



Empowering fishermen to collect essential data;
Piloting the Research Fleet approach in the Atlantic sea scallop fishery:

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1.0 EXECUTIVE SUMMARY

Project Title: Empowering fishermen to collect essential data; Piloting the Research Fleet approach in the Atlantic sea scallop fishery

Year Awarded: 2021

RSA Priorities Addressed By This Research: Priority #3 “Scallop Biology: Research on scallop biology, including studies aimed at understanding recruitment processes...”

Industry Partners: Vessel	Captain	Owner	Fleet Category
F/V Georges Banks	Rui Branco	Scott Rapoza	LA
F/V Yankee Pride	Joe Aluernes	Chris Roebuck	LA
F/V Roen Keil	Ben Crocker	Damian Parkington	LAGC
F/V Northern Light	Vincent Balzano	Vincent Balzano	LAGC
F/V Midnight Our	Jesse Rose	Jesse Rose	LAGC
F/V Glutton	Beau Gribbon	Beau Gribbon	LAGC

Narrative: The CFRF has trained six members of the federal scallop fishery to test the research fleet approach by collecting location data, shell height, gonad condition, meat quality, tissue weight and meat weight of individual scallops during their normal fishing operations. The goal of this project is to evaluate if this research fleet approach is a viable tool for this fishery to collect these data parameters on individual scallops to improve our understanding of the spatial-temporal variations in the biological condition.

Our research fleets use a custom-built android-based application, On Deck Data, to standardize the sampling protocol established by the fleet members and our scientific steering committee to collect the biological data in an efficient and reliable manner. The data can then be uploaded to the CFRF once the vessel returns to port in near real time for quality control and data storage.

Due to delays along the way establishing our steering committee, developing the sampling protocol, designing the On Deck Data app and most notably the significant delay with acquiring the motion compensated scales, a one-year extension was granted to allow for sufficient at-sea field testing and sampling by Research Fleet members.



2.0 PRELIMINARY RESULTS AND DISCUSSION

Research Fleet Participants

The announcement search for project fleet participants was sent to our email list serve, posted on the CFRF website, and posted on the CFRF Facebook page. We received applications for 13 vessels and using criteria posted in the announcement we selected 6 vessels to pilot this research fleet (see industry partners above). Each project participant has shown their support for this project and has helped develop the sampling plan to be tested at sea.

Sampling Protocols

With the help of the fleet participants and the project steering committee we developed the following sampling protocols and began testing with the research fleet in May 2022. We asked each limited access (LA) vessel to complete a minimum of three sampling sessions during each trip occurring in the sampling period, and the limited access general category vessels (LACG) to complete a minimum of one sampling session a month during the sampling period.

Each sampling session was to consist of collecting data of 30 scallops from a single tow. However, soon into sampling fleet members voiced concerns that the recorded weights at sea were not representative of the true values. Five additional scales were then tested at sea by CFRF staff and members of the project Research Fleet, however, it seemed none of the scales tested were able to produce reliable recordings of weight. Due to the problems with recording weights at sea we put less priority on collecting the weight data and did not ask any fleet members to separate the gonads for individual gonad weights. Each fleet member was given flexibility in how many scallops to sample on a given day (10, 15 or 30 scallops) or for a given area with a target of 30 scallops each month for the LAGC fleet and 60 for the LA fleet.

At each sampling location the date, time and position were recorded in the On Deck Data app, then the captain entered depth, and selected the presence of common bycatch species and bottom types. Each scallop was measured for shell height then shucked and imaged in the shell, next the sex, reproductive stage, and meat quality were selected in the app. Then, if possible, the weights of the meat and remaining tissues were collected.

Data was collected directly on android tablets using a modified version of the CFRF On Deck Data App. To collect data using the On Deck Data App, at the start of towing the captain press a button on the tablet to start the tow, which then collects the date, time, and position from the built in GPS. The captain enters the depth and once the tow is on deck the captain will enter the approximate volume of scallop catch, the dominant bycatch species, and characterize the substrate using the list of approved values. Then 30 scallops larger than 89 mm will be randomly selected for further measurements. Each scallop was processed within one hour of being caught. Each scallop was measured for shell height to the nearest mm using digital calipers then the bottom shell was removed. The first five scallops were imaged using the built-in camera on the tablet on selected trips. The meat quality was then graded into three different established levels of meat quality; white, brown, or gray (Huntsberger et al 2015; Inglis et al. 2016; Siemann et al. 2019; Figure 1). White scallops are firm and have the typically creamy scallop coloration; brown scallops are slightly discolored and the meat has started to degrade, noticeable by a change in



texture; and gray scallop have muscle that is degraded, soft and flaccid, often shrunken with a gray coloration. The sex and spawning condition were also recorded using the following categories; resting, developing, ripe, or spawning/partially spent. When feasible the scallops were then be rinsed in sea water and the abductor muscle, gonads, and remaining tissue was separated and weighed to the nearest 0.1 g The data collection platform also gave the option to then record any unusual observations or note any parasites present.

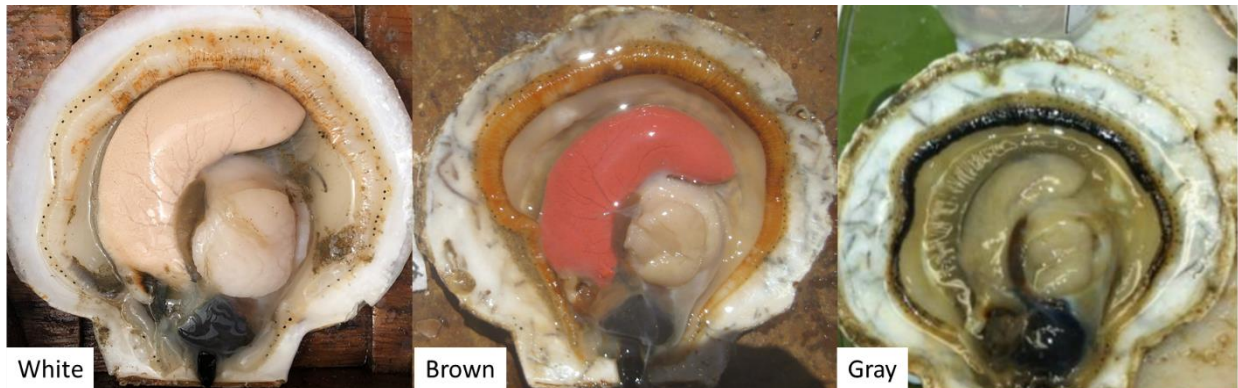


Figure 1. Established scale of scallop meat quality that will be used in this study.

On Deck Data App Modifications

The CFRF has built a custom android-based data entry application (app), called On Deck Data, to be used as for the data collection process in our various research fleets. We have modified this app to be tested in the scallop pilot research fleet to follow our sampling protocols. The app collects data on the sampling location, date, depth, total scallop catch, substrate type, as well as the biological data collected for each scallop (Figure 2 & 3). Testing of the data collection app and protocols had occurred at sea with all fleet members as well as during the South Fork Wind Farm beam trawl survey.

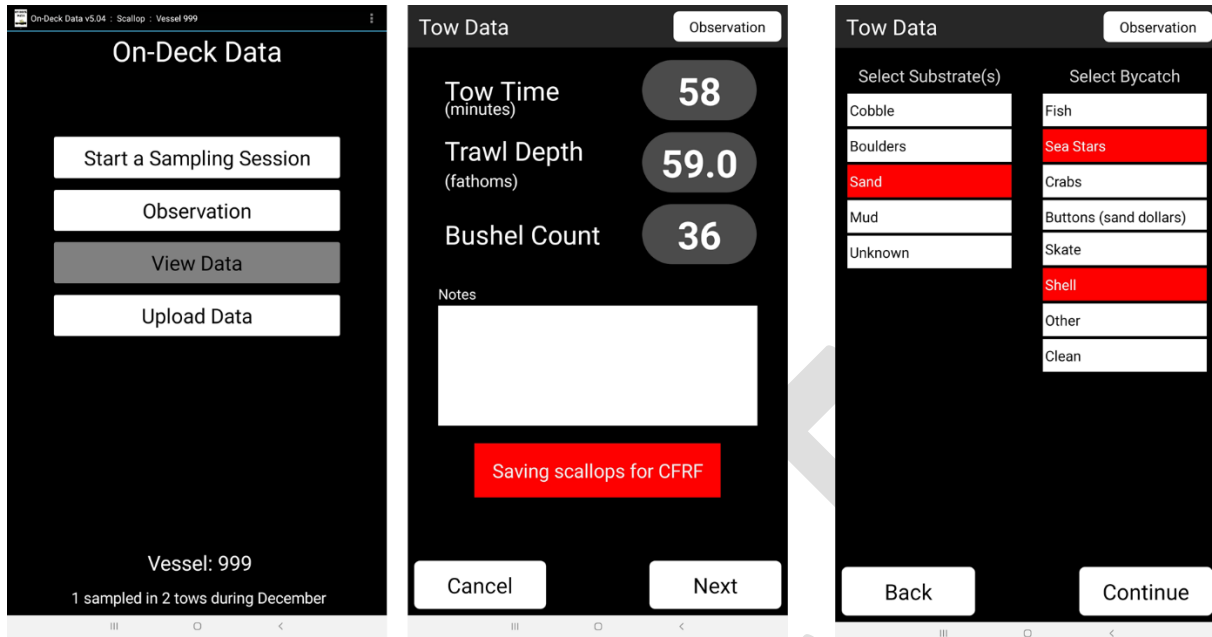


Figure 2. Screen shot of the haul level data being recorded on the On Deck Data app during testing.

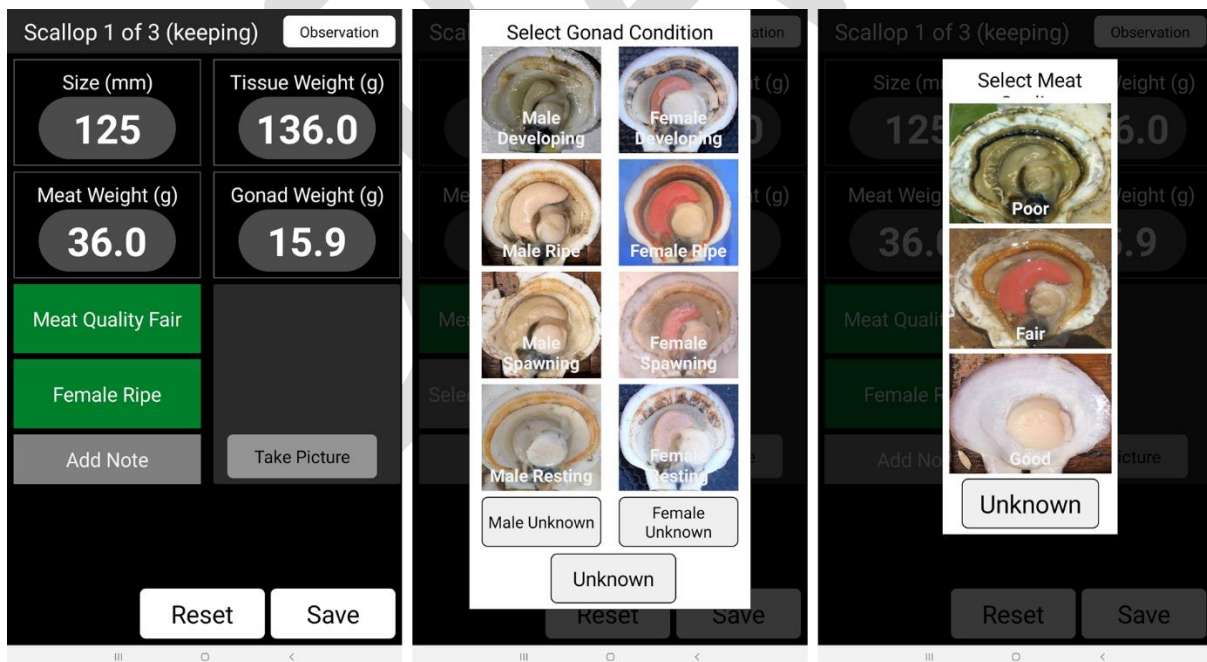


Figure 3. Screen shot of the individual scallop data being recorded on the On Deck Data app during testing.



Results from Exploring the Research Fleet Method

The overall goal of this project was to pilot the Research Fleet approach in the Atlantic Sea Scallop fishery and establish sampling methods. Therefore, assessment of the data collection methods rather than the data was the key outcome of this research. To help assess the methods and identify a path forward a one-on-one interview with each participant was conducted. The questions reviewed were:

1. Was the sampling workload reasonable? How much time did it take?
2. Did the scales work on your boat? Did you feel like the weights from the scale were correct?
3. How user friendly was the App/Data entry?
4. Should we change the way data is collected?
5. If the fleet decides to continue what is fair compensation?
6. Is there any other information you see as valuable that we're not collecting?
7. Do you have any overall thoughts on the project/Other comments

Most fleet members found the On Deck Data app very user friendly and easy to navigate. However, some crew members that deemed themselves as not very “tech-savvy” needed a little extra guidance at first, while there was only one crew member that decided they could not navigate the app.

Overall, a total of six different scale models were tested across the fleet and aboard CFRF surveys to determine if individual scallop meat, gonad, and tissue weights could be recorded at sea. However, none were able to produce weights that fishermen believed to be accurate. Fleet members did not voice any issues or concerns with the use of digital calipers to take shell measurements and overall were very pleased with collecting additional information using On Deck Data.

Fleet members sampled between 10-30 scallops per session. Those who sampled 30 scallops believed this was a reasonable amount when sea conditions are calm, but taking images and weights (in all ocean conditions) made sampling excessive at times. Once the option to take weights was given, fleet members believed 15-30 scallops to be optimal sample size per session.

Fleet members showed interest in continuing the research fleet where RSA pounds were provided as compensation or data collection is voluntary. Many voiced that they believe this type of data collection is important and would like to see more ways to become involved in utilizing the Research Fleet approach. Fleet members suggested adding to the data collected, such as more environmental parameters and by focusing on targeting different depths to better compare scallop health between areas. More than one fleet member also mentioned shell density and thickness should be collected as they are beginning to witness variations of these characteristics.



3.0 SPECIAL COMMENTS

Continuing the Atlantic sea scallop Research Fleet

Based on results from the pilot Research Fleet project, we will be working to continue to establish the research fleet approach in the Atlantic sea scallop fishery through image-based sampling on LAGC vessels. Though the overall consensus was the methods used in this pilot study worked well in the scallop fishery, fleet members stated concerns over the fleets' ability to stage scallop reproductive conditions accurately (inexperience, transitional stages are more difficult to determine), as well as all the intent to collect weight measurements from individual scallops.

We have been awarded funding through the 2023/2024 Sea Scallop Research Set-Aside program to continue this work and aim to address concerns found while during the pilot project. Each vessel will be equipped with a portable sampling station which includes a sampling board with a grid background and a scientific grade camera system. The goal is to devise optimal image-based sampling methods in order to create an annotated image library for algorithm training that will allow the camera system to automatically record parameters such as shell height, gonad condition, diseases present, meat quality, and combined volume to calculate an estimated mass of scallop meat.

References:

- Huntsberger, C. K. Thompson, M. Winton, L. Siemann, K. Stokesbury, S. Cadrin, S. Inglis, G. DeCelles, C. Bank, B. Wright, D. Rudders, and R. Smolowitz. 2015. Seasonal Bycatch Survey of the Georges Bank Scallop Fishery. 2013 Sea Scallop RSA Final Report.
- Inglis, S., A. Kristmundsson, M. Freeman, M. Levesque, and K. Stokesbury. 2016. Gray meat in the Atlantic sea scallop, *Placopecten magellanicus*, and the identification of a known pathogenic scallop apicomplexan. *Journal of Invertebrate Pathology* 141:66-75.
- Siemann, L., L. Garcia, C. Huntsberger, and R. Smolowitz. 2019. Investigating the impact of Multiple Factors on Gray Meats in Atlantic Sea Scallops (*Placopecten magellanicus*). *Journal of Shellfish Research* 38:233-243.