# GCIFA Research Plan LFA 31A and 31B 2002-2014

**Primary Research Objectives for LFA 31a and 31B:**

**1. #1 priority - At Sea sampling including live discards/ by-catch during the commercial lobster fishery in 31A and 31B**
2a. Determine where and when lobsters hatch their larvae and condition of molt/protein
2b. Estimate density of stage IV larvae in the sampling area
3. Monitor the abundance of juvenile lobsters via catch rate index in and out of season
4. Determine the age and size of sexual maturity for females lobster in 31A

**Objective #1**

**At-Sea sampling during the commercial fishery in 31A - 31B**

Re: The at-sea sampling will provide an overall index of the commercial catch in the LFA's from juveniles to markets as well as other species interactions by way of by-catch. As well the sampling will provide data on berried females, egg developments and release timing. This sampling will also allow GCIFA to contribute to the data sets being collected for all of Atlantic Canada on lobster initiatives through the Canadian Fisheries Research Network on lobster biology and health.

The lobster technician and student interns will conduct at-sea lobster samples, for industry during the 2014 lobster season, with fishermen from various ports within the LFA's. This will be repeated to include beginning, mid-way and end of season data sets. This will add to and continue the data contribution for the commercial fishery and provide information on the window measure (114-124mm) contribution. The lab technician and student interns will be conducting the sampling from April 19$^{th}$ to June 30$^{th}$, in both LFA's.

During the at-sea sample the technician and students will record, measure, sex and complete health records for all animals by trap haul. Temperature, salinity, weather conditions and GPS locations will be recorded. The window (114mm-124mm) and v-notch captures or recaptures will be documented and added to the data sets being collected on a daily basis, by the lobster fishermen to assess their continued contribution to conservation. As well all by-catch caught in the traps will be officially recorded, identified and returned per trap haul. This will satisfy eco-certification requirements for recorded by-catch and DFO monitoring of endangered and threatened species protocol.

**Objective # 2a.**

**Lobster Larval Survey and Methodology**

Re. - Attaining management targets. Production of stage IV lobster larvae will be calculated for each area to expand the spatial correlation with fishery yield.

- Determine where and when lobsters hatch their larvae from fishermen monitoring the egg release times during the June fisheries.
  Importance: Provides the times and locations to start the drift and larval tow models as well as providing an estimate of egg production, stage development, survival and retention to Stage IV development. . (**A measure of abundance of egg-bearing females can also be used as one management target.)**
- Estimate density of stage IV larvae in the sampling area and compared to previous years data.
- Importance: Do conservation measures that increase egg production benefit the immediate area or are larvae exported to other areas (GCIFA has partnered with the Lobster Node Network to conduct further research on larvae drift and retention)
- Importance: Stage IV larvae (the stage that settles from the plankton to the bottom) may be a good stage on which to base a target for managing the fishery.
- Lobster fishermen recently completed implementing regulation changes to increase egg production. A measure of stage IV production to compare with production at a later date and to add to the relationship between larval production and fishery yield would add to the understanding of the lobster life cycle. Location of stage IV larvae over suitable settling habitat would provide locations from which to run model back-calculations to hatching locations of these larvae.

Methodology: Fishermen record locations of catches of egg-bearing (berried) females during May and June. Lobster larval sampling throughout June -July-August- Sept will provide the time and approximate location of hatching
From fishermen's records of occurrence of egg-bearing females and larval sampling, determine when and where lobster larvae hatch in two areas representing the fishing grounds covering all of the LFA 31A – b and LFA 29 fishing area. Stations in Guysborough County include: Strait of Canso to Ragged head near Guysborough (LFA 29), Queensport to Canso to Dover to WhiteHead to Port Felix.

Lobster Fishermen complete the larval tows. A larval net is towed behind a lobster fishing vessel on an 8’ by 2’ aluminium frame outfitted with a wooden deflector to keep most of the net outside the boat’s wake. The net opening is 0.6 x 2.35 m with 1.3 x 1.3 mm mesh and fitted with a flow meter. Tows are in 10 min intervals and sampled about 2100 $m^2$ of the top 0.5 m of the water column. Larval densities are expressed per 1000 $m^2$. The sampling includes 56 stations, each at 2-week intervals (Queensport to Canso and Canso to Port Felix is divided into 4 quadrants) Quad **A** - Queensport area from Black Point to Big Fish Shoal in Canso, Quad B - Dover from Mackerel Rock to Dover Bay, Quad **C** was the WhiteHead area which covered the area from Dover Island to WhiteHead Harbour, Quad **D** Port Felix from Flying Point to Charles Cove. The new quadrant E is still being defined but runs from the Strait of Canso to Ragged Head near Guysborough.

Seaweed and jellyfish are removed at sea; the remaining sample is concentrated in 0.8 l jars and Formalin was added to each jar (~25ml) upon addition of the sample the formalin concentration per jar was ~ 2%. The four larval stages are sorted in the laboratory at the beginning of the sampling and onboard the vessel after the stage I and II are developed, as they are much more difficult to identify. Numbers of larva are calculated per two thousand meters squared volume of

water. As the **GCIFA technician has greater capacity in identifying the larvae stages on the vessel we currently retain only small samples of the larvae for identification purposes or provision to DFO biologist on occasion.**

GCIFA owns all equipment used in the larval sampling and owns the research lab facility. Lobster fishermen are paid a vessel, fuel, charter and captain's fee per day which begins at 6:00a.m.-12:00 pm. The rest of the cost is donated by the lobster fisherman. The lobster technician and or student interns accompany the fishermen to manage the samples. The samples will be examined and separated at the GCIFA lab, by the technician and intern and examined for identification, count, stage development and distribution.

This method of surveying egg-bearing females and larval development production, survival and retention will be used to evaluate possible recruitment trends to contribute to management and conservation plans. GCIFA license holders have acquired and share the capacity to complete this research methodology onto other fishermen's organization and LFA's.

**Objective 2b:**

**Phase 11 - -Deployment of 75 Gravel Bed Juvenile Entrapments in WhiteHead and Canso sites**

GCIFA has been participating in a Canada - USA collector study to look at the settlement of stage IV lobster on various bottom types. GCIFA began in 2007 by setting 50 entrapment trays in Whitehead Guysborough County. GCIFA partnered with FSRS and DFO in 2009 and added 25 trays in Canso off of Glasgow Head set and tended by LFA 31A fisherman, William Bond.

The entrapment trays are set on bottom to retain and provide habitat for juveniles from Stage IV to 55mm. These trays are of wooden frame construction with wire side panels and are filled with gravel and sand to create suitable habitat for this size juvenile. This is a size that we have been unable to retain in the current juvenile trapping survey. Various bottoms have been tested as well as baits and locations. The trays are set in July and periodically checked for positioning and condition and raised by two divers and the lobster fisherman in late September/ October where juveniles and all other species are identified and measured, sexed and counted.

The depth, bottom type, vegetation and temperatures are recorded and used to identify preferred juvenile habitat and conditions. Sex ratios, sizes, numbers, bottom preferences, and temperatures will be documented and added to the data sets from other locations in NS and the Gulf of Maine for comparison.

**Objective 3**:

**Juvenile Trapping Study – Out of Season**

**Re: Monitor the abundance of juvenile lobsters via catch rate index**

Juvenile trapping studies have proven to be very good indicators as to recruitment for the market fishery and consideration in management decisions, relating to growth trends as well as molt times for females and males. (Miller 2004 working paper) GCIFA has been collecting data on juveniles by trapping methods since 2003 and are somewhat confident in using the data set to identify 2-3 year market trends. GCIFA is aware and considers environmental conditions, such as major storms surges and temperature spikes and dips, as factors that may affect these trends. Out of season data provides a snapshot of the lobster biology and behaviour under various ecosystem conditions not present during the commercial fishery research phase.

- Can we get accurate estimates of future recruitment to the market fishery by trapping juveniles lobster on the grounds?
- Importance: Juvenile counts provide useful indicators as to the recruitment into the market fishery as well as growth trends, movements and sexual maturity for juveniles in a given area. Pre-identifying poor recruitment years or abundance can be beneficial to management and conservation decisions.

Methodology:

This is an out of season trapping study. Lobsters will be trapped, counted, sexed and measured from 30 juvenile traps in five sites in LFA 31A -B. The traps have no escape vents and the 5 1/2 inch entrance is reduced to 3 1/4 inches, to try and reduce the entrance of market sized lobsters. A portion of these lobsters will be streamer tagged for the purpose of tracking location in recapture, growth rates and sexual maturity. No animals are retained.
The trapping has generated data sets for animals' size range from 58mm to 130 mm, with the entrance reduced by 50%. The traps are baited with frozen mackerel and set for four days and hauled for the next three consecutive days by the participating fishermen of LFA's. All animals are measured, sexed and health notes as well as any by-catch is recorded by LFA fishermen and then given to the lobster technician and student interns to enter into a data base for analysis.

In 2007- 2011, GCIFA partnered with the University of Maine Lobster Institute and expanded a trapping study that Dr. Bob Bayers is conducting in the Gulf of Maine. These are smaller traps (24"L X 14'WX 9''H with a ½" mesh size) and target the juveniles from Stage IV settlement to 55 mm (a size category that is not captured in the larval and juvenile trapping study). The locations have been fixed, since 2009 for the WhiteHead site, after two seasons of placement testing by lobster fisherman Eugene O'Leary. The traps have proven to be very successful and the survey has expanded to the Queensport site with 12 additional traps being set in 2010- 13.

**Objective 4:**

**Maturity Study – Technician Resources required to collect and analyze the data and samples**

- Provides an indicator for # of females per at sea sample and the # of berried females within the sample

- Using pleopods to identify the size and age of maturity for female lobster in the LFA 31A area.
- Molt history can also be determined from the pleopod samples
- A small sample of the eggs will also be taken and will indicate the possibility of multi-year egg bearing females.

In the 2008 -11 lobster seasons GCIFA lab technician, interns and lobster fishermen worked to collect the samples for a female maturity study, using pleopods to identify the size and age of maturity for female lobster in the area.

Methodology:

During at-sea sampling with 2 license holders, a mixed sample of 200 berried and non berried females per sample, ½ of one pleopod on all female lobsters will be clipped and stored in sample vials, taken back to the lab and assessed for maturity and molt history. A small sample of the eggs of the berried females will also be taken.
The study will also indicate the possibility of multi-year egg bearing females. This data will begin a data set to identify the age and size of maturity for the female lobster in our area, as pleopod studies are currently being used by DFO lobster Science as an indicator of age and or size of maturity. Some preliminary results of this data set have been published in the *Hook Line and Thinker*, Jan. 2011- 13 newsletter by FSRS.

**NEW - 2010-2013 Lobster Node – Canadian Capture Fisheries Research Network**
GCIFA is a full partner and participant in the lobster Node Project.
The data collected through our on-going research plan will be shared with University and DFO scientist to contribute to the data sets being gathered in the Lobster node projects.

Through funding from NSERC, the Canadian Capture Fisheries Research Network has developed a Lobster Node to study lobster stock structure, the connectivity between management areas and other related topics. The purpose of the study is to collect important data that will help us better understand our lobster fishery.

The Network is building on the proven models for effective regional collaborations between fishermen and scientist to create a network of fishermen's organizations and scientists working together across the entire Atlantic region on a common lobster research agenda. This relationship is based on mutual respect for each other's valuable knowledge and contributions with the aim of breaking down the barriers that often keep scientists and fishermen apart. By working together on science, we can collect the information needed to make informed decisions about the management of our lobster resource.

The goal of our Network's research is to answer questions about lobster stock structure and the links between management areas:

1. Are lobsters made up of one or many populations or stocks?
2. Are lobsters from one management area connected to lobsters in another?

3. What is the best way to measure the overall health and sustainability of this vital resource?

Currently Lobster Fishing Areas (LFAs) are based on administrative, not biological considerations. We know that lobsters don't stay within the borders of an LFA but we don't know the extent of the connections between LFAs. Our working theory is that many of the connections between LFAs occur through the transport of lobster larvae. In fact, some scientists think that the larval stage in the lobster's life cycle might be the most significant in terms of movement. In order to understand these larval connections, a three-phase multi-year research strategy has been designed.

Phase One: Collect data on berried females – to get the most complete information possible on larval production.
Phase Two: Use the DFO's oceanographic models to show how the larvae are likely distributed along the coast.
Phase Three: Test the models' accuracy by collecting post-larval lobster in local areas where settlement should be particularly high or low.
Four or five years from now, a picture should emerge about where lobster larvae are produced, and how they are transported across large areas.
GCIFA will be participating in a review of results at the Feb 2014 AGM. in Montreal, for the Lobster Node of Canada.

**Components included in all GCIFA research Objectives**

Daily water temperatures (surface, midway and bottom) will be collected by deployed digital temperature gauges in April for each of the proposed research sites. The temperature gauges will be recovered in early November by lobster fishermen and the data downloaded by the lobster technician for the Guysborough County area.

This data will add to and be compared with previous year's data. Temperature is believed to be an indicator for larvae development, juvenile movement and development as well as molt and reproduction triggers for adult lobster. All data sets will provide a better understanding of lobster development trends and activities for all phases of the lobster research.

Wind direction and speed as well as weather conditions are recorded during all sampling and data collection field work.
Salinity is also recorded for the research sites during each field day on the water.
GPS locations for all at sea field data collection to be imported into mapping software for documentation and presentation purposes.

**Timeline**

**February – April 2014**

- GCIFA research committee meeting to review seasonal data sets and review research agenda for the 2014 season (review of work plan and anticipated outcomes )
- Completion and editing of the 2013 lobster research and GCIFA Lobster Working Document
- Lobster technician data entry completion and presentation of "window assessment" from data collections in LFA 31A
- Participation and contribution to the development of the MSC science review
- LFA 31A management meeting with senior DFO lobster management to review the implementation of the IFMP and PA components for the LFA's
- Lobster Technician begins research agenda for 2014 and review/update of the GCIFA Lobster Working Document to the license holders
- Check and order research equipment and complete scheduling of research
- Hire and train student interns for the 2014 research season

**May – June**

- GCIFA research committee meeting(s) meeting to assign research scheduling and evaluate project performance to date (review of work plan and outcomes achievements with fishermen and staff)
- Hold LFA management meetings with senior advisory manager to discuss/ review the sustainability plan/ reference points priorities
- Complete At- Sea samples in 31A-B-29
- Complete maturity study data collections
- Set temperature gauges in all site locations.
- Identifying locations for larval towing from log books and fishermen's knowledge
- Begin larval tows in four sites in mid June. Current environmental, maturity and egg release in specific areas will help determine the 2014 tow schedule

**July – August**

- Complete larval tows in 56 stations plus the new Quadrant E areas, separate and identify and count larval stages and complete data entry for site maps using Map Info and GPS data.
- Begin Juvenile trapping in five sites
- Record data from 12 additional traps (WhiteHead and Queensport) to sample juveniles from Stage IV to 55mm,
- With certified divers assisting, set locations and deploy the 75 collector trays in predetermined locations throughout 31A (WhiteHead and Canso)
- Complete reports for summer intern work placements

**September – October - November**

- Retrieve temperature gauges and digitize readings on the computer for inclusion in the analyst of all lobster research phases

- Complete entry of all data sets into MARFIS and provide data to MSC certifier where necessary
- GCIFA/LFA 31A research committee meeting to review 2014 research and data sets as well as evaluate project performance to date (review of work plan and outcomes achievements)
- Meet with research committee and interested funding partners to report on the 2014 research phase
- Prepare an outcome to date report and multi year comparisons for the LFA's to be updated in the GCIFA Lobster working document and presentations.
- Provide data sets to DFO