount used per trap haul was 1.9 lbs of bait, with a range from 1.25 to 3 lbs. All fishermen interviewed fished the maximum amount of traps. It was noted that when there was a presence of sea fleas in colder waters, the amount of bait usage increased. The Lobster Short Term Recruitment Index Project data showed there were more legal sized lobsters caught in the fall than in the spring from 2002 to 2005.

After reviewing the results, Harnish found that there was a trend in the average bait to catch ratio per month. There was a significant amount of bait used (over 20 lbs) per lobster in the month of March. He also discovered that most of the fish used for bait were migratory.

The Department of Fisheries and Oceans, the Fishermen and Scientists Research Society and the School for Resources and Environmental Studies are interested in these results. Future research may involve examining stomach contents of lobsters for the amount of bait and to calculate the amount of carbon added to the ecosystem via bait.

3.0 Plenary Sessions

3.1 Moving Forward: Discussion on Formalizing the Lobster Post-Larval Collector Research Collaboration and Integration with Other Research

Summarized by: Miriam Morgan, FSRS Fisheries Technician, Laura Ludwig, GOMLF Project Manager and Patty King, FSRS General Manager

This plenary session focused on five questions in relation to formalizing the lobster post-larval collector research collaboration. The results of the discussions are highlighted in this section.

Are any changes/refinements needed to the current standard protocols?
Data Collection, Use and Management
Objectives of the Collaboration
Who would be the collaborators?
- Collector Sampling
- Suction Sampling
- Biodiversity Sampling

How to integrate collector data with suction sampling and biodiversity data.

Are any changes/refinements needed to the current standard protocols?

It was agreed that standardizing the methodology is important and that there is still room for fine-tuning of the methodology. Site selection was one of the main issues discussed; the discussion included the following:

- A lot of emphasis is placed on haphazard sites. We've got very limited effort and infinite sites – need to pick the right spots.
- Would it be useful to do an interview-based survey asking fishermen where they observe very small juvenile lobster? It could be overlaid with ventless trap data to help select sites. It was noted that the FSRS has local ecological knowledge surveys from its Inshore Ecosystem Project upon which they could draw.
- Well-placed effort can help with predictive models.
- John Tremblay commented that concerning the issue of site selection, it is basically a shot in the dark. We did talk to fishermen; we are looking for areas with hard bottoms. In Lobster Bay we may like to extend sampling to a larger area. The primary goal is an indicator of settlers (temporal trends).
- Rémy Rochette commented that the information is good for temporal trends, although if you want spatial, we do not have the proper design. He indicated that they just got funding and have a meeting in the month to come; at that time, they may make spatial inferences on a small spatial scale (3 sites, 20 collectors).
- Carl Wilson commented that temporal trends are good; they are derived from data that we have right now. There is a fair amount of larval sampling done. It was sug-

gested the LNG companies might like to compare information, we could consider coordinating some of the LNG sampling with the research done on both sides of the border.

- Gareth Harding commented that there are negative sites in Nova Scotia and Newfoundland. It is important to find where the larvae are settling. There is a lot of zero sampling. It is better to put collectors downwind rather than upwind; wind direction needs to be taken into account when selecting sites.
- Suction sampling represents time trends rather than representing abundance. You need a few sites that are well chosen. It is accurately demonstrating things to come more and more often.

The discussion also included the following:

- What about tracking time trends? Following cohorts through time?
- The question was asked whether collectors have ever been put offshore (Georges Bank). It has been considered but is not supported yet in the US.
- Climate change may factor in all this work. It was commented that there could be more support for it from the US government due to the new NOAA director's interest in it. The question was asked if the survey fits into the climate change initiative. Is there potential for a trans-boundary initiative, a trans-boundary assessment of lobster?

Objectives of the Collaboration/Who would be the collaborators?

This portion of the discussion considered how formal should the collaboration be, should the focus be on suction or collector sampling, and who plans to continue the research. The collaboration is still in the early stages and there is interest in maintaining a collaboration. It was noted that different groups have different priorities. The primary focus is on lobster, however, there is also interest in crabs, fish, associated fauna, etc..

It was commented that suction sampling is already developed and proving useful and is the preferred method in some areas, however, each monitoring program has it own set of needs and collector sampling may be the preferred method for other areas. It was commented that both methods of sampling are forecasting tools to help predict the future.

The project leaders for the various areas were asked to comment on the future direction of their individual projects and participation in the collaboration. All were interested in being part of the collaboration. Their comments included the following:
Rick Wahle indicated that he can play the role of "warehouse" for the monitoring programs. Everyone would do their own data collection and then send it to him. A regional summary sheet would be made up by Charlene Bergeron, and then an annual report of the year's results would be prepared. Others would benefit from the pooled and summarized data. If he had to do more than this, funding would be needed. Rick indicated that for the States suction sampling is best for the most part

- although collectors go where divers can't go.
- Katherine Newell, from Canso, indicated that the collectors work for them and they plan to stay with them for now. They have done it for two years now. She commented that it is harder to get divers due to it being an isolated area.
- Victoria Burdett-Coutts indicted that the collectors won't be continuing in Newfoundland as it was part of graduate research that is now done. There may be an opportunity for suction sampling down the road.
- Michel Comeau indicated that more collectors will be used, that it will continue in the Southern Gulf of St. Lawrence (GSL) for another year. They plan to work in collaboration with the PEIFA (PEI Fishermen's Association) and get fishermen more involved. They are interested in doing more biodiversity work. There are issues with rock crabs in the GSL; the collectors are a good tool to observe rock crab, which are a key species. Peter Lawton tried the suction sampling method but it's too murky and challenging. Suction sampling is not viable as the winds create zero visibility. They will look at transect work the year after. PEI also has a ventless trap survey, which will hopefully be a good link to the collectors. They are working on getting funding for three years.
- John Tremblay indicated they are looking at three more years of collector work in a few areas and then see where things are at at that point. There is not a large diver resource in his area, which is required for suction sampling, therefore they will continue with using the collectors. He does have a mall group of divers to continue the suction sampling in Lobster Bay and hopes to continue it for three years at least.
- Angelica Silva commented that Lobster Bay is also a good site for biodiversity. She is hoping to continue her biodiversity work in Lobster Bay; she is looking into funding.
- Rémy Rochette indicated that the Southwest Bay of Fundy has funding for 300 collectors, which is good for two years. They would like to do biodiversity work. There will be 5-6 graduate projects in the next 2-3 years, with one large project working on lobsters; it will also use suction sampling that can be compared with collectors. He was unsure of whether or not they will continue after that; they will look at the data and decide at that point. If the data is promising, he felt they should be able to find funding for the SW Bay of Fundy. The more useful the data is the longer you can keep the projects running. Collaborations with other universities will involve genetic work, among other graduate student projects, during that 3-year endeavor.

The discussion also included the following:

- South of the border is more suction sampling, to the north is more collectors.
- Bob Glenn, DMF, just got funding to continue the collectors in southern New England, building on Rick's work.
- There are at least three places where the two sampling methods are happening side-by-side.
- These initial steps will help inform larger work later on; could become a useful forecasting tool.

- Carl Wilson commented that for Maine it's more efficient to put four divers in for a month to do all the sampling. He also indicated they don't have time to do biodiversity work, the commitment isn't there; they had to drop fish.
- Extra collectors could be sent to southern New England or New York; they'd be interested.
- As we look to move forward, it was felt it would be useful to identify some of the issues that might arise with collaboration, such as publications/co-authorship, having annual meetings, etc.. If was suggested that the FSRS could host an annual meeting and hold it in conjunction with their annual conference as has been done this year and last year. This will need to be discussed with and approved by the FSRS Executive Committee.
- Carl Wilson and Rick Wahle explained that a workshop is being planned for June 19 - 21, 2009 in Boothbay Harbor, Maine, to celebrate 20 years of collaborative collection effort (one of the longest-running data collection efforts in terms of time series) at the DMR's Burnt Island site.

Data Collection, Use and Management/How to integrate collector data with suction sampling and biodiversity data

The discussion centered around the management of the data and which database to use. The discussion included the following:

- Rick currently plays the role of "warehouse" for the data. An annual regional summary sheet is generated by Charlene Bergeron. It was suggested they could continue in that role; there is a benefit to having it all in one place.
- Michel Comeau explained that he has a major database in place thanks to Denis Gagnon. He suggested they could also be the custodian; they have a server and personnel. They didn't have time for a lot of data to be put into the database; they could hire people to enter data.
- The issue of confidentiality and proprietary data was discussed. The question was asked if it is possible to keep separate databases. Is it possible for each organization to have a copy of the format of the database, for example Michel Comeau's database, to ensure consistent data entry while maintaining separate ownership of their data? Denis Gagnon noted that they are doing something similar in PEI; they are using the same format of database and entering their own data. Excel would be workable with the database. They will design a database for their region. Those from the Maritimes can send their information to them, or they could send the database format to the other organizations.
- The state of Maine already manages the database in Maine. It was suggested that the projects in the US could depot their data with Rick Wahle and the projects in Canada could send their data to Michel Comeau's group (DFO). A regional summary sheet could be created each year from the combined databases.

- Everyone is collecting different information, therefore the database would need to be tweaked to accommodate the different focuses.
- It was suggested that a web-based data entry portal would be helpful. It could automatically produce graphs and do calculations. It was commented that DFO has been working on it and may get through the bugs soon. They are also working on the confidentiality issue. Michel Comeau suggested they could get their web guy involved; we would just have to identify the path to take.
- The question was asked whether or not the data would become public domain if DFO became the custodian of the data. Michel Comeau indicated that if the data was not collected through DFO using public funding then no the data would not become public domain. Access could be restricted; it would be protected under the privacy act. They are currently going through what they can and can't do, reading the privacy act. Some groups might be more concerned with ownership than others.
- How to move forward was discussed. Should timelines/dates be set? It was agreed that the conversation should continue, should maintain a forum to exchange data.
- Rick Wahle commented that it is good to have advice from those who do this - lobster model. How does all of that operate? Are there any legal issues? We have a vision to share a common data set; although it is not the best forum at this workshop to work out all the details, we need communication in order to move forward.
- It was suggested that the FSRS Data Management Working Group could facilitate meetings and/or the development of data management and sharing protocols.

3.2 Discussion on What Other Science Needs to be Done, Future Direction

The workshop concluded with a general discussion on what other science needs to be done and future direction of lobster research. The following summarizes the points discussed.

Q: Joanne Butland: Can DFO give us a suggestion of v-notching in knowing just what is to be protected? We need to know where the lobsters are moving. DFO science gives number to protect mature females. Need some sort of tracking to create a number. A fair number of movement studies were done in the late 1990's.

A: John Tremblay: Had a hard time evaluating v-notching in our areas, v-notching is voluntary.

A: Carl Wilson: V-notching has been a key factor in the success of the Maine lobster fishery. Without v-notching Maine would be in a world of hurt. Developed a technique as a percentage of egg bearing lobster v-notched.

Comment: PSP (Paralytic Shellfish Poisoning) levels showed up in Maine last summer so a monitoring program was quickly put together at a number of sites. Sampling was conducted for the two weeks before Christmas. Some lobster showed an increase in PSP in tomalley. Health Canada will be reissuing a health advisory this week or next week stating adults – one tomalley/day, children – none. Most sites were deemed safe, with only a few

sites showing an increased level. Health Canada is not going to identify individual sites since migration will not allow for the determination of the exact location the lobsters came from.

Comment: Jean Lavallée: The AVC Lobster Science Centre was involved in organizing the sampling which was then carried out by the provinces. Looking at the data, some sites have a high level of PSP. CFIA wants to increase coverage and continue the project. Most sites are safe and a few are high. Could be linked to the high year for algae in the Bay of Fundy.

Q: Does it have to do with red algae?

A: Yes.

4.0 Conclusion

The *FSRS-GOMLF Lobster Science Workshop* continued and expanded upon the cross-border information sharing and collaboration initiated through past workshops and other initiatives, such as collaborative research projects amongst the FSRS, the GOMLF, Fisheries and Oceans Canada, the Bigelow Laboratory for Ocean Sciences, and various Atlantic Canadian universities. The *Lobster Post-Larval Collector Research Collaboration* is one such initiative and was the primary focus of the workshop. There was a commitment to move forward with the collaboration, and the importance of such opportunities as this workshop to bring everyone together was stressed. It was recommended that the collaboration of lobster collector projects should meet annually to review results and continue the information exchange and the expansion of the research, both geographically and in terms of the scope of the research.

Discussions on how to move forward included looking at if any changes or refinements are need to the current standard protocols, will groups use suction sampling and/or collectors, and data management and sharing. It was agreed that standardizing the methodology is important and that there is still room for fine-tuning of the methodology. It was recognized that different groups have different priorities. The primary focus is on lobster, however, there is also interest in crabs, fish, associated fauna, etc.. Suction sampling is the preferred method in some areas and is already developed and proving useful, however, each monitoring program has it own set of needs and collector sampling is the preferred method for other areas. It was agreed that both methods of sampling are valuable forecasting tools.

It was agreed that we have a vision to share a common data set, however, there are a number of issues that need to be considered, including who should be the custodian of the data, confidentiality, ownership, and how to move forward with developing and implementing a strategy for data management and sharing. It was suggested that Rick Wahle could be the custodian of the data for the projects in the US and that Michel Comeau (DFO) could share his database format with the other projects and perhaps be the custodian of the data for the projects in Canada. It was agreed that a regional summary sheet could be created each year from the combined databases. It was suggested that the FSRS Data Management Working Group could facilitate meetings and/or the development of data management and sharing protocols.

The other focus of the workshop was on *Using Science to Better Understand the Environmental and Economic Impacts of the Lobster Fishery*, and included presentations on using life cycle assessment to understand global environmental impacts of lobster fishing in the Gulf of Maine, studies on the impacts of trap density on catch, and bait to catch ratio in the Nova Scotia lobster fishery. The workshop concluded with a short discussion on other research that is being done and potential future research.

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, companies, and individuals:

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Nova Scotia Department of Fisheries and Aquaculture
NSERC – Atlantic
EnCana Corporation
Atlantic Catch Data Ltd.
Prospect Area Fulltime Fishermen's Association
Atlantic Electronics Limited
AVC Lobster Science Centre
Clearwater
Guysborough County Inshore Fishermen's Association
Maritime Aboriginal Aquatic Resources Secretariate
VEMCO Division, AMIRIX Systems Inc.
Maritime Fishermen's Union
Atlantic Shark Association
Eastern Nova Scotia 4X Community Management Board
Halifax West Commercial Fishermen's Association
Nova Scotia Fish Packers Association
Scotia Fundy Inshore Fishermen's Association
Judique & Area Development Association
Wade Company Limited

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John Tremblay	Rick Wahle	Carl Wilson