Maritimes Region Inshore Lobster Trawl Survey Technical Description

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by

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ABSTRACT

Denton, Cheryl M. 2020. Maritimes Region Inshore Lobster Trawl Survey Technical Description. Can. Tech. Rep. Fish. Aquat. Sci. 3376: v + 52 p.

An annual trawl survey is conducted in Southwestern Nova Scotia and the Bay of Fundy to assess the lobster stocks in Lobster Fishing Areas (LFA) 34. The survey is conducted with the Northeast Fisheries Science Center Ecosystem Survey Trawl (NEST), a small mesh trawl with a cod end liner, which ensures the capture of various sizes of lobster. The dimensions and location of the trawl are monitored and recorded throughout the tow using an electronic trawl mensuration system. In addition, water temperature and depth are also recorded. The target tow length is 1 kilometer which is tracked using an Olex marine charting system. Vessel crew, DFO science staff and a contracted at sea observer work together to perform required tasks and collect all relevant data. Catch from each tow is separated by species, weighed and counted. Length frequency data is collected on select groundfish and crab species, detailed morphometric data is collected on each lobster. A detailed description of all tasks, standard operating procedures and materials used throughout the course of this survey are provided within this document.

RÉSUMÉ

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On mène un relevé annuel au chalut dans le Sud-Ouest de la Nouvelle-Écosse et la baie de Fundy afin d’évaluer les stocks de homards dans la zone de pêche du homard (ZPH) 34. Ce relevé est mené au moyen du chalut utilisé pour les relevés de l’écosystème du Northeast Fisheries Science Center (NEST), soit un engin à petites mailles petit muni d’un cul de chalut qui permet la capture de homards de différentes tailles. On surveille et on consigne les dimensions et l’emplacement du chalut pour tous les traits effectués, au moyen d’un système électronique de mesure du chalut. On consigne aussi les données sur la température et la profondeur de l’eau. La longueur cible d’un trait de chalut est d’un kilomètre; on effectue le suivi de la longueur des traits au moyen d’Olex, un système de cartographie marine. Les membres de l’équipage du navire de relevé, des scientifiques du MPO et un observateur en mer contractuel collaborent pour réaliser les tâches requises et recueillir les données pertinentes. Les captures issues de chaque trait sont séparées par espèce, puis elles sont pesées et comptées. On recueille des données sur la fréquence des longueurs d’espèces de poissons de fond et de crabes précises, ainsi que des données morphométriques détaillées sur chaque homard capturé. Le présent document fournit une description détaillée des tâches requises ainsi que des procédures opérationnelles normalisées et du matériel utilisés dans le cadre du relevé.

INTRODUCTION

The American Lobster (*Homarus americanus*) is widely distributed in coastal waters from the southern tip of Labrador to Maryland with the major fisheries concentrated in the Gulf of St. Lawrence and the Gulf of Maine. Juvenile and adult lobsters occupy various depths of up to 750 m and temperatures of 0°C to 25°C (Aiken and Waddy 1986).

The American Lobster fishery is the most economically important fishery in Canada with an estimated value of $1.42 billion (2018) in the Atlantic Region (http://www.dfo-mpo.gc.ca/stats/commercial/sea-maritimes-eng.htm). Landings from the Maritime Region contribute to a significant portion of this (60% in 2018) and are currently near all-time highs.

The American lobster fishery is trap based and traps are designed to allow the escape of under sized lobster through biodegradable escape panels. To accurately assess the stock, a fishery independent fishing method is required. To accomplish this, the annual Inshore Lobster Trawl Survey (ILTS) was initiated in 2013.

HISTORY

The ILTS evolved from the ITQ (Individual Transferable Quota) Survey in 2013. The ITQ Survey began in 1995 and was a fixed station mobile gear survey to provide abundance indices for groundfish stock assessments, particularly Cod (*Gadus morhua*), Haddock (*Melanogrammus aeglefinus)* and Winter Flounder (*Pseudopleuronectes americanus)* in NAFO Division 4X. It was a collaborative effort between fishing industry participants from southwest Nova Scotia and DFO Science staff from BIO. The survey occurred during the first 2 weeks of July and covered an average of 181 stations per year using 3 vessels. The gear used was a 280 Balloon otter trawl with rock hopper footgear (See Appendix 1 – Net Schematics) providing close bottom contact and a higher catch rate of species closely associated with the bottom. The details of this survey can be found in the Appendix of the “Review of Surveys Contributing to Groundfish Assessments with recommendations for an Ecosystem Survey Program in the Maritimes Region” (Claytor R, et al, 2014)

Throughout the ITQ survey period (1995-2012), the weight and estimated number of lobsters were recorded for all tows (Table I). In early 2000, it became apparent that the quantity of lobsters being caught during the survey was increasing and that the ITQ survey could provide essential information on lobster distribution and abundance. In 2005, DFO contracted a fisheries technician to collect detailed biological information on the lobster catch from a subset of the tows that were deemed likely to have high lobster catch rates. During that survey year, 705 lobsters were assessed for size, sex, shell hardness, egg condition and damage, 250 lobsters for blood protein (refractive index) and 176 for molt stage. The collection of blood protein and molt staging data was dropped from the sampling protocol in 2009. From 2006 to 2012, two of the three survey vessels were staffed with

additional personnel to collect biological information from the lobster catch on a portion of the survey tows (Table II). During that time period, 18,612 lobsters were measured.

A DFO review of surveys contributing to groundfish assessments was conducted in 2014 (Claytor, R *et al*, 2014). This review concluded there was a benefit to reallocation of resources currently put toward the ITQ survey. In 2013, the DFO lobster group took lead of the ITQ survey and with a greater focus on lobster stock characteristics.

During the period of 2013-2015, the 280 balloon trawl employed during the ITQ survey was used for the ILTS. In 2016, a project was initiated to transition the survey to a 4-seam 3 bridle trawl with 550 kg Poly-Ice doors. This net is also commonly referred to as the NEST (Northeast Fisheries Science Center Ecosystem Survey Trawl).

During the 2016 survey season, comparative fishing was completed at 30 stations to develop a size based conversion factor for lobster between the 280 balloon trawl and the NEST (Hubley *et al*, in review). In addition, the survey sampling protocol was refined and the number of stations expanded. During subsequent years, the survey has steadily moved towards a more standardized sampling protocol with the goal of successful completion of 150 stations per survey season (Figure I) and the intention of further expansion in the future.

VESSELS

The vessels used for the survey have changed in the short history of the ILTS (Table III). Commercial vessels are chartered for the survey by a competitive bidding process where the selection is based on technical merit and bid price.

STATION SELECTION / SURVEY DESIGN

The lobster survey is a fixed station design with tows of one kilometre in length. The one kilometer distance is measured from the point the winches stop paying out cable. Towing speed may vary under certain tidal conditions but the target speed is 3 knots. During the transition between the ITQ survey and ILTS, station allocation was adjusted to better characterize lobster distribution and fill in spatial gaps yielding the current design with 150 fixed stations. Thirty-two of those are “index” stations that were completed consistently during the period of the ITQ survey (Figure I).

FISHING GEAR

The ILTS is conducted with the Northeast Fisheries Science Center Ecosystem Survey Trawl (NEST), which is a 400 X 12 cm, 4 seam, 3 bridle bottom trawl, with Rockhopper footgear and 2.2 m^2, 550 kg Poly-Ice doors. This net was chosen in part because it will be used in future DFO Multispecies Research Vessel Surveys and is currently used during the Northeast Fisheries Science Center’s (NEFSC) Bottom Trawl Surveys. Both surveys have stations which overlap with the ILTS stations and employ a stratified random sampling design. During the spring of 2019, NEFSC completed 46 stations

in Canadian waters 8 of which were in Lobster Fishing Area 34 where the ILTS is focused (https://nefsc.noaa.gov/esb/mainpage/rsr/sbts/sbts-rsr-2019.pdf - NEFSC Resource Survey Report Spring 2019). During the 2019 summer DFO survey, 19 stations were completed in LFA 34 (Figure II) . Details of the trawl net and footgear can be found in Appendix I.

ELECTRONIC EQUIPMENT

ELECTRONIC SCALES

A motion compensated Marel scale is used during the survey to obtain a total weight for each species caught per tow. The scale platform is a Model PL 4200 with a resolution of 10 g and a max of 60kg. The scale display is an M1100 and is operated with 4 d-sized batteries.

OLEX

A Lenovo Ideapad 110 laptop with Olex charting and navigation software is used to track the position, depth and length of each tow. A GlobalSat USB GPS receiver (Model BU353S4) is connected to the laptop and placed within clear satellite view in the wheelhouse to obtain vessel position. The Olex software runs on a Linux operating system and the laptop is entirely dedicated to this software application.

TRAWL MENSURATION SYSTEM

Since the ILTS began in 2013, three different trawl mensuration systems have been used – Netmind (2013-2014), Marport (2015-2016) and eSonar (2017 to present). From 2013-2016, the monitoring systems used were determined by the equipment the survey vessels had on board. In 2017, the DFO lobster group purchased an eSonar receiver and sensors to be used for subsequent lobster surveys. During the period of 2013-2014, trawl metrics were visually monitored for the duration of a tow, but were not recorded to a data file. From 2015 to present, all trawl metric data has been recorded and saved in data files for each tow.

The eSonar system includes:

- Hull Mounted Hydrophone (supplemented with a towed hydrophone when possible)
- Headline Height Sensor
- 2 Spread Sensors
- Digital Receiver
- Software Package – eSonar Sensor Configuration Software (DBR) and DataLogger
- RS232 (9 pin serial) GPS input
- Panasonic Toughbook
- Custom protective housings for spread sensors

The headline sensor captures the height of the headline from the bottom. Port and starboard spread sensors that are attached to the ends of the trawl wings capture the

spread of the net. The spread sensors are placed in a specially designed aluminum housing to protect them from bottom contact (Appendix 13).

A hull mounted hydrophone communicates with the sensors and transmits the data to the eSonar software package via the Digital Receiver. In recent years, a towed hydrophone has been used to supplement the hull mounted hydrophone to obtain improved sensor signal reception. The eSonar DBR software allows the user to customize sensor settings and visualize the net metrics. The DataLogger is used to record net metrics, date, time, speed and position to a data file.

Specific sensor settings used during the ILTS can be found in Appendix 13.

TEMPERATURE AND DEPTH RECORDER

Since 2013, various instruments were used to capture temperature and depth including Vemco™ minilogs and Onset HOBO TidbiT data loggers. In 2017 the SeaBird SBE 39plus was chosen due to its high-accuracy and short acclimation time which is very important during short (10-15 minutes) tows. The model chosen has an external RS232 connector. The external connector is preferred over the internal USB connector as the latter involves opening the housing on a daily basis which puts the instrumentation at higher risk of damage.

The SBE 39plus is placed in a customized aluminum housing to protect the unit from bottom contact (Appendix 12). This is placed in a mesh bag on the top center of the net, just behind the headline. The unit is also tethered directly to the headline with 2 lengths of nylon cord and stainless steel carabiner clips.

A temperature only Vemco™ minilog is also placed on the net as a back up in case of SBE 39plus malfunction.

CAMERA

A waterproof camera is used to capture an image of the catch from each tow after the trawl net is emptied. A white board including the date, set number and station is included in the image for matching the image with the data post survey.

COMPUTER

A ruggedized laptop (Panasonic™ Toughbook CF-31) with docking station is used to capture trawl mensuration data as well as the setup and downloading of SeaBird temperature and depth data and the Vemco™ minilog. The docking station has two RS232 (9 pin serial) ports which are needed for the eSonar digital receiver and NMEA stream from the ship's GPS. A USB to serial converter is used to interface with the SeaBird Recorder, and must be used with hardware specific drivers. The minilog is downloaded via the Vemco™ field reader which interfaces through a Bluetooth™ / USB adapter.

SAFETY EQUIPMENT

The survey vessel is fully equipped with life saving equipment. In addition, the following items are brought for DFO staff:

- 3 Inflatable PFDs: Mustang HIT™ INFLATABLE PFD (AUTO HYDROSTATIC) MODEL: MD3153 02
- 3 Personal Locator Beacons : ACR Artex RESQLINK™+ - registered with the Canadian Beacon Registry
- 3 Ocean Signal–RescueME MOB1 AIS Personal Locator Beacons
- Immersion Suits – each DFO staff and observer brings their own suit with up to date inspection.

Before the vessel leaves port, a safety briefing is provided by the captain to any new staff joining the vessel.

REFERENCE MATERIALS

SOFTWARE / HARDWARE

Manuals for various software and hardware are consulted as required including:

- Vemco Loggervue Software User's Guide
- Marel M1100 User's Guide
- eSonar User's Manual
- Olex User Guide

SPECIES IDENTIFICATION

A full list of species codes is available in Excel format on the desktop of the Panasonic Toughbook ("SPECIESCODES.xls").

The following reference materials are used to aid in species identification and are available in electronic format on the Panasonic Toughbook:

- Selected Invertebrates Collected During Scotian Shelf Trawl Surveys: An Identification Guide and Sampling Protocols. 2nd Edition.
- A Guide to The Species Caught During The Scotian Shelf Snow Crab Survey
- Maurice Lamontagne Institute, DFO - Identification guide for marine fishes of the estuary and northern Gulf of St. Lawrence and sampling protocols used during trawl surveys between 2004 and 2008 (Nozères *et al*, 2010)
- NOAA NEFSC - Commercial Fishery Species Guide (Ball *et al*, 2012)
- Gulf Fisheries Center, DFO - A Rapid Reference Guide for the Identification and Sampling At-Sea of Marine Fishes Captured During Commercial Fishing Activities (Daigle *et al*, 2006)
- Starfish Poster

- Shrimp Poster (from the Estuary and the northern Gulf of St. Lawrence)

STANDARD OPERATING PROCEDURES

PRE SURVEY PREPARATION

Fisheries Research Notice

The ILTS survey is conducted under a scientific fishing license (pursuant to sections 52 and 56 of the General Fishery Regulations of Canada) issued by the Minister of Fisheries and Oceans to the Regional Director of the Science Branch (RDS) of the Maritimes Region. A Fisheries Research Notice (FRN) is prepared and distributed under the authority of the RDS to provide specifics of the fishing operations to various parties of interest such as DFO Licensing, Area Directors and relevant Conservation and Protection Chiefs and Detachments. Before submission of the FRN for approval, both the Species at Risk (SAR) office and relevant fisheries managers must be contacted to discuss possible permitting requirements and impacts to conservation objectives and other management implications in the survey area.

Licence Conditions Amendment

If the contracted vessel is retaining fish which they are authorized to catch under the conditions of their groundfish licence, a licence amendment will be required to allow for fishing with a net not permitted by condition of licence. This is done by providing necessary details to the groundfish fisheries manager. This amendment is made available to the licence holder via the National Online Licencing System (NOLS)

At Sea Observer

An at sea observer must be on board the vessel at all times during the survey. The procurement of the observer is the responsibility of the vessel captain and the selection of the observer should be made several weeks prior to the survey. The selected observer must meet the requirements of the Chief Scientist.

Station Preparation

If new stations are being completed, the locations are converted to Olex format using the software GPS Utility. The instructions for conversion and template for input data can be found in Appendix 2. The converted file is loaded into the survey Olex laptop and also provided to the survey captain for review.

Equipment and Data Forms

All survey equipment must be inventoried and packed in labeled tote boxes according to the “Inshore Lobster Trawl Survey Equipment List” in Appendix 3

Sufficient data forms for the entirety of the survey are photocopied and placed in the data file box. Data forms follow the format of those used in the At Sea Observer Program (Appendix 15).

TRIP, SET AND FISH NUMBERING:

Each working day of the survey receives a unique “Trip Number” following the naming convention of “Lddmmyyyy” (i.e. June 15, 2019 would have a trip number of L15062019). Sets are numbered sequentially starting at #1 for each trip number (day). Individual lobster (“Fish Number”) are numbered sequentially starting at #1 for each set. These fish numbers are unique to each lobster by set. Once stored in the database this combination of trip, set and fish number becomes the unique identifier for each lobster encountered on the ILTS.

Fishing occurs during the hours of approximately 06:00 and 21:00, but hours may be adjusted as needed by operational requirements.

BEGINNING OF DAY

- start Olex computer
- start eSonar DBR and ensure all appropriate diagnostic windows are visible
- start eSonar DataLogger and name the first file for the day and enter the tow number.
  - File suggested naming convention “TRIP#_TOW#” (L30092019_TOW1)
  - Ship Number = 1
  - Trip Number = trip number for that day, i.e. L30092019
  - Tow Number = Set number for the day, restarting at #1 each day
  - Priority = GPS
  - File Format = eSonar
- ensure crew has all required sensors to place on the net for the day. The SeaBird is changed daily. ESonar sensors will only need to be removed from the net if a charge is required.

START OF A TOW

- Start logging with the eSonar DataLogger (‘START’) when the net enters the water.
- The tow is started when the winches stop paying out cable. At this point, start tracking tow distance with Olex.
- Set Profile Card – Record set number, date, start latitude, longitude, depth and start time from the Olex. Obtain speed of the vessel from the captain’s GPS.
- Set Information Card – Record set number, commercial area, NAFO area, warp length and station. Warp length can be obtained from the captain during or after the gear is set. Warp to depth ratio is typically 3:1 but can be modified in shallower waters.

DURING TOW

- Monitor trawl diagnostic windows to ensure appropriate headline height and wing spread. The nominal values for the NEST trawl are 4-5 meters of headline height

and 12-14 meters of spread. If values are far out of the nominal range, it could indicate a problem with the net and hauling back might be recommended.

- Monitor the tow length on Olex. The target tow length is 1km. If the tow must be ended early (i.e. caught on bottom), the tow will only be considered valid if at least 750 meters is complete. If not, the tow will need to be re-done.

END OF TOW

- The tow is ended when one kilometer of distance is reached from the point the winches stopped paying out cable.
- Stop tow tracking on Olex.
- Set profile – record end latitude, longitude, depth and time from the Olex
- Stop eSonar DataLogger log ('STOP') when doors comes back on board and set up for next tow.

CATCH SORTING

- While the net is being hauled back, watch for any holes in the net that might affect fishing and/or catch retention. Watch that all sensors are properly attached to the net (no missing shackles).
- While the net is being emptied into the sorting tank, ensure all fish are removed from the cod end. This will often involve shaking catch down or placing the net on deck to access lodged fish / invertebrates.
- Before any fish are removed from the tank, take a photo of the entire catch and include a white board with the following details:
  - DATE
  - TOW #
  - STATION #
- Sort catch by species into orange scale baskets. Small species can be placed in the red totes which have been adjusted to weigh the same as the scale basket (~1.56 kg).

CATCH WEIGHING AND COUNTING

- Ensure the Marel scale is started up and tared with an orange scale basket.
- Weigh all of one species at a time. If there are multiple baskets of a species, ensure all have been weighed before moving on to the next species.
- Count and weigh a subsample of each species for which detailed sampling is not completed. A subsample should include approximately 100 fish or a representative quantity of smaller species such as shrimp, starfish, comb jellies, etc. The weight and count of the subsample will be used to prorate estimated total numbers of that species
- Record total weight in kilograms and numbers of each species / subsample in the yellow deck book

- If a length frequency is required for the species, place orange scale basket in appropriate sampling area.
- Large amounts of organic debris may be subsampled by weighing the entire amount then taking a 1 kg subsample. The subsample is separated by species and a weight and count of each is completed. The weights and counts for each species from the subsample are then used to prorate the entire sample of organic debris (see Table IV for example).

TOTAL WEIGHT (KG) OF ORGANIC DEBRIS	42 kg
SUBSAMPLE WEIGHT (KG)	3 kg

$$\boldsymbol{Wt\ Ratio} = \frac{Wt\ of\ Species\ in\ Subsample}{Wt\ of\ Subsample}$$

$$\boldsymbol{Total\ Wt\ Kg} = Wt\ Ratio * Total\ Wt\ of\ Organic\ Debris$$

$$\#\ \boldsymbol{Ratio} = \frac{Subsample\ \#}{Subsample\ Wt}$$

$$\boldsymbol{Total}\ \# = \#\ Ratio * Total\ Wt\ Kg$$

FISH / CRAB LENGTH FREQUENCIES

- Fish and crab lengths are recorded on the Length Frequency data form (Appendix 15)
- Length frequencies are completed for the following species deemed to be potential lobster predators:
  - *Cod*
  - *Cunner*
  - *Cusk*
  - *Haddock*
  - *Longhorn Sculpin*
  - *Monkfish*
  - *Pollock*
  - *Sea Raven*
  - *Spiny Dogfish*
  - *Wolffish*
- All fish requiring length frequencies are measured on a ½ centimeter offset measuring board. Measurements are to the nearest centimeter and rounded up (i.e. record the first whole number you can see). See Appendix 4 for details.
- Crab species including Jonah Crab, Rock Crab, Toad Crab, Snow Crab, Northern Stone Crab and Green Crab are measured (carapace width) with calipers and sexed. See Appendix 5 for details

- If greater than 100 fish of a sampled species are in the catch, keep enough fish to complete the length frequency and mark the corresponding weight in the catch book with an asterisk. Weigh and discard the remaining catch. An extra basket can be kept if unsure of the sample numbers and discarded later if necessary.
- Once a basket of fish is started for sampling, it must be completed.

LOBSTER MORPHOLOGIES

- All lobsters are sampled unless the catch is greater than 300 animals, in which case a subsample of the catch is done.
- Once a basket of lobsters is started for sampling, it must be completed.

For each lobster record on the Morphology Form (Appendix 15):

Length:

Measure the length from the back of the eye socket to the end of the head shell (carapace); mark the length in millimeters always rounding ***down*** to the nearest millimeter (see Appendix 5 for "how-to" guide on measuring a lobster).

Sex:

1 Male
2 Female
3 Berried

(see Appendix 6 for "how-to" guide on sexing lobster and crab).

Shell hardness (Morphology Code 77):

Evaluate the shell hardness of a lobster by squeezing the carapace

1 Soft jelly
2 Shell hardening but breakable
3 Soft shell
4 Hard shell compressible
5 Hard shell
6 Hard shell with epiphytic growth
7 Moutling

(see Appendix 7 for "how-to" guide on evaluating shell hardness)

Condition (Morphology Code 137):

Evaluate the lobster for any damage. Only injuries from the current fishing activity should be recorded. If an animal has a previous injury (partially healed or scarred), this is not included. Injuries resulting from the sampling activity are also not included.

0 No damage/injury
1 Minor damage
2 Multiple damages
3 Broken/crushed parts
4 Dead or dying

Lobster Shell disease (Morphology Code 135):
Evaluate the lobster for any signs of shell disease.

0 No disease
1 <10%
2 10-50%
3 >50%

(see Appendix 8 for "how-to" guide on evaluating presence of shell disease).

Egg stage (Morphology Code 78):
When a female lobster is berried, stage the eggs and record it in the egg column.
Lobster Egg Stage:

1 New eggs (dark green to black no eye spot)
2 Old eggs (green or brown; black dots or eye spots visible)
3 Mature eggs (partially hatched)
4 Eggs hatching or hatched (mossy)

(see Appendix 9 for "how-to" guide on lobster egg staging).

Clutch % (Morphology Code 138):
If the **lobster** is berried, evaluate the clutch for percent coverage.

1 100% - 50%
2 <50%
3 <10%

(see Appendix 10 for "how to" guide on evaluating clutch percentage).

V-notch (Morphology Code 76):
For **lobster**, in the V-notch column, record:

0 Not identifiable
1 V-notched during current sampling
2 New v-notch (flesh or scar visible)
3 Old v-notch (no setal hairs)
4 Old v-notch (with setal hairs)
5 Mutilated or missing flipper

(see Appendix 11 for a "how-to" guide on evaluating the presence of a V-notch).

The v-notch is on the tail flipper immediately to the right of the middle flipper, when the lobster is examined with the underside of the lobster down and its tail is toward the person making the determination.

CATCH DATA

Once the tow is complete, all data from the yellow deck book is transcribed onto the Catch Summary form (Appendix 15). For each tow record:

- *Trip No – The trip number*
- *Set No – The set number*
- *Species Name – The common name of the species caught, no abbreviations*

- *Species – The species code of the species caught*
- *Discard Weight – The total weight of the species caught in kilograms in the set*
- *Total Number Caught – The total number of the species caught in the set*

If counts of a subsamples were done, the estimated total number of that species will need to be calculated using the following formula:

$$estimated\ total\ number = \frac{\#\ of\ fish\ in\ subsample}{weight(kg)\ of\ subsample}\ X\ \ total\ weight(kg)\ of\ fish$$

END OF DAY PROCEDURES

- Remove Seabird from net and download. See Appendix 12 for Seabird sensor and software details
- Synchronise time between the Toughbook and the vessel's GPS time using the vessel's GPS time as the reference. This must be done before the Seabird is reinitialized for the following day. This allows the eSonar and Seabird datasets to be joined by time and date post survey.
- Set up the Seabird for the next day. Remove eSonar sensors from net if they require charging – reading less than 8 VDC (see Appendix 13 for voltage testing and charging details).
- Back up eSonar, Seabird and photo data to USB stick.
- Rinse scale with fresh water and calibrate. See Appendix 14 for calibration instructions.
- Clean and lubricate calipers with LPS 1 or other greaseless lubricant.
- Clean sampling station and stow measuring boards.
- Assist in cleaning of deck area as required.

ILTS STAFF DUTIES

CHIEF SCIENTIST

The chief scientist directs all survey-related activities.

Duties include:

- Ensuring that all scientific equipment is in proper working order.
- Supervising scientific staff.
- Monitoring eSonar™ software displaying net metrics throughout the course of the net deployment. Ensuring the nets metric data is properly captured in output file. Ensure sensors are charged.
- Tow tracking and recording of Set Information and Set Profile data.
- Retaining and properly archiving all paperwork generated from each tow.
- Troubleshoot set decisions on catch processing influenced by rips in net.
- Troubleshoot set decisions on catch processing influenced by foreign objects entering the trawl.
- Look for holes in the net that will compromise catch.
- Ensure all fish have been removed from net after each tow with the help of other staff.
- Aid in catch processing. Ensure all catch is weighed, counted and sufficient quantities and correct species are kept for sampling.
- Recording of catch data in yellow deck book.
- Make decision on when subsampling is recommended.
- Lead in the collection of lobster morphology data collection.
- Initializing and downloading Seabird™.
- Backing up electronic data daily.

ASSISTANT TO THE CHIEF (DFO SCIENCE STAFF):

- Assist chief scientist as required.
- Help ensure all fish have been removed from the net after each tow.
- Help look for holes in the net that will compromise catch.
- Assist in catch processing.
- After each tow, replace lobster morphology sheets with new sheets and label with expected next tow number. Ensure the correct tow number is used prior to recording data (be aware of skipped tow numbers due to aborted tows). Clipboard #1 uses the morphology sheet pre numbered with fish numbers 1 to 100, followed by unnumbered sheets and should always be used first. Clipboard #2 uses unnumbered morphology sheets only.
- Ensure scale is tared before each tow with the orange scale basket. Rinse scale with fresh water and calibrate at the end of each day or change in sea state.

- Clean and lubricate calipers with LPS 1 at the end of each day.

AT SEA OBSERVER

- Assist in sorting and weighing of catch.
- Ensure the correct species and quantities of fish are retained for length frequencies.
- Collection of Length Frequency Data.
- Complete Catch Card.
- Provide catch totals in metric tons for each tow.
- The at sea observer company is responsible for entry and loading of biological data into the Industry Survey Database (ISDB).

CAPTAIN AND CREW

Captain

The vessel captain is responsible for the operation of the vessel and the fishing gear in a safe and efficient manner. In the case of a marine emergency or any vessel related safety considerations, the captain of the vessel retains absolute authority over all decision making and direction of all persons onboard, whether employed by the vessel contractor or DFO. The captain directs all navigation of the vessel and ensures that all survey tows are done in the proper location.

For each survey station, a start and end point is charted. The captain attempts to place the net as close as possible to the exact location as past years. This helps ensure inter-annual continuity as well as reducing the risk of net damage as successful tows have been completed in past years in that exact location.
Prior to departure, the captain will provide a safety briefing.

Crew

All vessel crew work under direction of the captain. Duties include but are not limited to:

- Installing net mensuration and temperature sensors on the net.
- Deploying and retrieving net.
- Net repair under direction of the captain.
- Assist in catch sorting and processing as required.

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TABLES

Table I. History of Lobster Caught During ITQ Survey

YEAR	ESTIMATED WEIGHT OF LOBSTERS (KGS)	ESTIMATED # OF LOBSTERS	# TOWS
1995	341	319	135
1996	352	833	169
1997	225	591	175
1998	506	866	189
1999	400	728	187
2000	1019	2079	187
2001	633	1206	187
2002	919	1667	180
2003	1329	1983	177
2004	894	1440	176
2005	1276	2167	182
2006	1980	2701	180
2007	1645	1327	202
2008	1054	499	178
2009	1888	2614	180
2010	2311	4497	177
2011	2755	4549	181
2012	2595	4709	179

Table II. Lobster data Collected During the ITQ Survey

			# LOBSTERS		
YEAR	VESSEL	# TOWS	MEASURED	BLOOD PROTEIN	MOLT STAGE
2005	CARMELLE NO 1	13	705	250	176
2006	CARMELLE NO 1	42	1086	755	197
2006	LITTLE TJ	5	199	83	53
2007	CARMELLE NO 1	32	725	715	
2007	LITTLE TJ	8	437	132	131
2008	CARMELLE NO 3	35	585	551	393
2009	CARMELLE NO 3	36	2036		
2009	LITTLE TJ	9	222		
2010	CARMELLE NO 3	38	3325		
2010	LITTLE TJ	10	883		
2011	CARMELLE NO 3	44	3165		
2011	LITTLE TJ	8	973		
2012	CARMELLE NO 3	54	3290		
2012	LITTLE TJ	53	1686		

Table III. Survey Vessel Details

Year	Name	Length Overall	Gross Registers Tonnes
2013	Carmelle No 3	59	64
2014	Poseidon Princess	64	123
2015-2016	Cape Roseway	64	80
2017-2019	Josie's Pride	45	15

Table IV. Example of Subsample Calculation

	Measured Values		Calculated Values			
SPECIES	SUBSAMPLE WT KG	SUBSAMPLE #	WT RATIO	TOTAL WT KG	# RATIO	TOTAL #
P BOREALIS	0.06	15	0.02	0.84	250	210
LEMON WEED	2.49	N/A	0.83	34.86	0	N/A
TOAD CRAB	0.08	6	0.03	1.12	75	84
COMB JELLIES	0.12	48	0.04	1.68	400	672
P MONTAGUI	0.15	25	0.05	2.10	167	350
STARFISH	0.08	7	0.03	1.12	88	98
BRISTLE WORMS	0.02	1	0.01	0.28	50	14

FIGURES

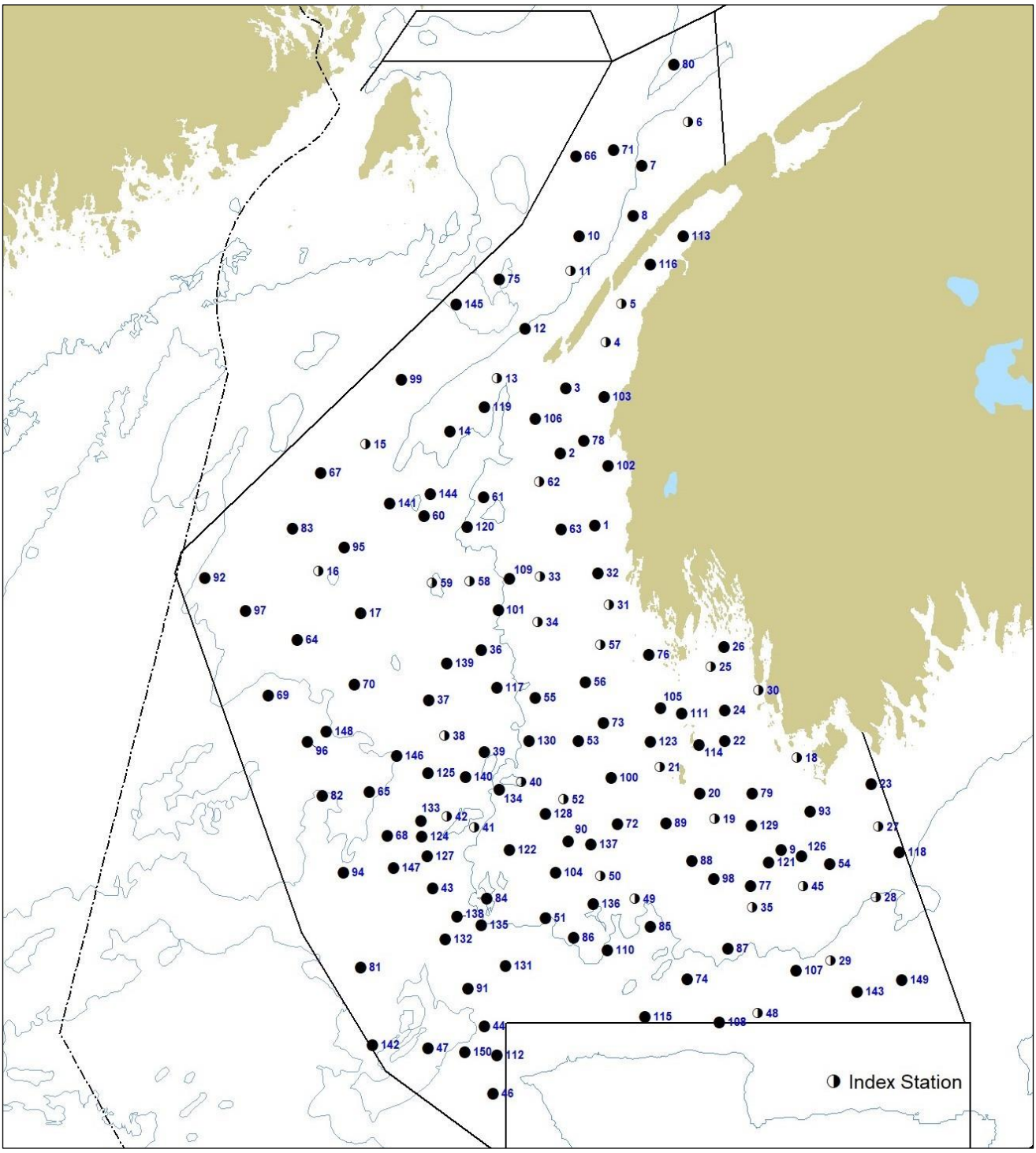


Figure I: Location of 150 fixed Inshore Lobster Trawl Survey stations. The thirty-two index stations are indicated by ◑.

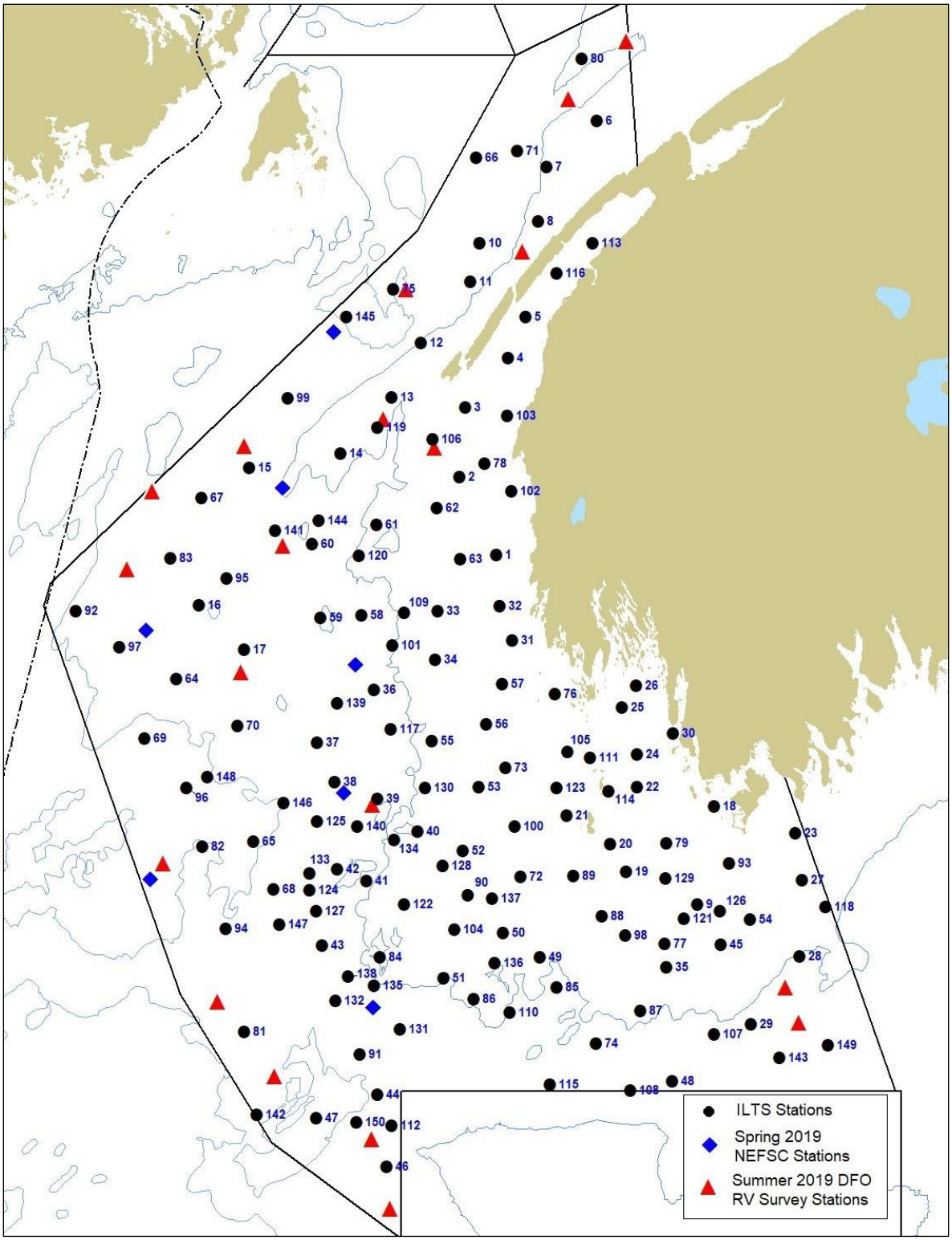
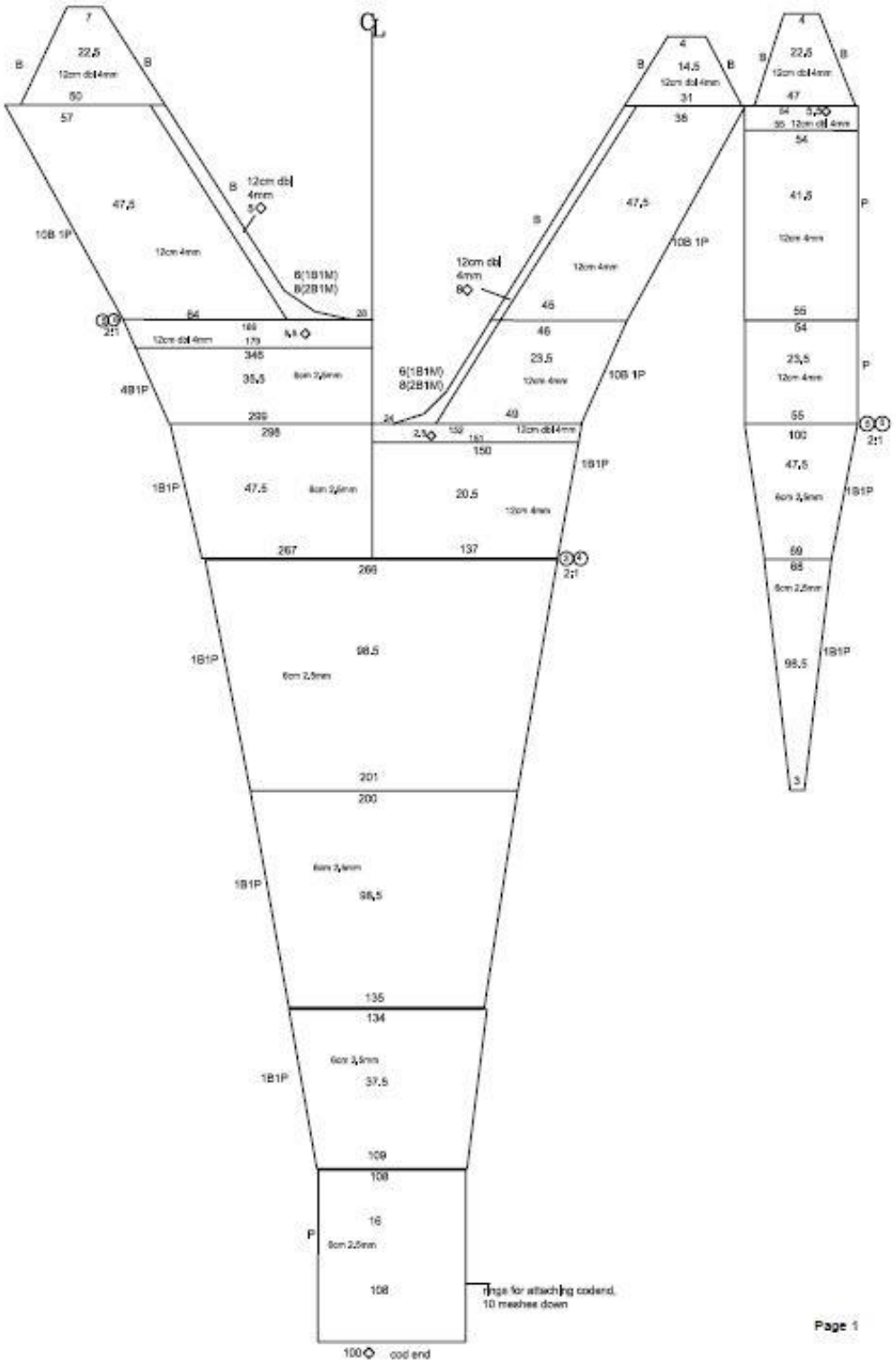


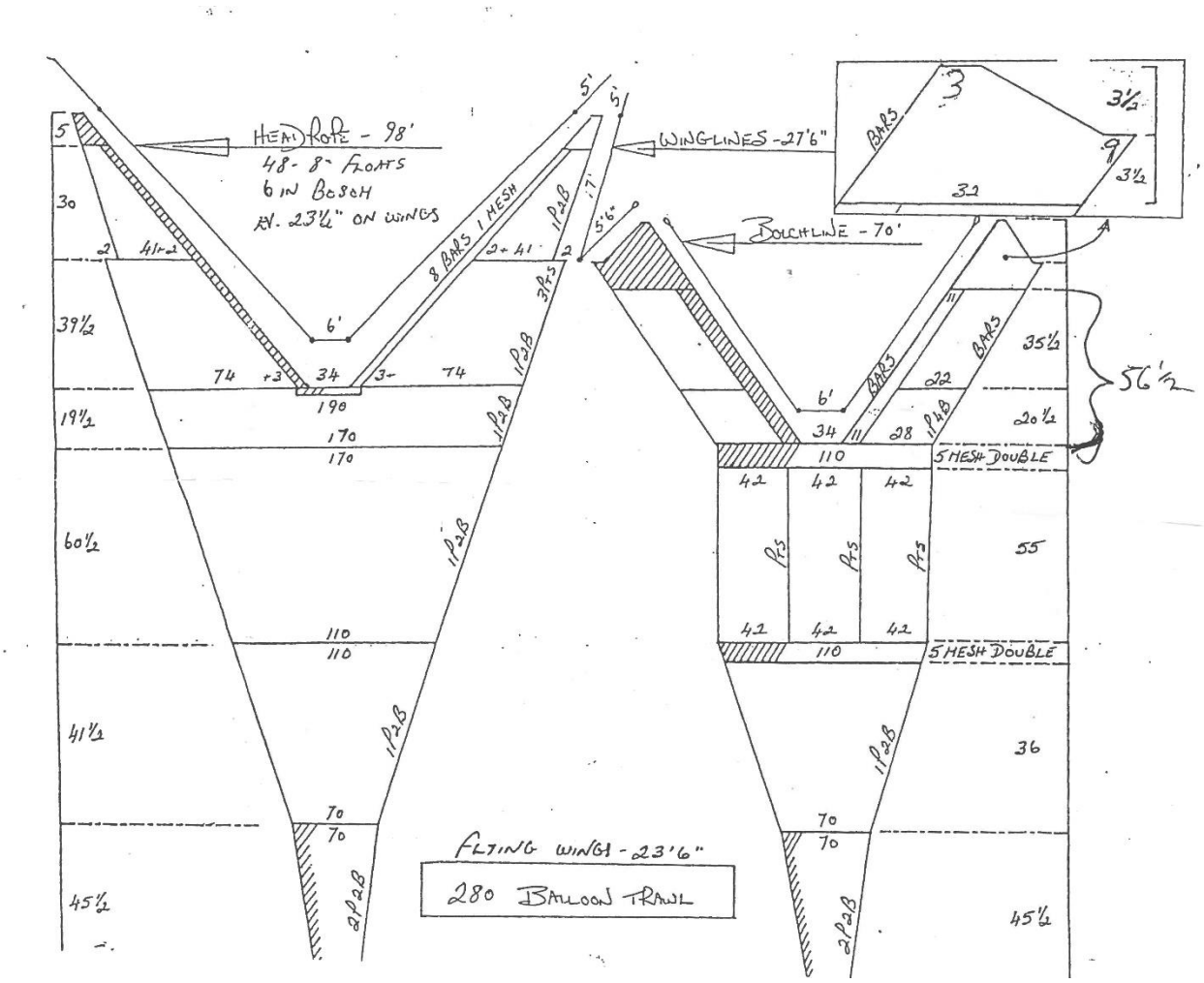
Figure II: Location of 150 fixed Inshore Lobster Trawl Survey stations (●), Spring 2019 NEFSC Survey Stations (◆) and Summer 2019 DFO RV Survey Stations (▲) within LFA 34.

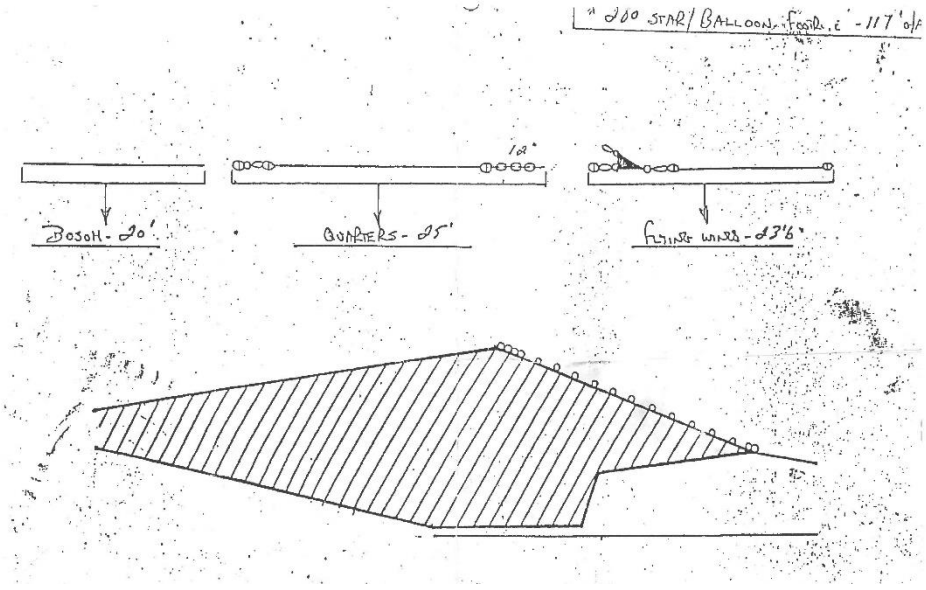
APPENDIXES

APPENDIX 1: NET SCHEMATICS



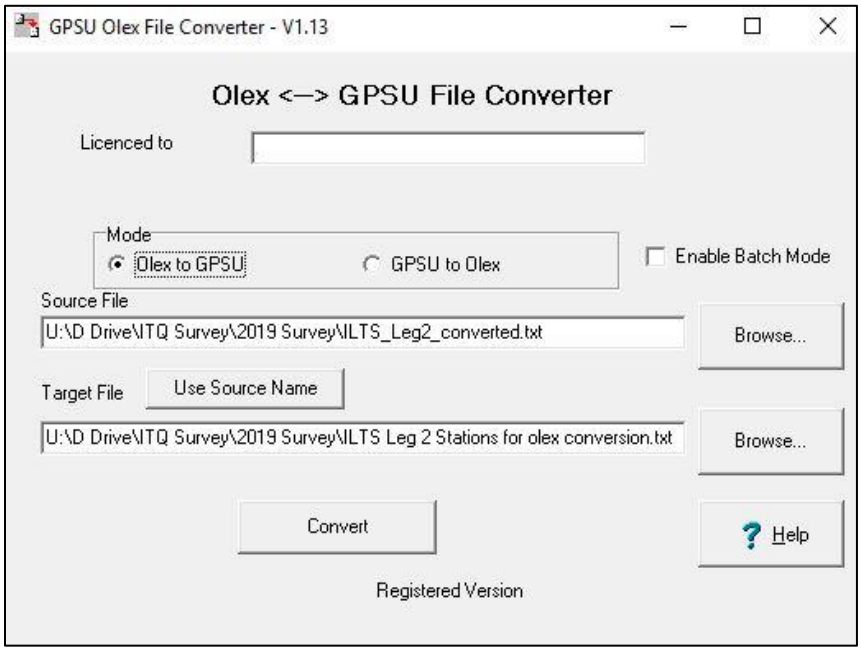
NEFSC Ecosystem Survey Trawl (NEST) Schematic





280 Balloon Trawl Schematic

APPENDIX 2: GPS UTILITY



- Choose: "**Olex to GPSU**".
- **Source File**: Browse to file to be converted. Must be in tab delimited text format.
- **Target File**: Browse to the destination of the converted file. A new name can be chosen or you can click "Use Source Name"
- Click "**Convert**"
  The output file will have the file extension ".GPS" which must be renamed to ".TXT" for loading into Olex

Input File Format:

F	ID----	Latitude	Longitude	Symbol----	T	Comment
W	200	N44°50.3299999999981'	W66°53.3299999999981'	Grønnkryss	I	GF
W	201	N44°53.3999999999996'	W66°51'	Grønnkryss	I	NEW
W	202	N44°57.6000000000004'	W66°49.5199999999986'	Grønnkryss	I	GF
W	203	N45°00'	W66°46.1999999999998'	Grønnkryss	I	NEW
W	204	N44°54.8134199999995'	W66°45.2725200000004'	Grønnkryss	I	ILTS
W	205	N44°52.1999999999998'	W66°42'	Grønnkryss	I	NEW
W	206	N45°01.73999999999978'	W66°39.3199999999979'	Grønnkryss	I	GF

Olex Symbols:

APPENDIX 3: INSHORE LOBSTER TRAWL SURVEY EQUIPMENT LIST

Olex
Large Scale
20kg calibrations weight
Scale Manual
D size batteries (scale)
AAA, AA & 9V Batteries
Mahr Caliper Batteries (type 2032)
Mitutoyu Batteries (type 357)
Digital Calipers (4)
Manual Calipers (2)
Crab Calipers (2)
LPS-1 (2)
Minilogs (7)
Minilog Reader
Fans (2)
Ziploc bags (1 medium, 1 large)
12 Lb Bags
Clipboards Masonite Legal (2)
Clipboards Masonite Letter (2)
Clipboards Aluminum Legal (4)
Gloves
Cable Ties
Data boxes (2)
Datasheets
Datasheets Originals
FRN and Scientific Licence
Waterproof Paper
Pencils – lead and mechanical
Pencil Sharpener
Leads
Eraser
Sharpies
Paper Clips
Colored binder clips
Deck books (5)
Note book
Vemco User Guide
Marel Scale User Guide
Olex User Guide
eSonar User Guide
Measuring Tape
Measuring Boards (2)
Camera & Charger
Memory Card
Power Bar
Velcro
Double-Sided Tape
Electrical Tape
Duct Tape
3/8” Dee Shackles (8)
Sand Paper
Steel Wool
Clipboard holder
Small red totes for small catch items

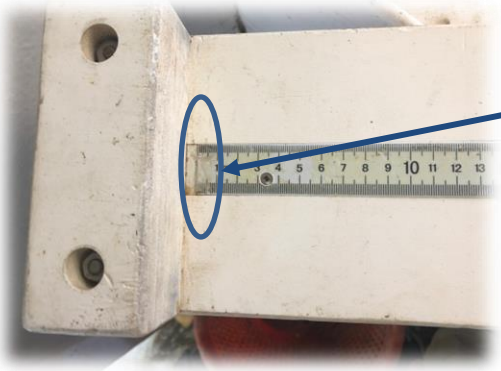
eSonar
2 wing sensors
1 headline sensor
Chargers
DBR
Power Supply
Serial Cable
Ethernet Cable
Serial to Ethernet Adapter
Power Y Splitter
Sensor Housings
Multimeter
Tool Kit for Housings

SeaBird
SeaBird temperature sensors (2)
SeaBird Housings (2)
Data Cable (2)
Wrench for housing
O-ring lubricant
3.6 V Batteries

Personal Gear
Oil Pants and Jacket
Survival Suit
Life Vest
PLB
AIS Beacons
Boots

Items provided by vessel
Scale Baskets
Fish Totes

APPENDIX 4: MEASURING FISH

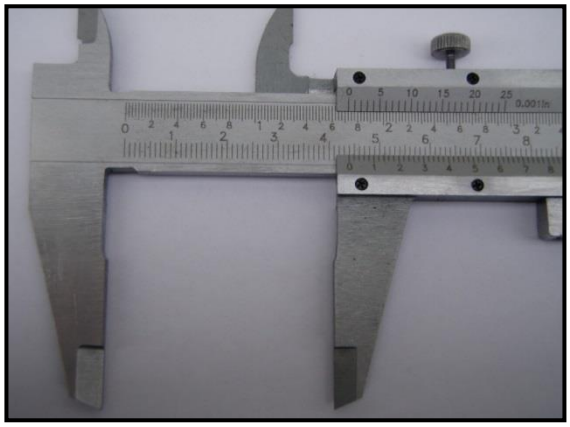


Using a .5cm offset measuring board, the fish is laid flat, snout abutted against the headpiece. The first number (cm) visible after the tail is recorded.

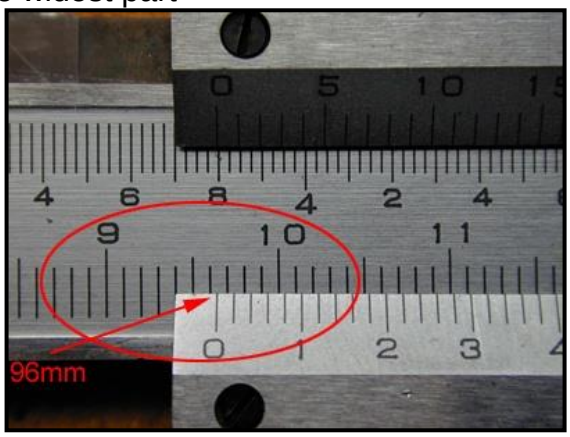
Fish Length = 54cm

APPENDIX 5: HOW TO MEASURE THE CARAPACE LENGTH OF A LOBSTER

1. Ensure the small screw on the top of the calipers is loosened in order to be able to open and close the jaws of the calipers. Once loose, the jaws should open easily.
2. Place the top end of the caliper at the back of the eye-socket of the lobster. Pull the jaw of the caliper back and gently tighten it to the edge of the carapace (where the shell meets the tail).
3. Check to make sure that the calipers are in a straight line (parallel to the mid-line of the lobster). If they are crooked the measurements will not be accurate.
4. Read the caliper where the **zero mark** on the slider indicates in millimeters the carapace length (**not** the inside edge of slider; there is a 3mm difference). The bottom of the caliper is marked in centimeters, lines between numbers are millimeters, so that **9|||** would be 93, **9||||** would be 96.
5. Always round down to a whole number, there is no need to estimate fractions of millimeters. For example, halfway between 96 and 97 would be recorded as 96.
6. For crab, measure the width of the carapace at the widest part



Vernier calipers.



How to read a caliper. Indicates 96mm

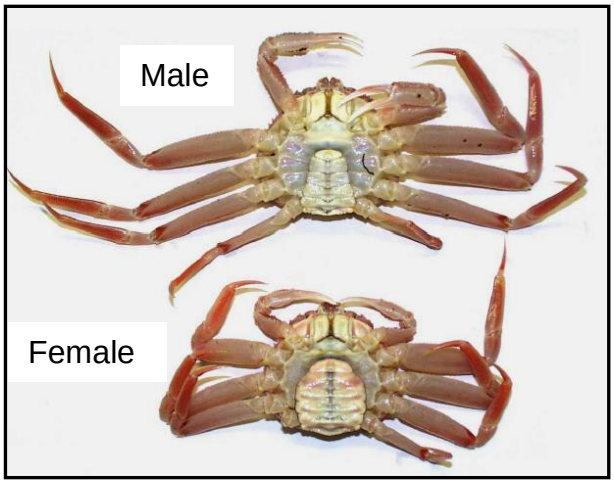
Ensure the calipers are in a straight line in order to get an accurate measurement.

APPENDIX 6: HOW TO SEX LOBSTER AND CRAB

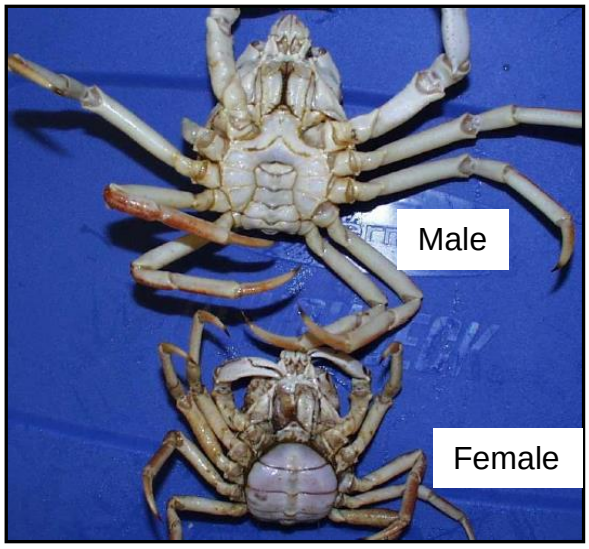
To identify the sex of the lobster, hold the lobster underside-up so that you can look at the swimmerets. The sex of a lobster is determined by looking at the first set of swimmerets (at the top of the tail). A female lobster's first pair of swimmerets are feathery in appearance and the structures are usually crossed next to the body. A male's swimmerets are more rigid in appearance and are straight, not crossed. Female crabs will have a wider abdominal flap than male crabs.

Female Lobster

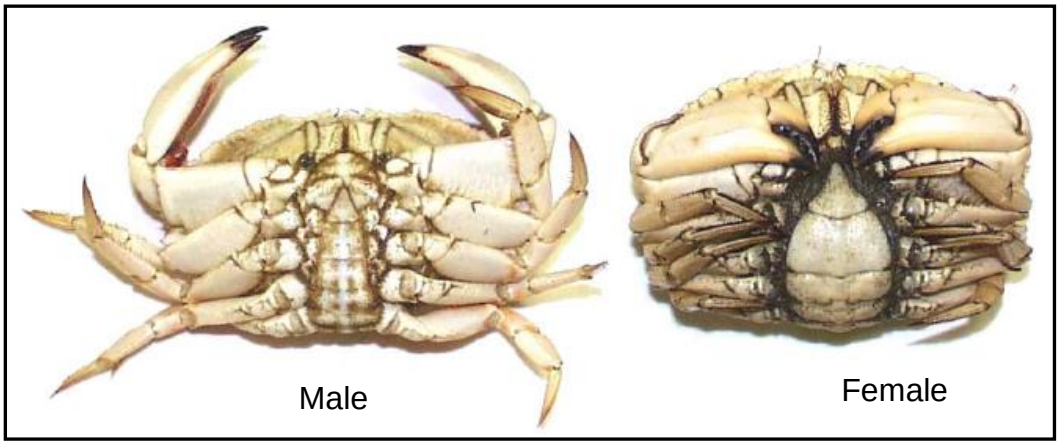
Male Lobster



Snow Crab



Toad Crab

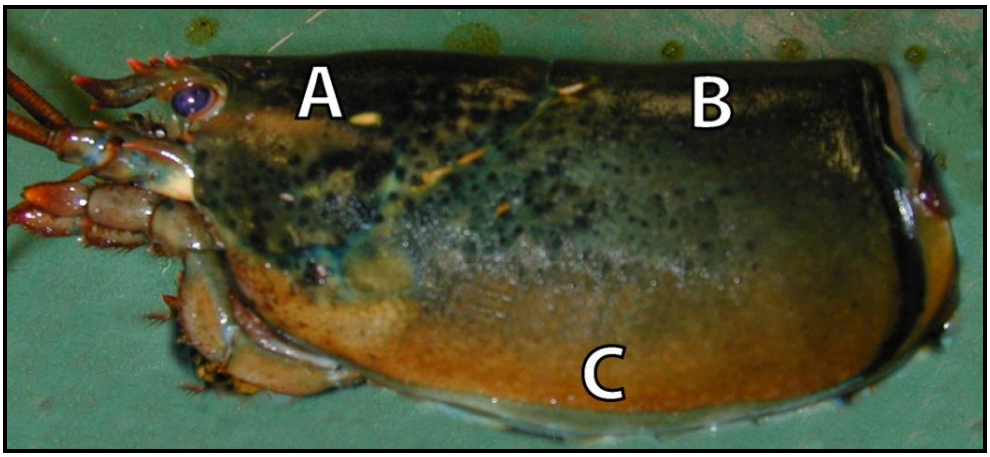


Jonah Crab

APPENDIX 7: HOW TO DETERMINE SHELL HARDNESS OF A LOBSTER

The shell hardness of a lobster is determined by gently squeezing different regions of the carapace. To determine the shell hardness, gently press the areas of the shell indicated; ‘A’ will harden first in a newly molted lobster, and ‘C’ will harden last. Be careful not to squeeze the carapace so hard as to puncture a hole through the shell.

A lobster that has just molted will have no shell and will be ‘jelly’ like to the touch (stage 1); a stage 2 hardness lobster would have a hardening shell but still be very breakable; a stage 3 would have a shell that could be compressed in both areas ‘C’ and ‘B’; a stage 4 would be compressible in only area ‘C’; a stage 5 would have a hard shell in all areas, and would not be compressible; a stage 6 would be a hard shelled lobster with epiphytic growth (ex. barnacle growth on the shell); and a stage 7 lobster would have the shell splitting in a straight line down the carapace (starting to molt).



Shell hardness determination - Adapted from Aiken (1980)

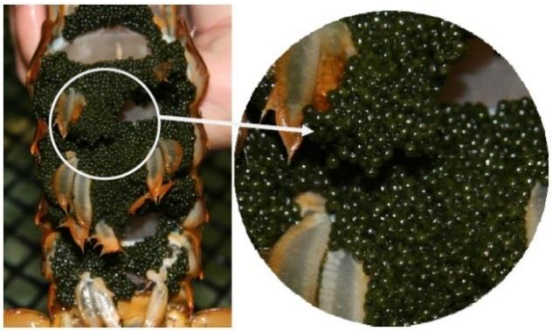
APPENDIX 8: HOW TO EVALUATE SHELL DISEASE OF A LOBSTER

Shell disease presents itself as degradation to the shell of the lobster. Shell disease is recorded according to the area of the shell covered in degradation; code ‘1’ is less than 10% of the shell; code ‘2’ is 10-50% of the shell; and code ‘3’ is more than 50% of the shell.

APPENDIX 9: HOW TO STAGE LOBSTER EGGS

Egg Stage

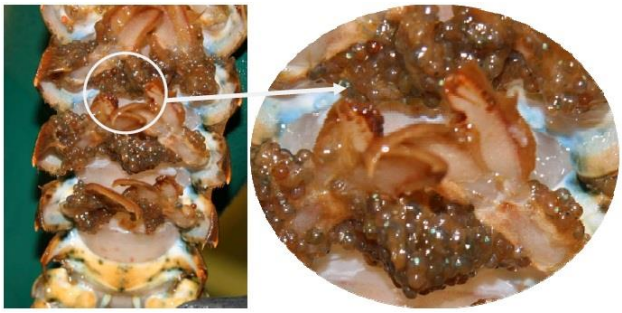
There are four egg stages that are used to describe how mature the eggs of a lobster are. New eggs (stage 1) are small in size, dark black or green in colour, and do not have an eye-spot visible. Once eggs develop an eye and start to lighten in colour to a brownish-orange shade, they are considered a stage 2; mature eggs (stage 3) are orange in colour or turning opaque, have swollen in size and are almost ready to hatch; a stage 4 has mostly moss (the cement used to adhere the eggs) left under the tail, and could have a few unhatched eggs remaining.



Stage 1 – NEW EGGS (DARK GREEN TO BLACK NO EYE SPOT)
Stage 1 indicates a clutch of eggs at an early stage when the eggs are new or recently extruded. A clutch of new eggs is easy to identify because the eggs are dark olive green or black, shiny and small.

Stage 2 – OLD EGGS (GREEN OR BROWN; BLACK DOTS OR EYE SPOTS VISIBLE)
Older eggs that are closer to being released by the female. The eggs have lost their shiny black colour and have become lighter and are starting to become brownish orange in colour. In these eggs the eyespot may be more or less developed depending on the time of sampling.

Stage 3 – MATURE EGGS (PARTIALLY HATCHED)
Stage 3 eggs are mature eggs close to being released. The eggs are orange or tan brown in colour and are very ripe. They are bulky and loose and hatching will soon start.



Stage 4 – EGGS HATCHING OR HATCHED (MOSSY)
During the early part of Stage 4 when the eggs are starting to hatch, you will notice that the eggs have lost some of the orange colour and are becoming more opaque. Both eyes can be seen. Empty egg casings will be evident and the “glue” that holds the eggs in place will be starting to show. Some of the eggs in this clutch have hatched / released.

APPENDIX 10: HOW TO EVALUATE CLUTCH PERCENTAGE OF A LOBSTER

Clutch percentage is the amount of egg coverage a berried lobster has on the underside of her tail. A normal clutch, coded with a '1' will have 50-100% coverage a code '2' will have 10-50% coverage, and a code '3' will have less than 10% coverage.

Examples of 'full' (code 1) normal clutches.

Example of a code 2 clutch.

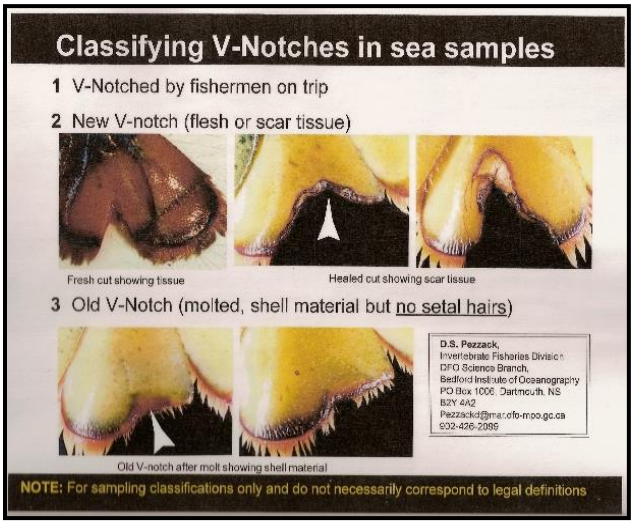
Example of a code 3 clutch.

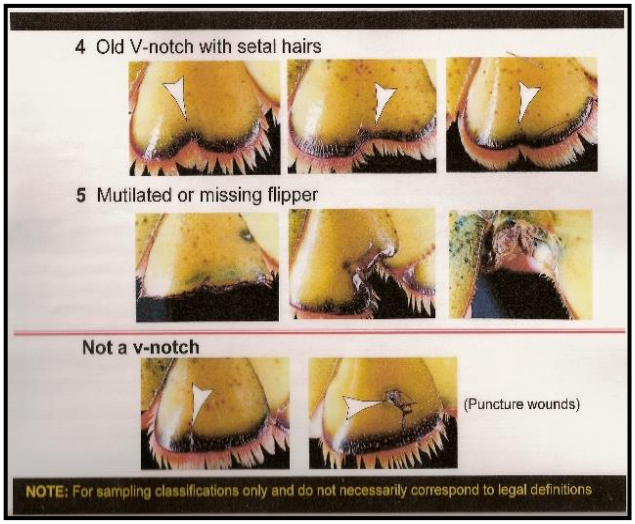
APPENDIX 11: HOW TO CLASSIFY V-NOTCHES IN LOBSTER

V-notching is used as a conservation measure to protect female lobsters from being caught and retained. V-notched lobsters can be legally retained in some LFAs, while in others they cannot.

V-notches are coded according to their condition and how long the lobster has had it. A code ‘1’ would be a lobster that was V-notch that day during your sampling; code ‘2’ would be a V-notch with scar tissue visible as if it had been done recently; code ‘3’ would be an older V-notch that has healed, but still has no setal hairs; a code ‘4’ would be a V-notch that has setal hairs grown back; and code ‘5’ is used for any mutilation to the V-notch flipper (outside edge). If a lobster has a puncture wound to the V-notch flipper, that need not be marked – V-notches only have to do with the outside edge of the flipper being altered.

The v-notch is on the tail flipper immediately to the right of the middle flipper, when the lobster is examined with the underside of the lobster down and its tail is toward the person making the determination.



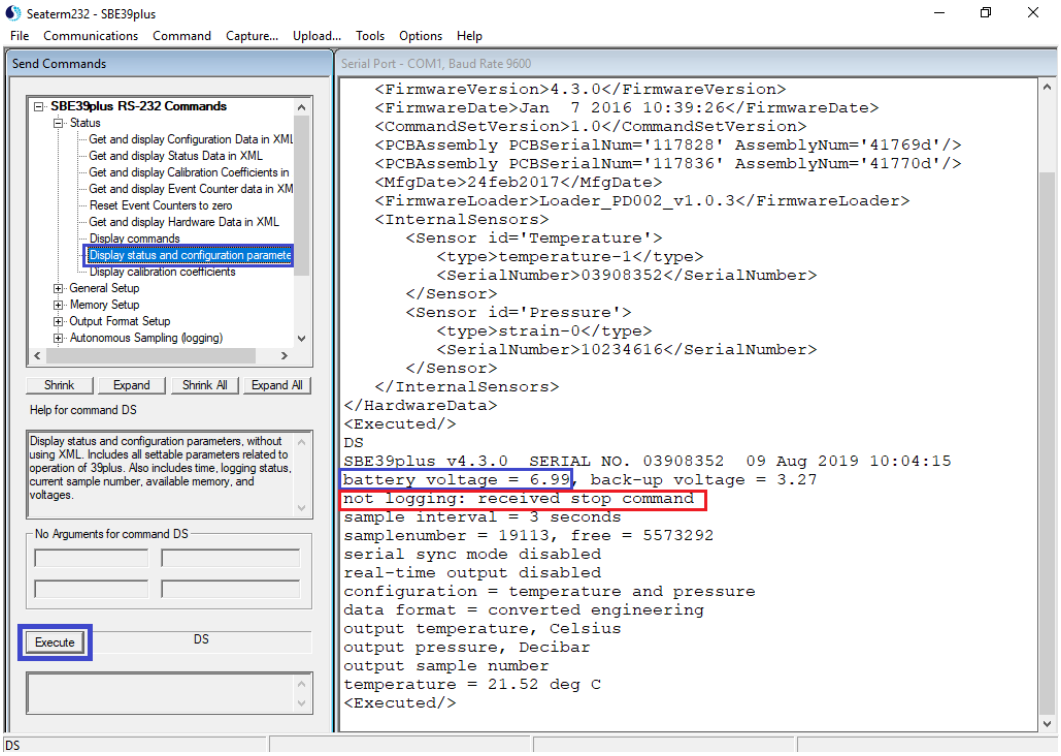


Examples of different classifications of V-notches

APPENDIX 12: SEABIRD DOWNLOAD AND SET UP INSTRUCTIONS:

Status of unit (sampling interval, battery):

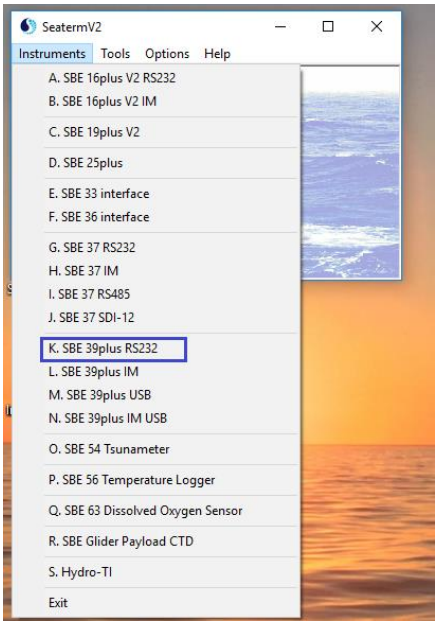
Status>Display status and configuration parameters. Check the status of the unit before disconnecting to ensure it is logging data. This is displayed in the 3rd line of the 'DS' output Battery replacement is suggested when unit status show less than 5 volts. Battery status is displayed in the 2nd line of the 'DS' output



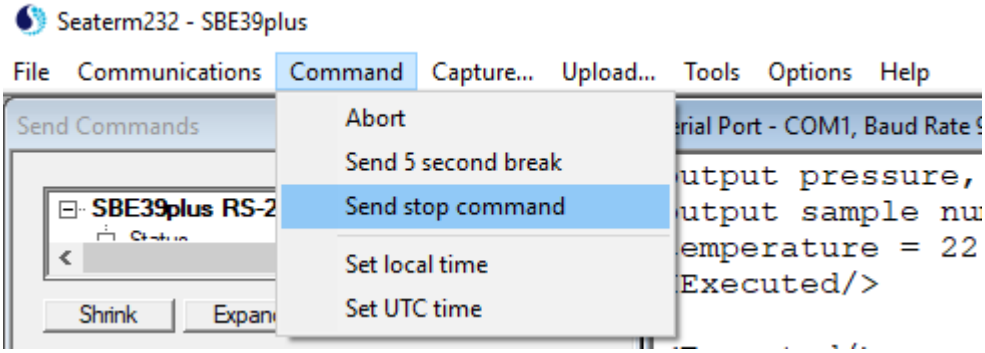
At the end of the day:

1. Remove the dummy plug from the Sea-Bird unit and attach the RS232 data cable which has been previously connected to a USB to serial adaptor and the Panasonic Toughbook USB port.

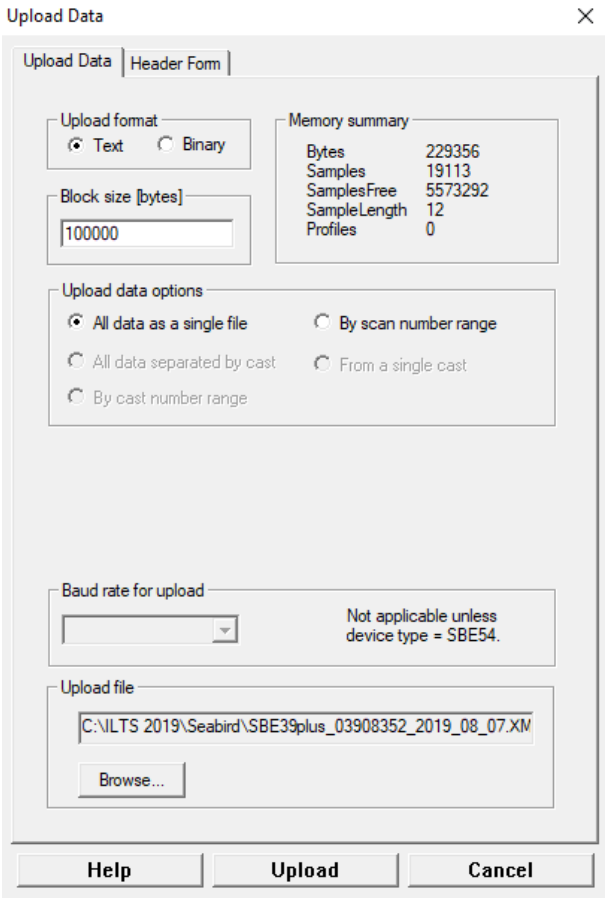
2. Open Seaterm V2 software and choose SBE 39plus RS232 form the list of instruments.



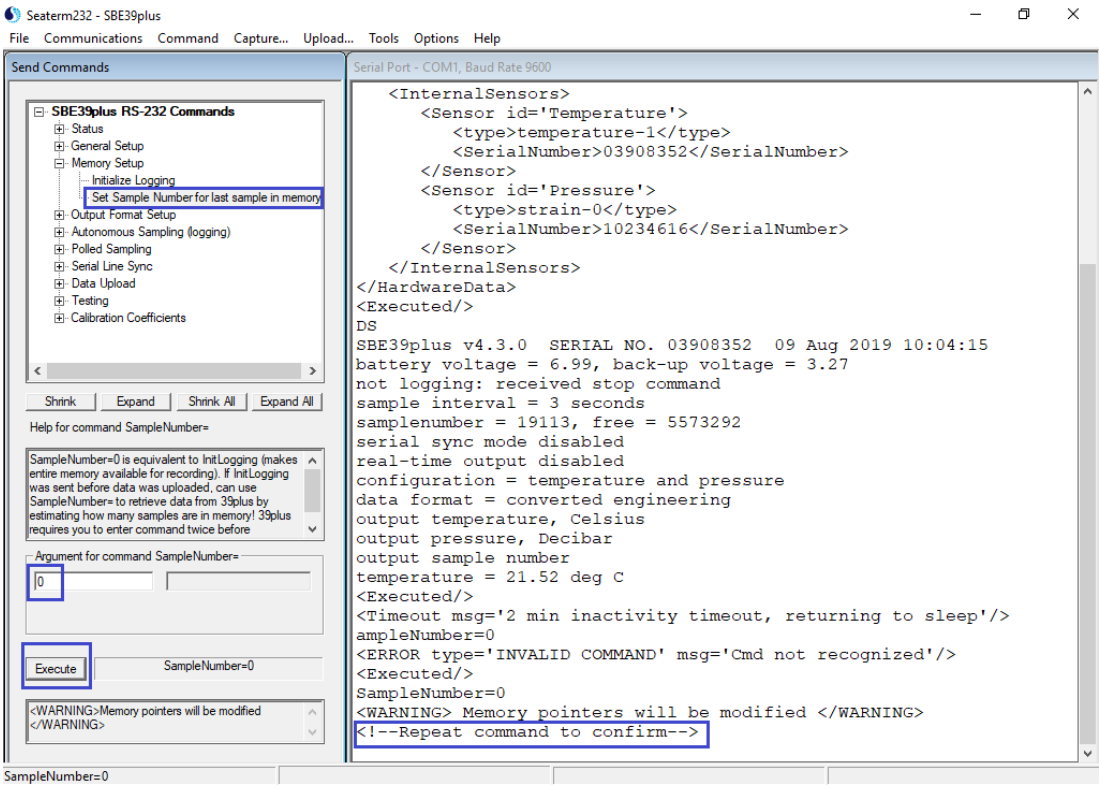
3. If it does not connect automatically when the program is opened:
   Communications > Connect
4. Stop the recording:
   Command > Send stop command



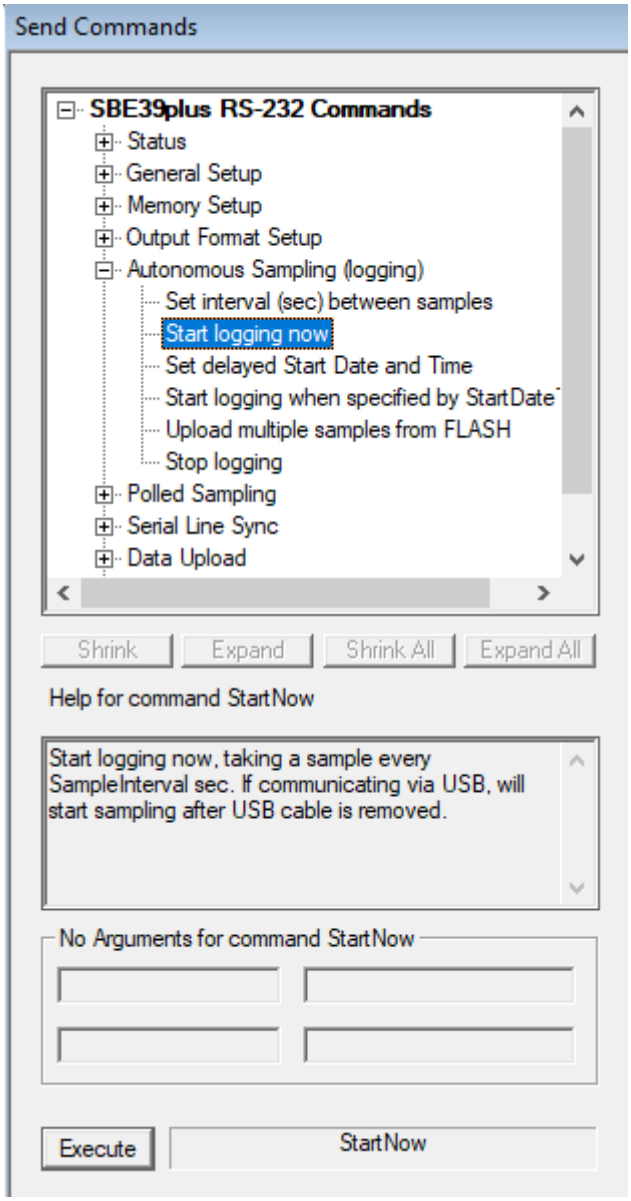
5. Upload data from unit:
   Upload – Select file location and file name



6. Confirm file is uploaded and data is present in file
7. Clear Memory:
   Memory > Set Sample Number for last sample in memory (use ‘0’ in argument) > execute twice



8. Synchronise time between the Toughbook and the vessel's GPS time using the vessel's GPS time as the reference. This must be done before the Seabird is reinitialized for the following day.
9. Set time to computer time:
   Command > Set Local Time
10. Start Sampling:
    Sampling interval = 3 seconds
    Autonomous Sampling (logging) > start logging now



11. Disconnect unit:
    Communications > Disconnect

APPENDIX 13: ESONAR SETUP AND OPERATION

System Set up

Sensor Housings

Both Master and Slave sensors are placed in protective canisters and are then placed on the net bridles at the end of the net wings. Canisters are specific to each sensor and are labeled ‘M’ for master and ‘S’ for slave. Ensure the correct canister is used.

Battery Testing

Sensors can be tested with a multimeter. To measure the voltage, place the voltmeter’s positive lead on the center shoulder bolt (unmarked on the end cap) and the negative lead on the negative (–) shoulder bolt (engraved on the end cap). ***Sensor leads must be dry to obtain a reading***. Sensors should be charged after 240-300 hours of operation as opposed to every day. If the sensor reads less than 8 VDC, it should be charged.


DOOR SLAVE
ES8620
9.54
Mastercraft

Sensor Charging:

To charge the sensors, place the black alligator clip on the negative post and the red on the positive post and plug in charger. A full charge should be obtained in 1-2 hours

Testing Sensors in Air

Place a wet finger on each the negative lead and the unmarked lead. Put your ear to the opposite end of the sensor and you should hear a faint ping/click every 12-14 seconds for the spread sensors and every 5-6 for the headline sensor.

DBR Set Up

Transducer Window Settings for ILTS Sensors

In the DBR Program choose **Setup>Transducers**

Transducer Setup

Transducer	Type	Min Time	Max Time	Min Value	Max Value	Sensor	Assoc Tx	Log	Dimension
Primary	Standard	5.000	5.980	0.000	60.000	Headline	Primary	☑	Length
Secondary	Standard	6.000	6.980	2.100	31.200	Headline	Secondary	☐	Length
FishCount	Standard	7.000	7.980	0.000	10.000	Headline	FishCount	☐	None
Error	Standard	4.830	4.970	0.000	0.000	Headline	Secondary	☐	None
DoorSpread	Standard	12.000	14.000	0.000	300.000	STBDDoorMas	DoorSpread	☑	Length
Error	Standard	11.850	11.950	0.000	0.000	STBDDoorMas	DoorSpread	☐	None
STBDPitch	Standard	20.000	21.436	0.000	359.000	STBDPitch	STBDPitch	☑	Angle
STBDRoll	Standard	16.000	17.436	0.000	359.000	STBDRoll	STBDRoll	☑	Angle
Depth1	Standard	3.000	5.000	0.000	1000.000	Depth1	Depth1	☑	WaterDepth
DoorSymmetry	Differential	8.000	16.000	0.000	150.000	PORTDoorSym	DoorSpread	☐	Length
PORTPitch	Standard	22.000	23.436	0.000	359.000	PORTPitch	PORTPitch	☐	Angle
PORTRoll	Standard	18.000	19.436	0.000	359.000	PORTRoll	PORTRoll	☐	Angle
Depth2	Standard	7.000	9.000	0.000	500.000	Depth2	Depth2	☑	WaterDepth
Catch1	Standard	30.000	31.000	1.000	0.000	Catch1	Catch1	☐	None

Close Window

Sensor Setup Settings for ILTS Sensor

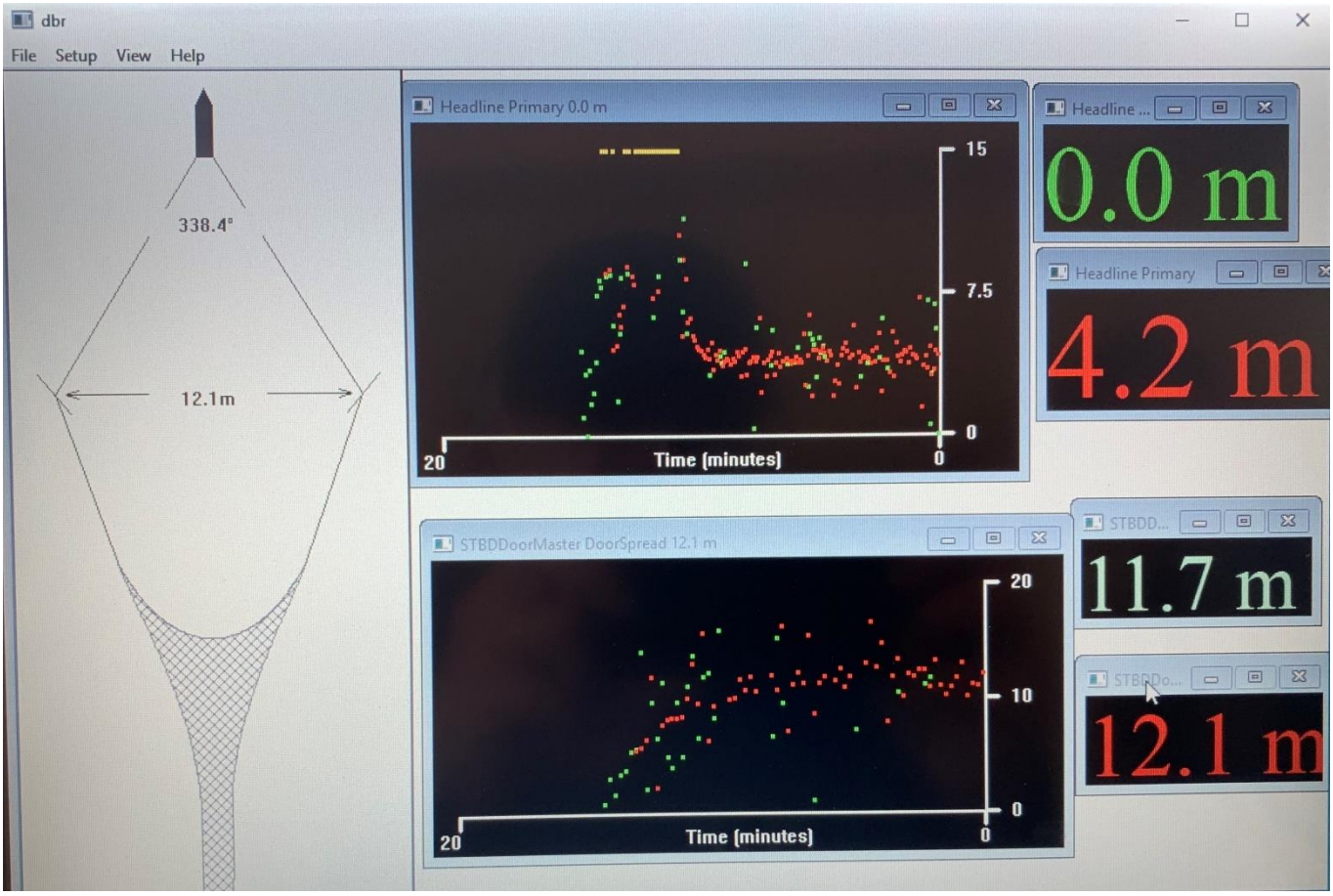
In the DBR Program choose **Setup>Sensors**

Sensor Setup

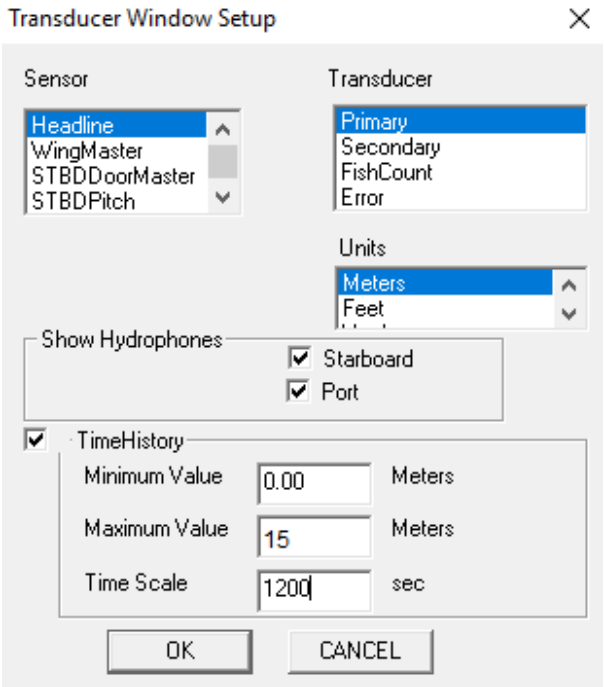
Sensor	Frequency (Hz)	Enabled
Headline	28640	☑
WingMaster	28000	☐
STBDDoorMast	28800	☑
STBDPitch	29600	☑
STBDRoll	29760	☑
Depth1	29280	☑
WingSlave	28000	☐
PORTDoorSym	28320	☐
PORTPitch	27520	☑
PORTRoll	27360	☑
Depth2	27680	☐
Catch1	28960	☐

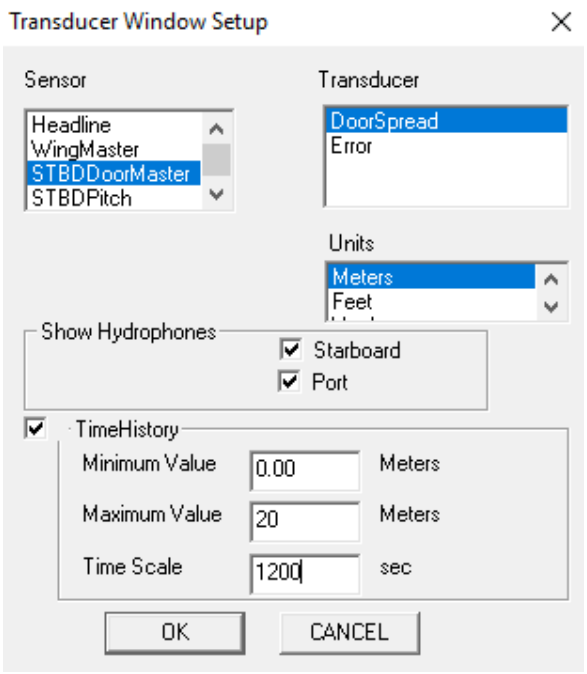
Close Window

DBR Transducer Window Display

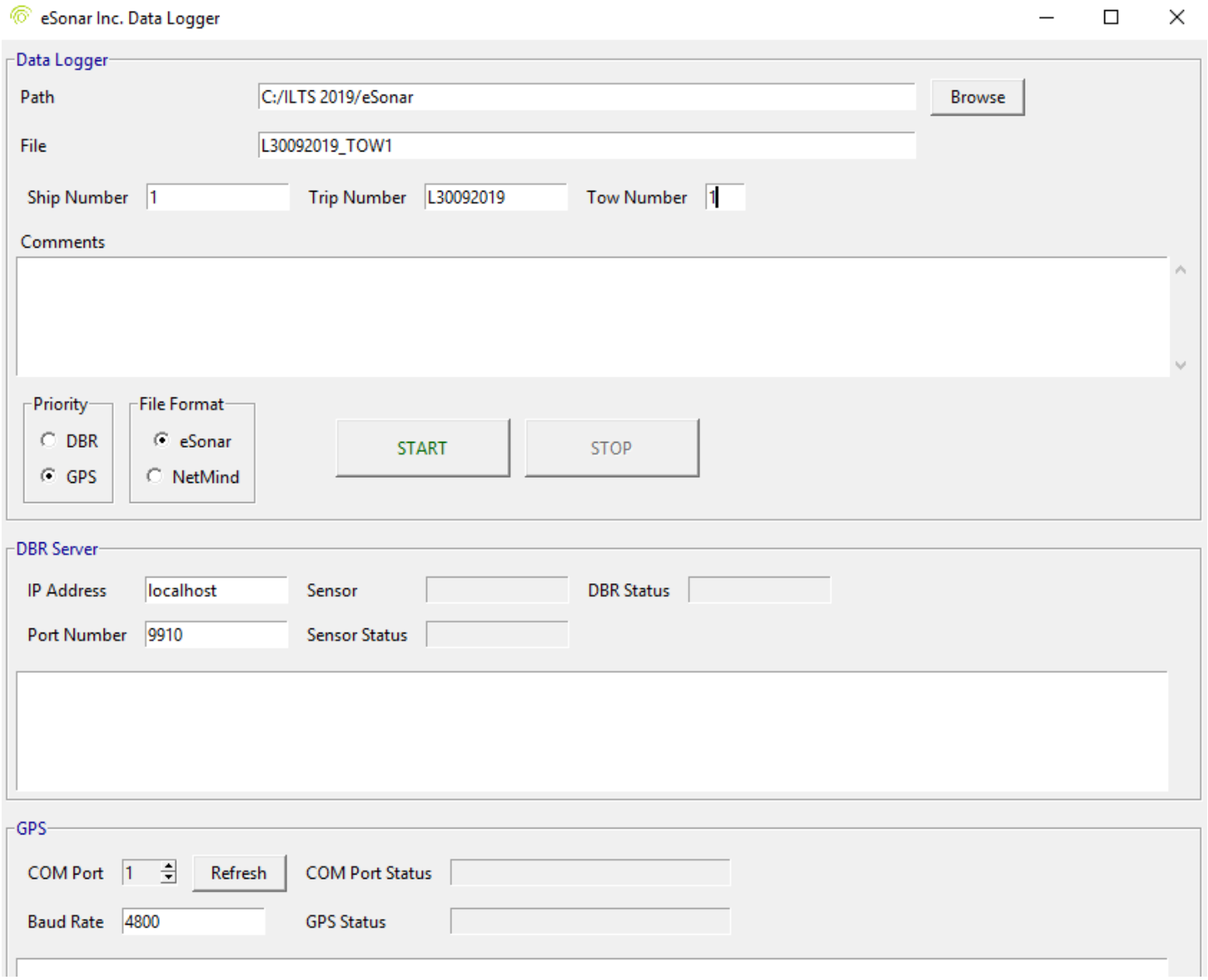


To obtain the time series graphs, Choose View > NewTransducerWindow and apply the following settings. For the sensor value windows, do not check the TimeHistory box.





eSonar Data Logger Window



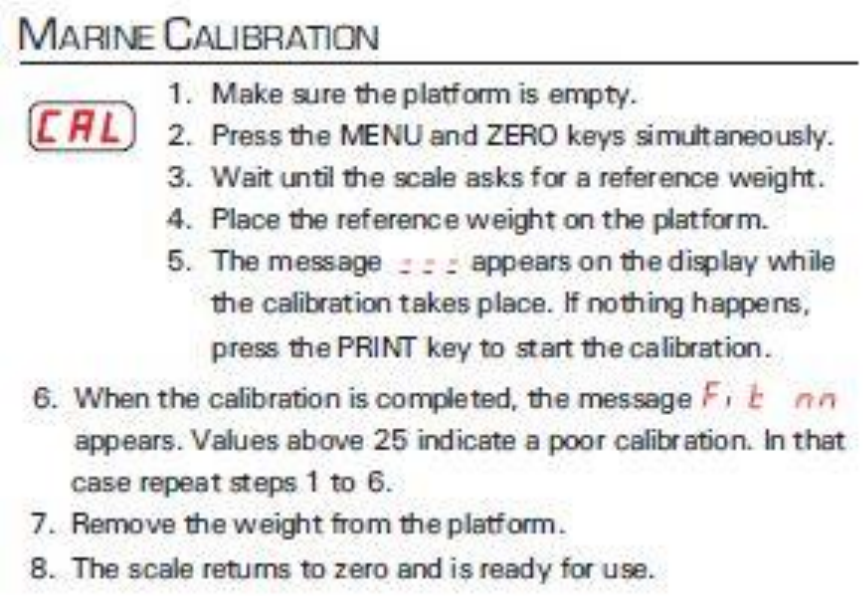
The full User Guide for the eSonar system is on the survey vessel for reference.

APPENDIX 14: MAREL M1100 MARINE SCALE CALIBRATION

The scale must also be calibrated at least once per day or:

- when the scale is unstable without the weighing platform being touched.
- when the displayed weight is inaccurate, even when the scale has a correct zero.
- when the scale is unable to assume the initial zero point, even with an empty platform.

A 20 Kg weight is used as a reference weight for calibration of the Marel catch scale



MARINE CALIBRATION

CAL

1. Make sure the platform is empty.
2. Press the MENU and ZERO keys simultaneously.
3. Wait until the scale asks for a reference weight.
4. Place the reference weight on the platform.
5. The message ::: appears on the display while the calibration takes place. If nothing happens, press the PRINT key to start the calibration.
6. When the calibration is completed, the message Fit nn appears. Values above 25 indicate a poor calibration. In that case repeat steps 1 to 6.
7. Remove the weight from the platform.
8. The scale returns to zero and is ready for use.

The full User Guide for the Marel Scale is on the survey vessel for reference.

APPENDIX 15: ILTS DATA FORMS

TRIP FORM

OBSERVER: _____ VESSEL: _____

TRIP NUMBER

TRIP TYPE

FOREIGN - LICENCE NUMBER

DOMESTIC - CFV #

REGISTRATION YEAR

BOARDING DATE

D D M M Y Y Y Y

LANDING DATE

OBSERVER ID

COUNTRY

OWNER GROUP

LOGBOOK CONFIRMATION #

LOGBOOK LICENCE #

TRIP COMMENTS: _____

Owner / Operator Name:

Street Address / PO Box / RR#:

City / Town:

Postal Code / Phone Number:

ISDB-V 8/12/2019

VESSEL FORM

VESSEL NAME _____

CFV NUMBER

LICENSE NUMBER

COUNTRY

LENGTH OVERALL (M)

BRAKE HORSEPOWER

GROSS REGISTERED TONNAGE

TONNAGE CLASS

VESSEL OPERATION CODE

TONNAGE CLASS CODES

0	Not Known
1	0 - 24.9
2	25 - 49.9
3	50 - 149.9
4	150 - 499.9
5	500 - 999.9
6	1000 - 1999.9
7	2000+

VESSEL OPERATION CODES

1	GROUNDFISH / SQUID
2	SCALLOP DRAG
3	PURSE SEINE
4	SHARK / TUNA / SWORDFISH
5	SQUID JIGGER
6	OVER THE SIDE SALES
7	RESEARCH
8	SHRIMP
9	OTHER
90	SURVEY

ISDB-04M

GEAR FORM - MOBILE

8/12/2019

TRIP NUMBER

OBSERVER: _____ VESSEL: _____

GEAR NUMBER					
GEAR TYPE					
WINGSPREAD (m)					
BODY MESH SIZE (mm)					
CODEND MESH SIZE (mm)					
MESH TYPE					
CHAFER TYPE					
GRATE TYPE					
DOOR TYPE					
FOOTROPE ATTACHMENTS					
INSTRUMENTATION					
INSTRUMENTATION					
INSTRUMENTATION					

	CODE	VALUE	VALUE	VALUE	VALUE
FOOTROPE LENGTH (m)	1				
HEADROPE LENGTH (m)	2				
TRAWL OPENING (m)	3				
BRIDLE LENGTH (m)	4				
DOOR WEIGHT (kg)	6				
DOOR LENGTH (cm)	7				
DOOR HEIGHT (cm)	8				
WING MESH SIZE (m)	9				
LINER MESH SIZE (mm)	10				
CENTRAL ROLLER HT. (mm)	12				
CENTRAL ROLLER LEN. (mm)	13				
NO. HANGING CHAINS	15				
AVG. WT. HANG. CHAINS (kg)	16				
AVG. LEN. HANG. CHAINS (m)	17				

MISC. GEAR DATA

DESCRIPTION	CODE	VALUE	VALUE	VALUE	VALUE
_____					
_____					
_____					
_____					

SET INFORMATION

ISDB-06

8/12/2019

TRIP NUMBER

OBSERVER:

VESSEL:

SET NO.	GEAR #	OBS SET	SPECIES SOUGHT	ESTIMATED CATCH (MT)	COMMERCIAL AREA	200 MILE	NAFO ID	SET TYPE	HAUL COM.	WARP LENGTH	AMOUNT OF GEAR	STRATUM ID	STATION NO.
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					
						1		4					

Haul Comments: 1 Good Tow
4 Bad Tow

Estimated Catch: Total Catch in Metric Tonnes of All Species

Gear: 1 NEST

SET PROFILE

TRIP NUMBER: ______ OBSERVER: ______ VESSEL: ______

SET NO.	DATE DD/MM/YYYY	PT ID	LATITUDE START	LONGITUDE START	DEPTH START (m)	TIME START	SPEED	BOT. TYPE	PT ID	LATITUDE END	LONGITUDE END	DEPTH END (m)	TIME END
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:
	/ /	2	° .	° .		:			3	° .	° .		:

Depth: 1 Fathom = 1.83 metres

ISDB-12

8/12/2019

CATCH SUMMARY

TRIP NUMBER: _____ OBSERVER: _____ VESSEL: _____

SET _____

SPECIES	KEPT WEIGHT (KGS)	DISCARD WEIGHT (KGS)	TOTAL NUMBER CAUGHT

SET _____

SPECIES	KEPT WEIGHT (KGS)	DISCARD WEIGHT (KGS)	TOTAL NUMBER CAUGHT

LENGTH FREQUENCY

TRIP NUMBER: [-] OBSERVER: ____________________

SET [ ] SPECIES ________ [ ] | SET [ ] SPECIES ________ [ ] | SET [ ] SPECIES ________ [ ]

SEX [ ] PRODUCTION TYPE [ ] SEX WEIGHT CODE [ ] SUB-SAMPLE [ ] SPECIES SAMPLE WEIGHT [ ] (each of the three columns)

1.0	0.5	TALLY	NO.	1.0	0.5	TALLY	NO.	1.0	0.5	TALLY	NO.
0	0.0			0	0.0			0	0.0		
1	0.5			1	0.5			1	0.5		
2	1.0			2	1.0			2	1.0		
3	1.5			3	1.5			3	1.5		
4	2.0			4	2.0			4	2.0		
5	2.5			5	2.5			5	2.5		
6	3.0			6	3.0			6	3.0		
7	3.5			7	3.5			7	3.5		
8	4.0			8	4.0			8	4.0		
9	4.5			9	4.5			9	4.5		
0	5.0			0	5.0			0	5.0		
1	5.5			1	5.5			1	5.5		
2	6.0			2	6.0			2	6.0		
3	6.5			3	6.5			3	6.5		
4	7.0			4	7.0			4	7.0		
5	7.5			5	7.5			5	7.5		
6	8.0			6	8.0			6	8.0		
7	8.5			7	8.5			7	8.5		
8	9.0			8	9.0			8	9.0		
9	9.5			9	9.5			9	9.5		
0	0.0			0	0.0			0	0.0		
1	0.5			1	0.5			1	0.5		
2	1.0			2	1.0			2	1.0		
3	1.5			3	1.5			3	1.5		
4	2.0			4	2.0			4	2.0		
5	2.5			5	2.5			5	2.5		
6	3.0			6	3.0			6	3.0		
7	3.5			7	3.5			7	3.5		
8	4.0			8	4.0			8	4.0		
9	4.5			9	4.5			9	4.5		
0	5.0			0	5.0			0	5.0		
1	5.5			1	5.5			1	5.5		
2	6.0			2	6.0			2	6.0		
3	6.5			3	6.5			3	6.5		
4	7.0			4	7.0			4	7.0		
5	7.5			5	7.5			5	7.5		
6	8.0			6	8.0			6	8.0		
7	8.5			7	8.5			7	8.5		
8	9.0			8	9.0			8	9.0		
9	9.5			9	9.5			9	9.5		
0	0.0			0	0.0			0	0.0		
1	0.5			1	0.5			1	0.5		
2	1.0			2	1.0			2	1.0		
3	1.5			3	1.5			3	1.5		
4	2.0			4	2.0			4	2.0		
5	2.5			5	2.5			5	2.5		
6	3.0			6	3.0			6	3.0		
7	3.5			7	3.5			7	3.5		
8	4.0			8	4.0			8	4.0		
9	4.5			9	4.5			9	4.5		

LOBSTER MORPHOLOGIES

TRIP NUMBER: _____ SET #: _____ SPECIES : 2 5 5 0 PAGE _____ of _____

OBSERVER: _____ SAMPLERS: _____ VESSEL: _____

				V		V		V		V		V		V						
	FISH NO.	CARAPACE LENGTH	SEX	SHELL		DAMAGE		DISEASE		EGG STAGE		CLUTCH		VNOTCH		CODE		CODE		COMMENT
1	1			77		137		135		78		138		76						
2	2			77		137		135		78		138		76						
3	3			77		137		135		78		138		76						
4	4			77		137		135		78		138		76						
5	5			77		137		135		78		138		76						
6	6			77		137		135		78		138		76						
7	7			77		137		135		78		138		76						
8	8			77		137		135		78		138		76						
9	9			77		137		135		78		138		76						
10	10			77		137		135		78		138		76						
11	11			77		137		135		78		138		76						
12	12			77		137		135		78		138		76						
13	13			77		137		135		78		138		76						
14	14			77		137		135		78		138		76						
15	15			77		137		135		78		138		76						
16	16			77		137		135		78		138		76						
17	17			77		137		135		78		138		76						
18	18			77		137		135		78		138		76						
19	19			77		137		135		78		138		76						
20	20			77		137		135		78		138		76						
21	21			77		137		135		78		138		76						
22	22			77		137		135		78		138		76						
23	23			77		137		135		78		138		76						
24	24			77		137		135		78		138		76						
25	25			77		137		135		78		138		76						
26	26			77		137		135		78		138		76						
27	27			77		137		135		78		138		76						
28	28			77		137		135		78		138		76						
29	29			77		137		135		78		138		76						
30	30			77		137		135		78		138		76						
31	31			77		137		135		78		138		76						
32	32			77		137		135		78		138		76						
33	33			77		137		135		78		138		76						
34	34			77		137		135		78		138		76						
35	35			77		137		135		78		138		76						
36	36			77		137		135		78		138		76						
37	37			77		137		135		78		138		76						
38	38			77		137		135		78		138		76						
39	39			77		137		135		78		138		76						
40	40			77		137		135		78		138		76						
41	41			77		137		135		78		138		76						
42	42			77		137		135		78		138		76						
43	43			77		137		135		78		138		76						
44	44			77		137		135		78		138		76						
45	45			77		137		135		78		138		76						
46	46			77		137		135		78		138		76						
47	47			77		137		135		78		138		76						
48	48			77		137		135		78		138		76						
49	49			77		137		135		78		138		76						
50	50			77		137		135		78		138		76						