
HOOK, LINE AND THINKER

The Newsletter of the Fishermen and Scientists Research Society

Issue: 2004 - 1

Winter/Spring 2004

FSRS 11TH ANNUAL CONFERENCE A SUCCESS DESPITE BLIZZARD DELAY

The Fishermen and Scientists Research Society held its 11th Annual Conference and Annual General Meeting in Halifax, NS on March 22 & 23, 2004. Originally scheduled for February 20 & 21, 2004, the Conference was delayed due to a blizzard which shut down the city. Efforts were made to go ahead with the Conference on the original date as some people had already arrived and others were on the road from as far away as Maine. However, when a state of emergency was declared on February 20 there was no choice but to postpone. Despite the delay until March, when many are starting to fish again, attendance was strong and the Conference was a great success. (*cont'd page 2*)



● Inside this Issue ●

FSRS 11th Annual Conference	1
Measuring the Abundance of Eggers, Larvae, Juveniles and Window Female Lobsters in LFA 31 ..	3
Spiny Dogfish	4
National Workshop on Collaborative Fisheries Science	6
Notice to Mariners	7
New to the FSRS Library	8
The FSRS Welcomes New Members	8
Call for Nominations: A.G. Huntsman Awards - Silver Jubilee	8
Remembering One of Our Own	9
Lobster Movements and Migrations	9
FSRS Scientific Program Committee Report	10
Patty's Picks - Websites of Interest	15
Offshore Development and its Impact on the Fisheries	16
2004 Polychaete Workshop	19
Dalhousie Graduate Student Requests Assistance From the FSRS and Its Members	19
FSRS Lobster Recruitment Project 5 Year Review	20
Exploring the Marine Ecosystem of the Eastern Scotian Shelf	22
Beachcombing	26
Upcoming Events	26

On behalf of the members we would like to gratefully acknowledge the Director's Office, Science Branch, Maritimes Region, Department of Fisheries & Oceans; Marine Fish Division, Department of Fisheries & Oceans; Blue Atlantic Transmission System; Nova Scotia Department of Agriculture and Fisheries; Jacques Whitford; AVC Lobster Science Centre; Halifax West Commercial Fisherman's Association; Bay of Fundy Marine Resource Centre; Shelburne County Competitive Fishermen's Association; South West Fishermen's Quota Group Association; Scotia Fundy Inshore Fishermen's Association; and Wade Company Limited for their support and financial contributions, without which the Conference would not have been possible.

WORKSHOP SESSIONS

The Conference workshops dealt with a wide range of topics. On behalf of the members, thank-you to all presenters for their informative and enlightening sessions: Carl MacDonald and Ross Claytor - FSRs Lobster Recruitment Project 5 Year Review; Alida Bundy - Exploring the Marine Ecosystem of the Eastern Scotian Shelf with Mass Balance Ecosystem Models: Comparative Results Before and After the Groundfish Collapse; Eugene O'Leary, Duncan Bellefontaine and Mike Newell - Measuring the Abundance of Eggers, Larvae, Juveniles and Window Female Lobsters in LFA 31; Ross Claytor - FSRs Proposed Research on Lobster/Pipeline Interaction; Virginia Soehl, Terry Oram and Sue Belford - Blue Atlantic Project Update; and Chris Cooper - Lobster Movements and Migrations. Find out more about these thought provoking presentations by checking out the articles in this issue.

POSTER/INFORMATION DISPLAYS

In addition to the workshop sessions, there were a number of poster and information displays. The scope of topics covered in the displays was broad. A special thanks to all the participants in the poster/information displays:

- ◆ AVC Lobster Science Centre - *Jean Lavallee and Natasha Doyle*
- ◆ Centre of Marine BioDiversity Hosted Databases and Electronic Atlases - *Bob Branton, Jerry Black and Derek Broughton*
- ◆ ESFPA V-notch and Tagging Project - *Nellie Baker-Stevens*
- ◆ Jacques Whitford
- ◆ Lobster Institute, University of Maine - *Bob Bayer and Cathy Billings*
- ◆ Lobster Life Cycle and Growth - Gulf of Maine Lobster (*Homarus americanus*)
- ◆ Lobster Recruitment Index From Standard Traps (LRIST) - *Carl MacDonald and John Tremblay*
- ◆ Marine Invertebrate Diversity Initiative (MIDI) - *Beth Vardy*
- ◆ Maritime Region Port Sampling - *Peter Comeau and Bob Branton*
- ◆ Northwest Atlantic Fisheries Organization (NAFO) - *Johanne Fischer*
- ◆ Quality Lobster from Ship to Shore - *Nova Scotia Fisheries Sector Council, Lisa Anderson and Denny Morrow*
- ◆ Species Composition of Commercial Landing as an Indicator of Regulatory Compliance in the NAFO Division 4X Cod Haddock Fishery - *Tara McIntyre, Bob Branton, Ralph Halliday and Dan Fleck*
- ◆ Temperature - Salinity Characteristics During the 4VsW Sentinel Survey - *Liam Petrie*

RECEPTION

Not all of the Conference was serious work. Members and guests had a chance to sit back, relax and socialize during the reception that was held on the first night. Not only did this give members a chance to get reacquainted, it was also a great opportunity to continue to build better communication between fishermen and scientists.

A new feature at the reception was a “Dutch Auction” where people could buy tickets for 25¢ each and use them to bid on items. The auction raised \$500 for the FSRS. It is hoped we can expand this concept next year, with even bigger items to bid on. Participants also had a chance to win some fabulous door prizes throughout the two days of the Conference. A special thanks to the companies who donated the door prizes and items for the auction.

Associated Marine
 Atlantic Aero Marine Supply and Manufacturing Ltd.
 Baker's Point Fisheries
 Classic Seafoods
 Cleves Sporting Goods
 Fisheries Museum of the Atlantic
 Golf Central
 Halterm Ltd.



Participants get a chance to relax after a hard day at the conference and enjoy the auction at the evening reception.

Hi Liner Fishing Gear and Tackle
 Holiday Inn Select
 Home Hardware - Lockeport
 Home Hardware - Shelburne
 H.P. Fisheries
 IMP - Dartmouth
 IMP Group - Yarmouth
 Karlo Marine Group
 Lockeport Pharmacy
 Lockeport Town Market
 Lunenburg Foundry
 Maine Lobstermen's Association
 Massachusetts Lobstermen's Association
 Mirror Image Shelburne
 Motor Mart - Shelburne
 Nordsea Ltd.
 Olands Brewery
 Paul D'Entremont Marine- Pubnico
 Rainbow Net and Rigging
 Sambro Fisheries Ltd.
 Scotia Trawler Ltd.
 Shelburne Irving Mainway

MEASURING THE ABUNDANCE OF EGGERS, LARVAE, JUVENILES AND WINDOW FEMALE LOBSTERS IN LFA 31

By Jeff Graves, FSRS Senior Fisheries Technician

Mike Newell, Duncan Belfontaine, and Eugene O’Leary gave a brief presentation of some of the out-of-season and in-season lobster science being done in LFA 31A. The out-of-season science consisted of two different components: a larval sampling program, and an out-of-season trapping project. The in-season work was based around a tagging project.

Mike Newell spoke about the in-season tagging work that was completed. The lobsters that were tagged were made up of window-sized lobsters (114-124 mm carapace size), short lobsters (82.5-86 mm) and all berried females. Some of the questions this study was trying to answer were: are the window lobsters that are being released migrating into a neighboring LFA where they are being caught and retained, and are the lobsters that are in the window-size becoming berried.

Results indicated that window-sized lobsters do not move very far; this was determined through the work of 49 fishermen. There were 1540 first time captures, 223 re-captures; 98% were berried. These window-sized lobsters were tagged by 27 fishermen; 1835 lobsters were tagged, with 351 re-captured. 7516 berried females, and 453 short lobsters, were tagged. 32 lobsters were re-captured once, 6 were re-captured twice, and 2 lobsters were re-captured 3 times. (*cont'd page 18*)



SPINY DOGFISH

By Katie Rapp, FSRS Fisheries Technician



Dogfish is a name given to many small types of sharks. The most common dogfish caught in our area are the Spiny Dogfish Sharks (*Squalus acanthias*). This common name of “dogfish” originated from fishermen who described these fish as chasing smaller fish in large dog-like “packs”.

This species has been found particularly vulnerable to over fishing as a result of their late maturity, small litters of pups, slow growth rate and possessing one of the longest gestation periods of any shark (an estimated 18-22 months).

Dogfish travel and feed in schools segregated by sex and size but packs can be mixed, especially during mating. Mating typically occurs in offshore waters in the winter (Kirnosova, 1989). Fertilization occurs internally and development is ovoviviparous, meaning that they bear live young. The male dogfish have modified pelvic fins that form claspers allowing for this internal fertilization (Hanchet, 1988).

The female’s eggs are large, up to 45mm in diameter, and contain much yolk. After fertilization, the eggs pass through the female’s uterus and are enclosed in protective gelatinous capsules called candles. This membrane breaks down about four to six months after fertilization and leaves the embryos free in uteri without placental attachment to the female. The embryos bear an external yolk sac attached to its abdomen to serve as a food resource throughout the remaining gestation period (Figure 1). The remaining internal development takes place over 18-22 months (Jones and Ugland, 2001).

The number of young born to an individual female dogfish varies according to size, larger females typically having more young. Dogfish embryos can number from 2 to 15 individuals, and are approximately 20 to 30 cm in length (Figure 1). An average of 6-7 individuals or pups are born to a female every two years (Jones and Ugland, 2001). During the winter months (November to December), the pups form large schools and remain on the surface water in order to feed on jelly fish and other types of plankton.

Once the pups mature, they migrate to deeper water feeding particularly on small fish such as hake, herring, menhaden, capelin, cod, haddock, and ratfish. They also eat jellyfish, ctenophores, amphipods, squid, krill, crabs, polychaete worms, and octopus. Growth is relatively quick during the first two years but will slow once the organism reaches about 40cm (5 years). Sexual maturity in males is reached at a size of 65-90 cm and 6 –13 years of age. Females reach sexual maturity at a later age, between 12 and 21 years at which time they are between 80 and 120 cm long (Jones and Ugland, 2001). So at approximately these ages, the cycle repeats itself.

Some fishermen believe that dogfish may be responsible for the slow recovery of groundfish stocks that are under moratoria. Some also feel that dogfish have driven traditional groundfish species from some areas by either dispersing the stock or by eating a significant quantity of mature or pre-recruit fish (Hurlbut et al., 1995).

In essence, there are many commercial fishers that feel the numbers of dogfish should be reduced, either by means of eradication or a sustained dogfish fishery. This must be carefully thought-out because of their vulnerability to over fishing. However, today spiny dogfish are also valued as food in many countries.

The Fishermen and Scientist Research Society (FSRS) are involved in sampling dogfish being caught in Nova Scotian waters. They are sampled either at sea or onshore. Sampling includes length frequency, determining their maturity stage, measuring the diameter of ova in mature females, counting and measuring embryos and removing the second dorsal fin for aging the sharks. This collection of current reproduction/maturity information is essential for the management of dogfish.

Figure 1: Spiny Dogfish Embryo (19 cm Total Length).



http://www.mar.dfo-mpo.gc.ca/science/shark/english/dogfish_embryo_19_cm.jpg

References:

- Hanchet, S. 1988. Reproductive biology of *Squalus acanthias*., South Island, New Zealand. NZ J. Mar. Freshwat. Res., **22** (4): 537–549.
- Hurlbut, T., G. Nielsen, R. Hébert, and D. Gillis. 1995. The Status of Spiny Dogfish (*Squalus acanthias*, *Linnaeus*) in the Southern Gulf of St. Lawrence. DFO Atlantic Fisheries Research Document 95/42.
- Jones, T.S. and K.I. Uglund. 2001. Reproduction of female spiny dogfish, *Squalus acanthias*, in the Oslofjord. Fish. Bull., **99**: 685–690.
- Kirnosova, I.P. 1989. Reproduction of spiny dogfish, *Squalus acanthias* in the Black Sea. J. Ichthyol., **29**(3): 21–26.

NATIONAL WORKSHOP ON COLLABORATIVE FISHERIES SCIENCE

By Dave Gillis, Senior Advisor for Partnering and Technology, DFO Science

DFO Science has some long-standing collaborative research relationships with various industry sectors and fleets which provide key knowledge about commercial resources and ecosystems. The nature of these arrangements varies widely; from single projects and collaborative programs to full-blown co-management arrangements or lands claim agreements with a science component. The Fisherman and Scientist Research Society is a unique approach where the organization itself exists solely to undertake science-based activities, many of which are done in concert with the Department.

The Department considers partnering to be an important instrument of change in the future delivery of science, and we are now striving to improve our own guidelines and tools for establishing and maintaining collaborative arrangements. We also felt it was timely and important to discuss the state of collaborative science with our major partner groups, particularly the commercial and subsistence fishing sectors.

To initiate this discussion, DFO Science hosted the National Workshop on Collaborative Fisheries Science in Montreal on February 17th to 19th 2004. About 50 people attended representing the industry, the department and others with a direct interest. General Manager Patty King ably represented the FSRS.

In his opening address, Serge Labonté, Director General for Fisheries, Environment and Biodiversity Science at DFO, challenged all participants to “...*look comprehensively and critically at the current state of collaboration; to see what approaches are working, and to work on what needs improvement.*”

Over the next 2 ½ days, we informed ourselves of the current state of collaborative fisheries science in Canada, identified the key enablers and constraints to our efforts to work together and discussed those constraints that we might help resolve or improve.

We learned that there is a substantial amount of collaborative fisheries science already underway. Inventories assembled for the workshop identified over 180 projects across Canada with a total value of work exceeding \$27M in 2003-04. Of this amount, industry is contributing over 55%.

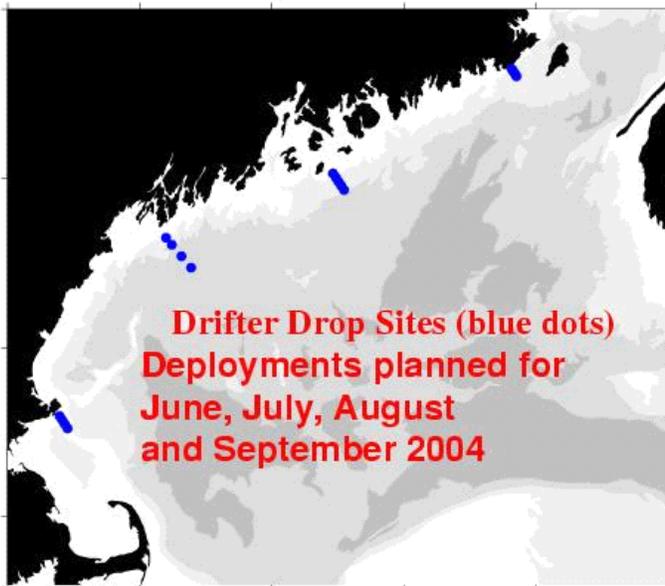
We discussed a wide range of issues; from a common vision for collaborative science to operational matters such as common priority-setting mechanisms and the cooperative management of knowledge and data. Industry participants took an active role in sharing their perspectives on collaborative science in formal presentations, and subsequently in the table and plenary discussions. Many participants reported an increased awareness of the many collaborative efforts underway across the country.

A workshop report will be produced later this spring to outline the state of collaboration and capture the views of participants on the issues raised and discussed. These views will also help us to ensure our policies and guidelines for collaborative science are appropriate and workable as we continue to work together on our key needs for resource knowledge.

NOTICE TO MARINERS

Drifter Sightings:

Mariners who sight a drifter unit (see figure at right) should report the drifter ID# and location via an automated tollfree system at: 1-888-284-4904. Enter "5" on the first phone prompt and then follow the instructions using keypad entry. Please have the five-digit drifter ID# and the loran or GPS position ready.



Plan: Lobstermen deploy drifters off Cutler, Isle of Haut, Cape Small, ME; and Gloucester, MA

When: June –Sept 2004

Purpose: To validate numerical ocean circulation models.

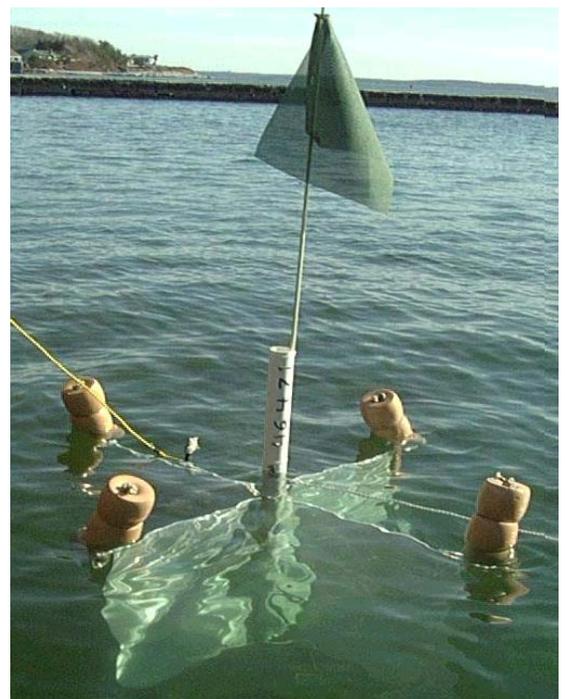
Particular Details:

If you find a drifter ashore or it appears to be exiting the Gulf of Maine (off the backside of Cape Cod, for example), please recover the unit, take it home, and call the Gulf of Maine Lobster Foundation at 207-985-8088.

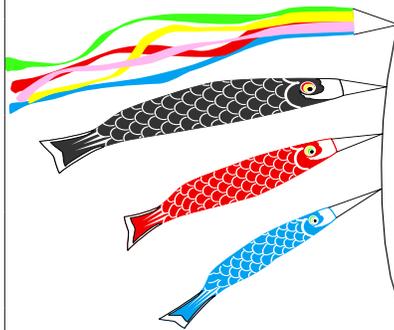
To monitor the tracks of all 70+ drifters, visit www.emolt.org.

The drifters, built by the Southern Maine Community College Marine Science students, consist of a 5' length of PVC vertical pipe which support a set of rods and sails. The unit is configured to minimize wind resistance. The only parts above the waterline, the top 2' of PVC, a small flag, and 4 sets of flotations, are labeled with the unit ID#.

Cooperative Research Funding by the Northeast Consortium.



NEW TO THE FSRS LIBRARY



Fisheries Resource Conservation Council: 2004/2005 Conservation Requirements for Groundfish Stocks on the Scotian Shelf and in the Bay of Fundy. (4VWX5YZ). FRCC.2004.R.2. February 2004.

Fisheries and Oceans Canada and Natural Resources Canada. **Bedford Institute of Oceanography 2002 in Review. 40th Anniversary Edition.** Cat. No. Fs75-104/2002E. ISBN: 0-662-34402-2. ISSN: 1499-9951.

Hilborn, R., et al. 2004. National Research Council of the National Academies. **Cooperative Research in the National Marine Fisheries Service.** The National Academies Press. ISBN: 0-309-09074-1. LCCN: 2003114991. *(Includes a section about the FSRS p. 36-42)*

THE FSRS WELCOMES NEW MEMBERS

The Fishermen and Scientists Research Society would like to welcome the following members, whose applications were approved at the February 12th Executive Committee meeting. We trust that this expansion of the FSRS's membership will prove to be beneficial to all involved.

David Baker
Vivian Bushell
Mizanur Rahaman

Kevin Bond
Jason Cheverie
Md. Monowar Parvez

Mark Gleason
Mark Johannes

Ashol Kumar Verma
Kathy Stuart

CALL FOR NOMINATIONS A.G. HUNTSMAN AWARDS – SILVER JUBILEE

The A.G. Huntsman Award was created in 1980 to recognize excellence in marine sciences. To mark its 25th Anniversary, a 2-day jubilee is planned for the fall of 2005, hosted by the Bedford Institute of Oceanography and Dalhousie University. Awards will be presented in each of the following categories:

- Biological/Fisheries Oceanography
- Marine Geosciences
- Physical/Chemical Oceanography
- Interdisciplinary Marine Science

The latter category is intended to recognize exceptional contributions across two or more marine science disciplines, at the interface between the oceans and other natural systems, or in the expansion of marine sciences into new fields.

Nominations for outstanding individuals in the above categories are encouraged. The deadline for their receipt is **30 June 2004**. More information on the Huntsman Award and on the nomination procedure can be found on the Huntsman website at <http://www.bio.gc.ca/huntsman/huntsman-e.html>. For further information, please contact John Loder (Chair, Huntsman Selection Committee) at loderj@mar.dfo-mpo.gc.ca.

REMEMBERING ONE OF OUR OWN

We would like to take this opportunity to remember Jason Day, the Fishermen and Scientists Research Society's 2003 Cape Breton Fisheries Intern who passed away suddenly, December 28, 2003 at the age of 28. Jason was a valuable employee who continued working with the FSRS after his internship. He will be greatly missed. Born in Sydney July 29, 1975 he is survived by his parents Norman and Lillian (LeMoine) Day; wife April (Wareham); two daughters, Brianna and Kayla; one sister Norma Dixon. Sydney: three brothers, his twin Jamie, Montreal; Cory, Halifax; and Parker, Calgary; paternal grandmother, Janie LeMoine and grandfather Norman Day Sr. He was predeceased by his grandfather, George Lemoine and grandmother, Roseanna Day. Interment in the parish cemetery. Donations may be made to the Nova Scotia Heart and Stroke Foundation or a charity of your choice. Our thoughts and prayers are with his family.



Erin, Carl and Jason in the lab.



Jason with his class during MED training.

LOBSTER MOVEMENTS AND MIGRATIONS

By Jeff Graves, FSRS Senior Fisheries Technician

On Monday March 23, 2004, those in attendance at the FSRS annual conference were treated to an excellent presentation and video given by Chris Cooper, Project Director for the Ocean Technology Foundation in Connecticut. The presentation dealt with the migration and ecology of the American lobster. The study was done along the New England portion of the Continental Shelf. A manned submersible vehicle was used to take extensive video on each dive. The dives were done in 150 to 300 fathoms of water. Temperatures in the study area were in the 10⁰C to 11⁰C degree range. This warm water can cause lobsters to molt twice per year. In the areas studied up to 50% of offshore lobsters migrate inshore. This migration begins in April or May. It is unknown why some lobsters migrate one year and not others. The female lobsters migrate inshore to lay eggs, molt, and mate. The male lobsters migrate inshore following the females. By September or October the lobster that migrated inshore in April or May have returned to the offshore and the deeper water.

The video showed some incredible shots of tilefish, ocean pouts, lobsters, redfish, white hake and conger eels. It was especially interesting to see the burrows that many of these species use for habitat.

FSRS SCIENTIFIC PROGRAM COMMITTEE REPORT

By Katie Rapp, FSRS Fisheries Technician

***I* WORKING GROUPS**

Presently there are four groups: Shellfish, Groundfish, Assets and Data Management working groups. The Shellfish working group is currently looking for members from LFA's 27 and 28. The Groundfish working group is also seeking participants. Non-members can be in a working group. Anyone interested in being on a working group should contact Patty King for more information.

***II* ASSETS WORKING GROUP REPORT**

Objectives

To maintain and communicate an inventory of FSRS assets available for use in projects, including equipment, vessels, personnel, what data sets we have, etc. (eg: current assets are minilogs, CTD's, scales, measuring boards, members' vessels - need to determine who/when willing to volunteer time and vessel and who/when need expenses paid, for example up to half a day will volunteer use of vessel, over that need to be paid for fuel and other expenses, and what the rates would be). This will be useful in soliciting project proposals, for example from Dalhousie University. This should be put on the web site.

Inventory of FSRS Assets

An inventory of services/assets will be added to the web site, put in the newsletter, and promoted through other appropriate means. It will include:

- Vessel Inventory
 - Have 100+ vessels in the database
 - # of vessels by county and size will be listed on the web
 - rates will be negotiated on a contract by contract basis
 - Still working on insurance issue
- Equipment Inventory
 - List of equipment for rent or loan
- Data Sets
 - List of data sets from projects
 - Will be linked to projects section for more details and results
 - Anyone wishing to use FSRS data sets must agree to abide by the FSRS Data Sharing Policies
- Services
 - List of services previously provided and capable of providing
 - Includes biological sampling, vessel charter, collection of live fish samples, at-sea and shore-based sampling, otolith preparation, tagging, environmental monitoring, data entry and analysis, etc.

***III* DATA MANAGEMENT WORKING GROUP REPORT**

Objectives

The objectives of the Working Group are to deal with the following issues: database design and data entry, error checking, data sharing (structure should conform to a recognized international standard; let people know what data exists), data management (security, backups and long-term storage).

Database Design

The FSRS is using currently using Access while GOMLF/MLA are using Excel, but they are converting to Access. The design of the database is to be as consistent as possible to allow sharing of data, while allowing for differences specific to each area (ie: although the core project is the same, how GOMLF/MLA collects data differs from how FSRS does it). The database has automatic error checking capabilities being added and is going to be modified to allow for the new measuring gauge design.

Data Sharing

Established locations and formats exist in order to make data sets known, however a “data dictionary” needs to be developed. Meta data (data describing the data) is to be listed on locations such as GeoConnections. As always, the sharing of FSRS data is done in accordance with FSRS Data Sharing Policies.

Data Management

Procedures are in place for multiple on-site and off-site back ups. The schedules for exchange of information between FSRS and GOMLF/MLA have yet to be established.

IV SHELL FISH WORKING GROUP REPORT**i) Trap Effectiveness Study**

This project was conducted to determine how effective the FSRS recruitment traps are at catching lobsters compared to commercial traps. We wanted to verify if the FSRS recruitment traps do catch smaller lobsters. The project also looked at whether a closed vent commercial trap catches the same size lobsters as the FSRS Recruitment trap. From one trawl, fishermen measured and sexed the catch of lobsters from 2 commercial traps, 2 FSRS recruitment traps, and 2 commercial traps with the escape vents closed off. To compare the traps, they were to be placed alternately. All lobsters in the traps are measured using the FSRS measuring device and recorded in a record book. There was only one participant in LFA 34 who collected information last year and one participant in LFA 33 this year. It would be ideal to have at least one more participant.

The recruitment traps were found to have a higher catch rate of small sublegal/legal lobsters while commercial traps had a higher catch rate of larger legal lobsters (however the significance of these findings was not determined because it is such a small difference).

ii) Commercial Trap Sampling Project

This project was initiated last year as a pilot project in LFA 33. The project participants were asked to collect data from three of their commercial traps. It was a successful project and about half the Lobster Recruitment Project participants from LFA 33 are involved in it. This project is planned to continue and expected to be an expanding project if fishermen are interested and we have the personnel, equipment and financial resources to do so.

iii) LFA 29 Off-Season Sampling

Out-of-season tagging is being planned to see what is in LFA 29 after the fishery is over and then compare it to the fall. Funding is being sought for this project.

V GROUND FISH WORKING GROUP REPORT**4VSW Sentinel Program****Results**

201 of 202 stations were completed during the Random Survey Phase of the 2003 4VsW Sentinel Program. Two Commercial Index days have been done to date. Participants had until March 31, 2004 to complete the Commercial Index Phase of the program. Results and reports are being developed, which will be sent to participants and posted to the FSRS web site.

Budget

The Sentinel Budget was reviewed. Tables 1 and 2 summarize the revenue from the sale of fish landed during the Sentinel Program. The average amount of fish and revenue per station during the Random Survey Phase is down from last year. The average amount of fish and revenue per fishing day during the Commercial Index Phase is also down from last year. Total pounds of fish sold and average pounds of fish per station were influencing factors on the decrease in revenue.

Proposal

The 4VsW Sentinel Program was found to not be viable under the current structure and needs to be replaced with a more possible program that does not cost FSRS money as it does now. The Groundfish Working Group will design a new 4VsW Sentinel Monitoring Project and present it to the Scientific Committee for approval. It was proposed to focus on inshore sets where DFO's vessel does not survey and also in closed areas where there is no fishing. Efforts are underway to seek funding to re-expand the project to past levels.

Table 1: Random Survey Phase Revenue Analysis

Year	# Stations Completed	Total Pounds Fish Sold	Average Pounds of Fish/Station	Total Revenue From Sale of Fish	Average Revenue Per Station	Average Price Per Pound
2003	201	11,032	54.89	\$8,430.35	\$41.94	\$0.76
2002	191	19,124	100.13	\$17,304.33	\$90.60	\$0.90
2001	202	19,300	95.54	\$14,287.35	\$70.73	\$0.74
2000	251	27,404	109.18	\$19,951.55	\$79.49	\$0.73
1999	253	26,865	106.19	\$22,633.70	\$85.79	\$0.81
1998	252	36,639	145.39	\$33,073.30	\$131.24	\$0.90
1997	248	23,396	94.34	\$15,376.43	\$62.00	\$0.66
1996	252	41,163	163.35	\$24,055.25	\$95.46	\$0.58
1995	221	31,168	141.03	\$25,932.76	\$117.34	\$0.83

Table 2: Commercial Index Phase Revenue Analysis

Year	# Fishing Days Completed	Total Pounds Fish Sold	Average Pounds of Fish/Fishing Day	Total Revenue From Sale of Fish	Average Revenue Per Fishing Day	Average Price Per Pound	Vessel Share of Revenue	FSRS Share of Revenue
2003 Class 1	2	2,022	1,011	\$1,700.95	\$850.48	\$0.84	\$1,180.41	\$520.54
2003 Class 2	0	0	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
2003 Class 3	0	0	0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
2003 Total	2	2,022	1,011	\$1,700.95	\$850.48	\$0.84	\$1,180.41	\$520.54
2002	20	52,379	2,618.95	\$45,372.95	\$2,268.65	\$0.87	\$32,790.15	\$12,582.80
2001	21	40,960	1,950.48	\$30,264.45	\$1,441.16	\$0.74	\$25,007.49	\$5,256.96
2000	4	10,943	2,735.75	\$7,893.15	\$1,973.29	\$0.72	\$5,874.74	\$2,018.41
1999	41	143,092	3,490.05	\$112,393.15	\$2,741.30	\$0.79	\$91,053.35	\$21,339.80
1998	23	85,153.5	3,702.33	\$79,999.72	\$3,478.25	\$0.94	\$58,529.92	\$21,469.80
1997	100	250,053.6	2,500.54	\$168,180.80	\$1,681.81	\$0.67	\$122,622.54	\$45,558.26
1996	44	259,509.0	5,897.93	\$186,716.00	\$4,243.55	\$0.72	\$134,545.96	\$52,170.04

VI MASTERS STUDENTS STUDYING FSRS

Leslie MacDougall, a Masters in Marine Affairs Student from Dalhousie University, is currently conducting a four week internship with the FSRS to study the society and its members.

VII EEL GRASS STUDY

Mapping out of the inshore tidal eel grass is being studied in the Port Joli area. They are examining diversity, long term near shore fish habitats and chronic back ground sound effects on fish.

VIII INTERNSHIP PROGRAM

Funding for four FSRS Fisheries Technicians has been approved as follows: South Western NS – 1 position full-time for 12 months & 1 position full-time for 6 months; Eastern Shore of NS – 1 position fulltime for 6 months; Cape Breton – 1 position full-time for 6 months.

IX 2004 WORKPLAN

PROJECT	STATUS	PROPOSED PLAN FOR 2004
4VsW Sentinel Program	<p>Finish date is March 31/04; 201 of 202 stations completed in Random Phase; 2 Commercial Index days done to date.</p> <p>Results will be sent to fishermen and will be posted to web site.</p>	<p>4VsW Sentinel Program not viable under current structure; needs to be replaced with a more viable program.</p> <p>Groundfish Working Group will design new 4VsW Sentinel Monitoring Project. Sentinel captains and others invited to be on Working Group.</p> <p>Proposal - focus on sets inshore where DFO vessel does not survey and closed area where there is no fishing; develop in a way that ensures a bridging index between current survey and future if the resource recovers. Consider commercial index and how it should be structured to be viable and not cost FSRS money as it does now.</p> <p>Prepare workplan and budget.</p> <p>Present to Scientific Program Committee for approval.</p> <p>Seek funding to re-expand project to past levels.</p>
Condition Study	<p>Peter Hurley has been working on analysis.</p> <p>Data has been incorporated into DFO database.</p>	<p>Peter Hurley to evaluate results and determine if project should be continued as is, modified or discontinued.</p> <p>If continue, increase sampling at selected sites.</p> <p>Peter, Carl and Shannon will continue working on analysis.</p> <p>Results to be presented at 2005 annual conference.</p>
Minilog & CTD Deployments	<p>Minilogs deployed by individuals and project participants.</p> <p>CTD 's used only during Sentinel.</p>	<p>Continue to provide minilogs to as many project participants as possible.</p> <p>Brian Petrie has been working with the data and will do an article for the newsletter and possibly present at 2005 annual conference.</p>
Ecosystem Study - Predator/Prey Relationships Project	<p>Analysis of stomachs is on-going.</p> <p>Data entry is up-to-date.</p>	<p>Continue data entry as stomachs are collected.</p> <p>Evaluate results.</p>

PROJECT	STATUS	PROPOSED PLAN FOR 2004
Lobster Recruitment Project	Currently 159 fishermen participating in LFA's 27, 28, 29, 30 31A, 31B, 32, 33 & 34. Results available by contacting Carl MacDonald. Individuals receive own results. Group results presented at LFA and other meetings. Program working well. 5-year review of project is being done. Attended and presented at Lobster Workshop at Maine Fishermen's Forum	Expand coverage. This is limited by financial, equipment and personnel constraints. Continue attending LFA meetings to present results. Expand into Bay of Fundy LFAs. Finish writing 5-year review document and have it published.
Lobster At-Sea and Shore-Based Sampling	In addition to our own samples, DFO Invertebrate Fisheries Division has provided funding for interns to do sampling for them. Working well.	Continue. At-sea sampling should be focus, particularly on vessels in the recruitment trap project.
Trap Effectiveness Study	One participant in LFA 34 collected information last year. Results were presented in newsletter; available by contacting Carl. One participant in LFA 33 collecting information this year.	Would be good to have at least one more participant.
Sampling From Commercial Traps	Initiated last year as a pilot project in LFA 33. A successful project. It is continuing. About half the Lobster Recruitment Project participants from LFA 33 are participating in it. Results were presented in newsletter; available by contacting Carl.	Consider expanding project if fishermen are interested and we have the personnel, equipment and financial resources to expand.
Crab Sampling	Some sampling has been done on Jonah, Rock and Snow Crab, much of it under contract to industry and DFO	Expand sampling as time/resources permit.

X GENERAL DISCUSSION/COMMENTS

i) Grey Seals Predator/Prey

- DFO is spending 5 million over a two year period to do research on Grey Seal predator/prey relationships.
- FSRS should get involved in this.
- Their new breeding ground areas also need research.

ii) Parasite Infestation Data

- Determine the level of parasites in Cusk.
- How much support is there for doing research on Cusk?
- Possibly able to obtain money from COSWIC/SARA.
- Consider a Sentinel Survey of Cusk - find out relationship with seals.
- 4VW is where Cusk.
- Cusk and the lobster fishery - it was suggested research could be done to determine if the lobster traps are catching cusk. Some fishermen believe it's a risky study because the lobstermen will be the ones to go.

XI OTHER BUSINESS

i) Soft shelled lobsters

The following comments were made during a discussion about soft shelled lobsters:

- There are serious science issues related to this matter. The situation is very bad in some areas. ie. near-shore 1-2%, mid-shore 15% and offshore more than 60% of catch are soft shelled according to one fisherman.
- Why are the lobsters dropping their shell and or are still soft shelled in February?
- In Maine the lobsters molted 40 days late - if this was carried over to our areas the molt would have been in December, which it was not.
- Even hard lobsters are not 100% full.
- Nutrition - is there something we can feed lobsters (eg. crabs) to help build their shells?
- A crustacean scientist in Quebec found that rock crab is very important to nutrition.
- Some felt that in LFA 34 there are too many lobsters and not enough food.
- Perhaps low temperatures are effecting crabs, etc. and making them unavailable for food.
- Some fishermen feel there is none or not enough science going on in their areas with a need to determine the problem. Is it climate? Disease?
- We might have to change our fishing practices in order to resolve this issue of soft shelled lobsters. We can't add food to the bottom and can't cure climate, but we can change when/where we fish.



PATTY'S PICKS - WEBSITES OF INTEREST



Schooner Solutions Inc. provides an online resource centre for those involved in the Canadian Commercial Fishing Industry. Check out their website at: www.fishingnet.ca.

The National Undersea Research Centre has snippets of underwater video showing lobsters going in and out of a trap as well as other underwater video. To view these go to: <http://data.nurp.noaa.gov/mmedia/mmsearch.asp>.

For information on the Gulf of Maine Council browse there website at: www.gulfofmaine.org.

Interested in learning how you can help with conservation and restoration of the Gulf of Maine and its watershed? Go to the Gulf of Maine Summit Website for more information on the Summit and its objectives: www.gulfofmainesummit.org.

**Do you know of a website
that would be of interest to
FSRS members?
Please send suggestions to:
www.pattyfsrs@auracom.com**

OFFSHORE DEVELOPMENT AND ITS IMPACT ON THE FISHERIES

By Katie Rapp, FSRS Fisheries Technician

The prospect of oil & gas development onshore and offshore in Nova Scotia has risen - and will continue to raise - important issues surrounding the protection of the fisheries. On the first day of the Fishermen and Scientist Research Society (FSRS) Annual Conference, two speakers participated in the presentation about the proposed Blue Atlantic natural gas pipeline. The Blue Atlantic team from Jacques Whitford began the presentation by giving an overview of some initiatives and projects of the Blue Atlantic Natural Gas Pipeline. They included conducting a tank study to examine lobsters crossing over pipeline material and a tagging study in the Jordan Bay area to study the migration of lobsters.

Video

Blue Atlantic has conducted extensive 3-D mapping of the ocean bottom on the route of the preliminary corridor of the pipeline. Virginia Soehl of Blue Atlantic illustrated this mapping with a multi-media video detailing the ocean bottom composition along the corridor. Three hundred transect samples of photo imaging were also taken during the mapping to eliminate mis-representation of the sea floor. Some of the areas they focused on were Roseway Basin, Browns Bank, Northeast Channel and Georges Bank.

Q - Are you running the pipeline through Browns Bank for sure?

A - Additional routes are being studied to go outside Browns Bank. This is just a preliminary corridor.

Research

Department of Fisheries and Oceans scientist and FSRS Scientific Program Committee Chair Ross Claytor then presented the FSRS project proposal for research on Lobster/Pipeline interactions. The basis of the proposal was to answer any questions brought back from a Rhode Island Conference held last June. A timeline of the development of research proposals thus far has been:

- A Long Term Proposal (goal) in August,
- Pilot Project Proposal in September,
- Terms of Reference from Blue Atlantic in December, and
- A Short Term Proposal based on revised terms of reference in February.

The general principles of the research are to evaluate the effects of pipeline construction and operation on the inshore lobster population by collecting data from the affected site in Jordan Bay as well as a control site that is not affected by the pipeline. By combining the data from these two sites it would reduce confusion of any natural annual variation that might be attributed to pipeline effects.

Lobster Movement/Tagging

Ross went on to explain that most or many possible pipeline effects are related to lobster movement. By focusing on the direct outcome of lobster movement we would gain understanding of the environmental effects. Then to also center on the fishery effects we would better understand the economic outcome. Acoustic and streamer tags, detailed fishery sampling and temperature and salinity are all included in model project elements to be studied. The Long Term Proposal includes conducting one full year of this research before the construction of the pipeline, which would form a baseline of information to then continue during the construction and stabilization of the pipeline and into two years of its operation.

The objectives of the Short-Term Project proposed to start in September 2004, based on the revised terms of reference received in February, are to:

- Estimate the proportion of unberried female (>100mm) lobster leaving the near-shore habitat of Jordan Bay to offshore water and returning to the bay.
- Estimate the distance and direction of small-scale movement of unberried female (>100mm) lobster in an area of high density.

The proposed project also seeks to acquire information related to the long-term objectives of increasing scientific knowledge on the movement of lobster and to develop new and transferable methodologies to study and monitor near-shore oil and gas industrial activity on crustacean fisheries.

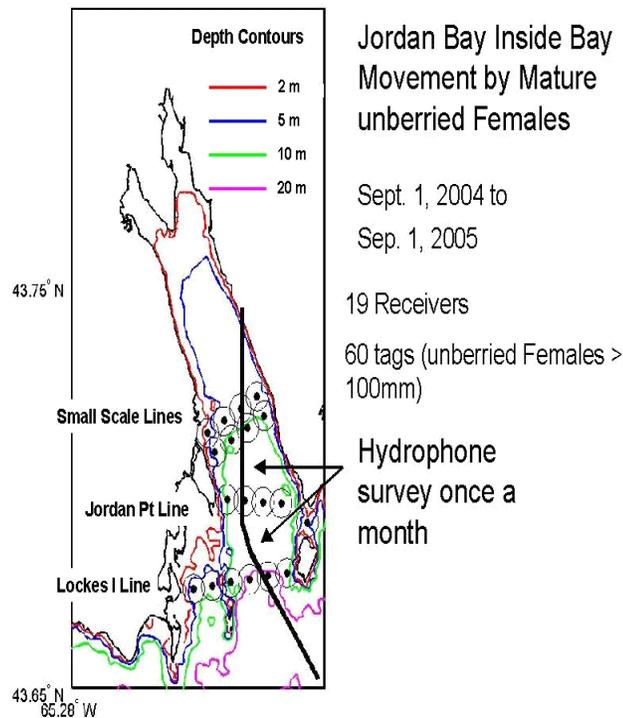


Figure 1: Short term project design

The Blue Atlantic Team and the FSRS have found that their objectives are similar, with some differences that still need to be addressed. They hope to meet in the near future to clarify project objectives, information needed, field data and analytical techniques and the work to be done within the expected budget. Through co-operation and collaboration, it is hoped valuable research can be conducted on lobster migration and interaction with the proposed pipeline.

The FSRS stated that they neither support nor oppose the pipeline; they are just there to conduct the science. Also they plan to share all data and have local consultations in Jordan Bay.

Q - Has anyone looked at the Country Harbour pipeline to get baseline information?

A - Yes, a study has been done, the results just have not been presented yet. Blue Atlantic has asked for more results from the interm report, but it has not been finalized.

Q - What direction do the members want the FSRs to take?

A - Make sure funding is transparent and that no underlying guarantee is made. There is no question that this research should go through the FSRs, which is made up mainly of fishermen and the scientific committee whom are already involved & educated in the issue.

.....

(Measuring the Abundance of Eggers... Cont'd from page 3.)

Some of the questions raised were:

- Once a lobster has been caught in a trap is it more wary of going into a trap a second time?
- How were the tags attached?
- What size constitutes the window size?
- Why are catches of female lobsters down?
- Are the lobster grounds too crowded?

Eugene O'Leary presented information on a juvenile trapping survey. This survey was sponsored by the Guysborough County Inshore Fishermen's Association, Department of Fisheries and Oceans, Social Research for Sustainable Fisheries, the Fishermen and Scientists Research Society, and Human Resources Development Canada.

The purpose of this study was to follow the abundance of different stages of lobster life history. This was tested using the standard FSRs recruitment trap, with modified entrance rings. The study areas were Whitehead, Cooks Cove, Little Dover, and Queensport, all in LFA 31A. The study was done in August, September, and October. Best catches were shown in October; this is thought to be due to the fact the all molting activities had been completed. This study is considered a success, however, more years of study are needed before it can be used as an effective tool for making predictions for the future of the lobster fishery.

Duncan Belfontaine spoke about the Lobster Larvae sampling study that took place the past two years. Sponsors of this study are the Guysborough County Fishermen's Association, NS Department of Agriculture and Fisheries (Innovations Fund), Department of Fisheries and Oceans, and Human Resources Development Canada. Two questions are being answered by doing this study are: when does hatching and settling occur of lobster eggs in LFA 31A, and are Stage IV lobster larvae related to future catches of juvenile lobsters or landings.

Juvenile lobster larvae are studied by towing a 1.5mm mesh net that is 2 feet deep by 8 feet wide. The net is towed for 10 minutes at each station at a speed of approximately 3 knots. Once the samples were on board they were strained to remove jellyfish and seaweed and stored in glass jars. These jars were then transported to the office where interns sorted the larvae from each sample. Sampling was increased from 48 stations in 2002 to 56 stations in 2003. So far it's been concluded that hatching of lobster eggs takes place from the last week of June to early September. Stage IV lobster larvae settles to the bottom from mid-August until mid-September. It is difficult to get an accurate sample of Stage IV lobsters due to the fact that they continually move through the water column in search of suitable environment. The towing method does not have the ability to sample water deeper than a couple of feet. Survival appeared to be better in 2002 than in 2003. This could be due to a decrease in water temperature in July 2003.



**Need help identifying marine worms?
Register for the Marine Invertebrate Diversity Initiative
2004 Polychaete Workshop**

October 2004



photo by A. Cogswell

**Nova Scotia Museum
of Natural History
Halifax, Nova Scotia**

**Registration opens in August at www.fundyforum.com/MIDI
Seats are limited.**

For more information contact the MIDI office:

Phone: (902)426-3587

Email: MIDI@fundyforum.com

DALHOUSIE GRADUATE STUDENT REQUESTS ASSISTANCE FROM THE FSRS AND ITS MEMBERS

Lesley MacDougall, a grad student at Dalhousie University, has requested the opportunity to be an intern with the FSRS and survey its members to obtain information for her grad project.

Lesley will be studying the FSRS, and the way it operates, and comparing it to fishermen's associations in British Columbia, to draw parallels, and suggest possible future initiatives.

Lesley is interested in the way people work together within the FSRS, the sharing of decision making and information between fishermen and scientists, and the opinions, concerns and ideas of members of the FSRS.

Lesley will be an intern with the FSRS in May and will be contacting FSRS members to see if they would be willing to participate in her survey. She is looking forward to her work with the FSRS and the opportunity to get to know the FSRS membership.

FISHERMEN AND SCIENTISTS RESEARCH SOCIETY LOBSTER RECRUITMENT PROJECT 5 YEAR REVIEW

By Carl MacDonald, FSRS Research Biologist

Overview of the FSRS Lobster Recruitment Project

Introduction:

In the spring of 1999, the Fishermen and Scientists Research Society launched a Short Term Lobster Recruitment Index Project. During the regular commercial season, fishermen use a particular number of scientific lobster traps to gather information about undersize lobsters in their area. Volunteer fishermen count, sex and record the sizes of lobsters from their science traps and record them in a logbook. These fishermen also indicate if lobsters are berried, tagged, and or v-notched. Each year the project traps are fished in the same locations to minimize that variable. The project includes all Lobster fishing areas (LFA's) from LFA 27 to LFA 34, with over 160 fishermen currently participating in the project. Participants also monitor bottom temperatures by placing a computerized temperature recorder in one of their project traps for the whole lobster season.

Project objectives:

This project is designed to study the number and size of juvenile lobsters that will be recruited into the lobster fishery in the upcoming seasons. Collecting juvenile lobster information over a number of years allows an index of recruitment to develop. Over time, trends develop in the data allowing one to predict what the lobster recruitment will be in the upcoming seasons. Lobster fisheries in Atlantic Canada rely heavily on newly recruited lobsters. Hence, we will be able predict, with some degree of uncertainty, if there will be increases or declines for the commercial lobster fishery.

Trap and gauge design:

It was decided that all participating fishermen should use the exact same science trap. The standardized science traps have two 5-inch entrance rings, 1-inch wire mesh, no escape vents, and a biodegradable ghost panel. This design was used to maximize the capturing and retaining of smaller size lobsters (Figure 1). The Department of Fisheries and Ocean support this initiative and supplies the scientific lobster trap tags for the project traps. The fishermen use a specially designed gauge to measure the lobsters (Figure 2). A new gauge with more size increments was introduced in the Fall of 2003.

The size groupings are from 1 to 15 and are in 10 mm increments, with the exception of size groupings 8 and 9 which are in 5mm increments to give a clear indication of the number of lobsters just under the legal size limit. The logbook deals with if a lobster was of minimum legal size for the size grouping in question. So the fisherman would indicate in the logbook if the lobster were a size 10 legal or short.

Figure 1: Standardized lobster trap used by fishermen researching undersize lobsters

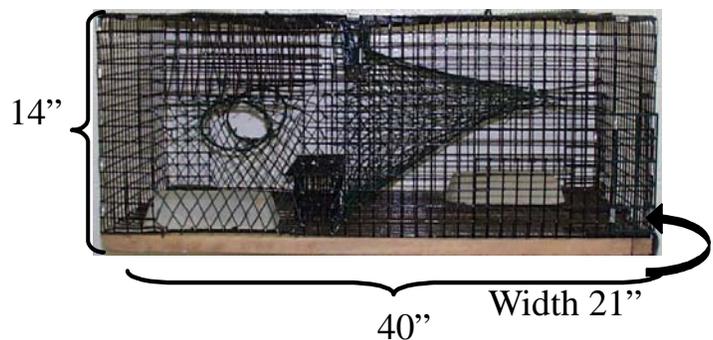


Figure 2: Measuring gauge—First 5 Years



How are Recruitment Trap Data Used in Lobster Assessments?

What we need to know is how the lobster population responds to fishing, ecosystem changes (temperature), and management actions. Understanding the population response requires indicators. Three main indicators used to understand lobster populations are:

1. Abundance
2. Distribution
3. Exploitation

The Society's recruitment data provides information for all of these indicators. By using the recruitment data one can look at abundance trends by area and size, distribution by size, and exploitation rate by area and size. Greater than 50% of the data used in the recent LFA 33 lobster assessments was provided by the FSRS in the form of lobster recruitment data.

1) To assess lobster abundance through recruitment data we can look at trends in the catch rate of a size grouping of lobsters over the seasons. In that way we can determine if there are lower or higher catch rates of a size grouping of lobsters. Increasing participation in the lobster recruitment project reduces uncertainty in the level of lobster abundance. To capture migration of lobsters into an area the recommendation would be to add traps or participants rather than to move traps around during the season.

2) To evaluate lobster distribution through recruitment data we can look at maps created by using 10-minute square areas. The data can be analyzed to show the distribution of males, females, and berried lobsters all by size groupings. For example, one could create a map showing the distribution of size 3 lobsters. Or the data could be analyzed to show the areas where berried lobsters are captured more frequently. One can assess trends in the catch rate of a size grouping of lobsters over the seasons.

3) Exploitation rate is described as the catch of lobsters over the season divided by the population of lobsters in that area ($ER = \text{Catch} / \text{Population Number}$). Exploitation rate can be used as an indicator to measure fishing effects on the population, as a tool to calculate success of lobster management decisions and helps to evaluate egg-per-recruit targets.

The catches from the lobster recruitment traps are useful in determining exploitation rates because the fishermen record the catch information daily over the whole season. At the first of the season there will be a certain ratio of legal size lobsters to undersize lobsters. The numbers of legal-size lobsters are being depleted over the season while the numbers of under-size are not being depleted. The number of under-size lobster remains constant, as they are not depleted. So, the change in the ratio of legal size lobster to under-size lobsters during the season is used to estimate exploitation rate. The more the ratio of legal to undersize lobsters declines the higher the exploitation rate.

Why sample while fishing?

The data from the lobster recruitment index standardized traps project is very useful. The data provided by fishermen supplies information that is otherwise unobtainable via other avenues. The collecting of data leads to cooperation between fishermen and scientists. The data collected is cost effective as fishermen can collect the data during the normal commercial fishing. Fishermen are present to provide local knowledge about the lobster fishery and have the opportunity to influence decisions.

(cont'd page 25)

EXPLORING THE MARINE ECOSYSTEM OF THE EASTERN SCOTIAN SHELF WITH MASS BALANCE ECOSYSTEM MODELS: COMPARATIVE RESULTS BEFORE AND AFTER THE GROUNDFISH COLLAPSE

By Shannon Scott-Tibbetts, FSRS Research Assistant

Alida Bundy spoke at the FSRS Annual Conference on March 22, 2004. She is a Research Scientist with the Marine Fish Division of the Department of Fisheries and Oceans. Her area of expertise is investigating the predator/prey relationship of certain species on the Eastern Scotian Shelf.

Until the early 1990's, the eastern Scotian Shelf supported a large groundfish fishery that included cod, silver hake, haddock, and American plaice. The majority of these fish were caught by large groundfish trawlers. By 1993, the groundfish resource base, and in particular the cod, had collapsed and a moratorium was placed on this fishery. By 2002, the cod and haddock have not recovered their numbers and the fishery has not reopened. The biomass of other groundfish is also low. Fisheries for invertebrates like shrimp, crabs, and bivalves have developed since the moratorium was enforced.

CDEENA originally proposed a comparative analysis of changes in the structure and function of the Northwestern Atlantic shelf ecosystems to determine how these may have affected the productivity of living resources. The **Comparative Dynamics of Exploited Ecosystems in the Northwest Atlantic** project had a big question to try and answer: "What have been the relative effects of fishing, trophic interactions and environmental variation on the population dynamics of marine finfish and shellfish inhabiting shelf ecosystems of the Northwest Atlantic?"

The goals of CDEENA are:

- 1) model the structure and function of the shelf ecosystems of eastern Canada and determine how the physical and biological components of their ecosystems change over time,
- 2) fill critical gaps in the knowledge required to develop model descriptions of these ecosystems, and
- 3) use these models to investigate hypotheses concerning the impact of changes in reproductive potential, mortality, and trophic interactions on the dynamics of Atlantic cod and other groundfish.

Alida's talk focused on the description of two mass balance models (Ecopath model) of the eastern Scotian Shelf (1980-85 and 1995-2000), showing results for the eastern Scotian Shelf (how has the system changed), discussing what do these models tell us about the structure and function of the eastern Scotian Shelf ecosystem, and what does this all mean for the cod.

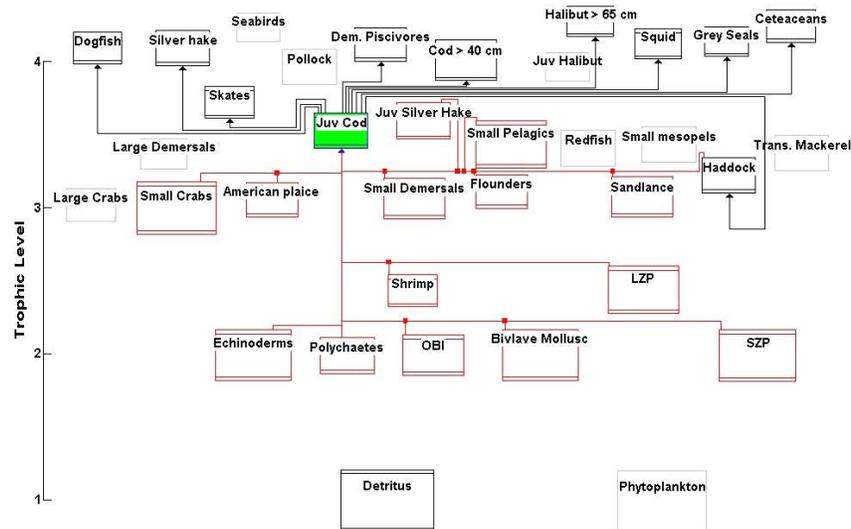
The Ecopath is a mass balance model that gives a 'snapshot' of the resources in the ecosystem and their interactions. It represents the whole ecosystem, from detritus to top predators. Trophic interactions are represented through trophically linked biomass pools and the links are determined by the diet matrix, and it assumes that all gains are balanced by losses. Ecopath tries to work as an ecological book-keeper by identifying and quantifying major energy flows in the ecosystem.

Key data requirements for the Ecopath model:

Biomass	(t/km ²)
Production/ Biomass	(t/km ² /yr)
Consumption/ Biomass	(t/km ² /yr)

Ecotrophic efficiency	(proportion)
Diets	(proportion)
Catches (by fleet)	(t/km ² /yr)

As you can see from this flowchart, juvenile cod was a major player in the early 1980 system. How has that changed in the 1995-2000 time frame?



Through analysis and use of the models, it was found that there was a significant decrease in the mean trophic level of the catch (from 1995-2000), which translated into fishing down the food web. The biomass of the eastern Scotian Shelf has changed since the mid 1980's (1980-1985). The changes in species structure is significant. There is a definite species change, particularly for sandlance, small pelagics, and shrimp. The system pelagic:demersal ratio has increased; meaning there is more energy flow through pelagic pathways, and less through demersal. Through the use of the Ecopath model, it was found that the percentage of small demersals, sandlance, other fish and other prey have moved up in the food chain to be at a higher trophic level and therefore a potentially more significant predator.

During the 1980-1985 period, the large cod were a significant predator but following the collapse, the role has been taken over by large silver hake, small silver hake, and seals.

What do the models tell us?

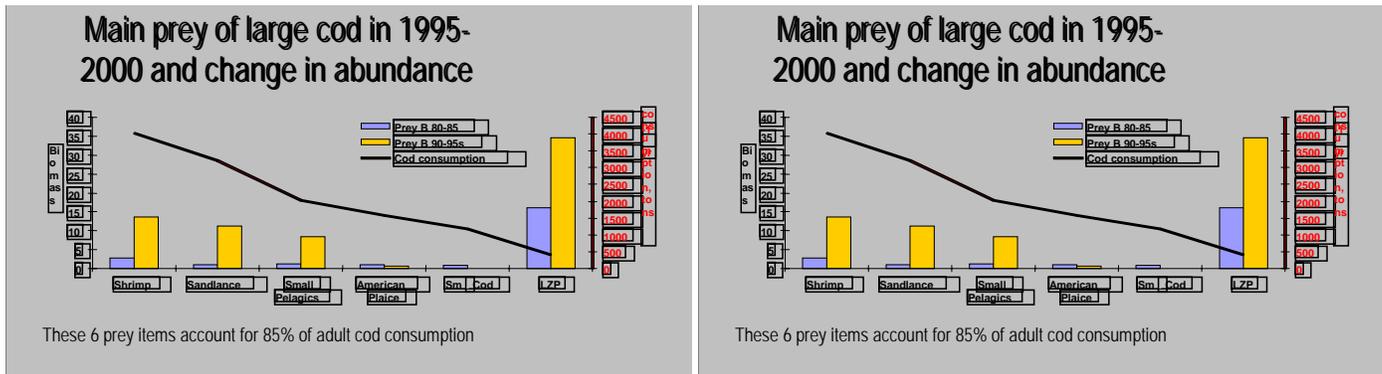
- ◆ Greater pelagic biomass (more forage fish)
- ◆ Increase in trophic level and piscivory (feeding on fish)
- ◆ Changes in predator structure
- ◆ Increase in predation mortality on small cod
- ◆ No change at the whole system level but there is the effect of fishing down the food web

Why is there no recovery of Atlantic cod on the eastern Scotian Shelf after 10 years of fisheries moratorium?

There seems to be a large unknown mortality for adult cod in 1995-2000; predation mortality is low. The total mortality and predation mortality on small cod is higher in 1995-2000 than in 1980-1985. There are few predators of large cod identified. The most important are grey seals, whose biomass has increased. But in the 1995-2000 period, most of the mortality is not accounted for by the model. There

seems to be an equal amount of predator species on small cod in both study periods. The six predators that account for 85% of the predation mortality on small cod are: small demersal piscivores, silver hake, squid, cetaceans, large cod, small LDF, and grey seals. The biomass of these predators has generally increased (except for the large cod, and small demersal piscivores).

The following two graphs show the changes in the prey items of large and small cod in the 1980-1985 period and the 1995-2000 period. The prey items of both the large and small cod seem to have increased so are not likely food limited.



There seems to be a niche overlap of small cod. This means that there are lots of potential competitors for the different food sources. Sandlance, capelin, small demersals and small pelagics all have increased in biomass and have increased their consumption. Cod may be losing the competition for large zooplankton. The condition of small cod has been low since the early 1990s which has corresponded to an increase in biomass of their competitors for food.

Summary:

- There has been an increase in biomass and consumption at all trophic levels, but especially at the middle of the food web.
 - There are changes in the species structure- increase in the pelagic:demersal ratio.
 - There are changes in the predator structure.
 - There is an increase in trophic level and piscivory.
 - Total mortality is relatively consistent, but changes in distribution.
 - There seems to be no changes in whole system indices but we are fishing down the food web.
- The lack of recovery of cod after the collapse in the early 1990's may be explained by trophic factors:
 - Predation mortality on small cod is high.
 - There is still a large unknown mortality for adult cod.
 - Small cod are competing for their resources with highly abundant competitors.
 - The ecosystem has fundamentally changed.

Questions:

- ◆ Are forage fish predators of small cod? Cannot be answered, yet, diet studies too limited. Are forage fish competitors with small cod? Definitely.
- ◆ Has anyone looked at the nutritional value of what the cod are eating now? Cod are in poor condition, so maybe what food items they are getting are in poor nutritional health as well.

- ◆ Where are the capelin and Saury in the diets? Supposed to be a large biomass of both species. Fishermen have seen large amounts of saury (billfish), who are their predators?
- ◆ What should management do? Should just wait and observe, do more science. Don't have the knowledge to take any more steps like getting rid of seals and sandlance. Might upset the already fragile ecosystem. This new system might just need time to rebalance itself.
- ◆ The Scandinavian countries monitor and cull grey seals, what value are the grey seals? The grey seals keep down the populations of other species besides cod.
- ◆ Have you sampled sandlance? In July and March, zooplankton are their main diet
- ◆ Has there been any sampling on juvenile cod prey? The biologists in the Gulf have done work on it



(Lobster Recruitment Project 5 Year Review cont'd from page 21)

Future Direction

Some future considerations about the lobster recruitment project are to expand the number of participants in some areas, expand areas where traps are located, and possibly conduct some out-of-season lobster tagging studies. In addition, a publication is planned based on the review of the 5 years of the recruitment study.

Questions and Answers

- Q. The recruitment traps cannot be moved around throughout the season. Are we missing information by leaving the science traps in one location.
- A. By leaving the science recruitment traps in the same location we eliminate the variable of how different fishermen fish. As well, we want to monitor an area year after year and see how lobster catch rates vary. If we think we are missing an area that is different then we should add more participants. In addition, by leaving the traps stationary we have seen pulses in recruitment in LFA 29 and 31. Hence, the stationary method works.
- Q. How does the tide, wind, and weather events like thunderstorms effect catch rates in the lobster recruitment traps? Would these variables cause the recruitment trap data to be incorrect?
- A. There are wind, tides, and weather events every year – so that is considered constant from year to year and thus it is not a factor. In addition, fishermen record weather information in their logbooks. If fishermen feel a drastic storm like Hurricane Juan caused juvenile lobster to be lessened, that should be noted and is considered as a possible area of uncertainty.

BEACHCOMBING - What's New in The News

OVER 47,000 COD TAGGED AND RELEASED

In the Winter, 2004: Issue No. 2, of the Northeast Regional Cod Tagging Program Newsletter it was stated that the Northeast Regional Cod Tagging Program is well on target for tagging 100,000 Atlantic cod in the Gulf of Maine and neighbouring waters over the next 2 years. Since January 2003 more than 47,000 cod have been tagged and released.

For more information of this tagging program visit the Northeast Regional Cod Tagging Program website at:

www.codresearch.org

**We're on the
Web!
www.fsrns.ca**

EXECUTIVE COMMITTEE

OFFICERS

John Levy	President
Junior (Winfred) Risser	Vice President
James Gray	Secretary
Bob Henneberry	Treasurer

DIRECTORS AT LARGE

Randy Boutilier
Jerry Creamer
Garnet Heisler
Peter Hurley
Bill Hutt
Barry Levy
Rick Nickerson
Wilford Smith
John Tremblay

Ross Claylor - Scientific Program Committee
Chairman

FISHERMEN AND SCIENTISTS RESEARCH SOCIETY

P.O. Box 25125
Halifax, NS B3M 4H4

Phone: (902) 876-1160 Fax: (902) 876-1320
E-Mail: pattyfsrs@auracom.com
Web Site: www.fsrns.ca

Editor: PMD Services

© Fishermen and Scientists Research Society, 2004

UPCOMING EVENTS

Gulf of Maine Summit- Committing to Change

October 26-29, 2004
Fairmont Algonquin Hotel
St. Andrews, New Brunswick

For more information visit their website:
www.gulfofmainesummit.org

6th Bay of Fundy Workshop- The Changing Bay of Fundy ~ Beyond 400 Years

September 29 - October 2, 2004
Annapolis Basin Conference Centre
Cornwallis Park, Nova Scotia

For more information visit their website:
www.bofep.org