

Project Title:

Piloting a Low-Bycatch Commercial Squid Jig Fishery in Southern New England

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Recipient Name:

The Commercial Fisheries Research Foundation (CFRF)

Principal Investigators:

David Bethoney, Executive Director, CFRF; Katie Almeida, Senior Representative, Government Relations and Sustainability, The Town Dock; Mike Roderick, Senior Director of Fresh Sales, Purchasing and Vessel Operations, The Town Dock

Report Prepared By:

Noelle Olsen, Research Biologist

Katie Viducic, Research Biologist

N. David Bethoney, PhD, CFRF Executive Director

**Project Team:****Commercial Fisheries Research Foundation (CFRF)**

N. David Bethoney, PhD, Executive Director; Thomas Heimann, Research Biologist; Noelle Olsen, Research Biologist; Teresa Winneg, Business Manager

**The Town Dock**

Katie Almeida, Senior Representative, Government Relations and Sustainability; Mike Roderick, Senior Director of Fresh Sales, Purchasing and Vessel Operations

**Mid-Atlantic Fishery Management Council**

Jason Didden, Fishery Management Specialist

**Participant Vessels**

F/V Mattie and Maren, F/V Miss Edi, F/V Hadley Ruth

**Project Summary:**

This project aimed to pilot the use of automatic squid jigging gear for commercially harvesting squid in the U.S. North Atlantic. Automatic squid jigging technology is utilized around the globe in large-scale commercial operations; however, only minor commercial application has been seen in the United States. Locally, jig machines have been periodically tested with mixed results, from the 1960s through the 1980s. Therefore, this project set out to test the feasibility of automatic squid jigging machinery aboard commercial fishing vessels (F/Vs) to assess the catch rates and commercial viability of this harvesting method. This was accomplished by installing and operating automatic squid jigging machinery aboard three commercial F/Vs and performing at-sea trials to quantify bycatch rates, catch efficiencies, habitat impacts of squid jig fishing, and compare these results to traditional squid trawling. On multi-day trips, the F/Vs would commercially trawl during the day and the jigging machines would operate throughout the night. Additionally, to better explore commercial viability, this project also focused on estimating start-up costs to develop an implementation plan for operationalizing automatic squid jig equipment on commercial F/Vs of various sizes.

The project team successfully worked with the crews of the three F/Vs install and operate the machines with increasing efficiency. At-sea gear trials were started in the spring of 2021 and the project team completed 20 at-sea gear trial days through the fall of 2022. This includes an additional multi-day trip support with funding from the Mid-Atlantic Fisheries Management Council. Overall, the squid catch was very low during the at-sea trials with some nights not catching any squid. However, based on observations, the squid that were caught by the jigs were considered clean or of a high grade. During the trials, no harmful habitat impacts were observed, and the only bycatch encountered by the jigs were two lady crabs. Based on feedback from industry members and the project team, it was concluded more at-sea trials are required to better understand how to apply this technology to local squid species. The CFRF has received substantial local and regional interest to further investigate the effectiveness of automatic jigging and hopes to continue to pilot this method in U.S. fisheries.

## **Final Project Timeline:**

- **January- February 2021:** Project set-up: Convene project team, issue call for F/V applications, develop outreach materials & protocols documentation, order jig and sampling equipment
- **March 2021:** Review F/V applications & select participants, schedule training & research trips, meet with participants & review project components
- **April – May 2021:** Prepare sampling gear, install jig equipment on inshore F/V & train crew, vessel shakedown to test functionality of jig equipment
- **June 2021:** Prepare sampling gear, install jig equipment on offshore F/V & train crew, at- sea gear trials of squid jigging equipment
- **June 2021– August 2021:** At-sea gear trials of squid jigging equipment on inshore F/V
- **September 2021:** Application for no-cost extension due to difficulties with Covid-19
- **October 2021:** Recruit replacement offshore vessel, order two new jig and sampling equipment
- **May 2022:** Prepare sampling gear, install jig equipment on new offshore and inshore F/V, train offshore vessel crew
- **May 2022 – October 2022:** At- sea gear trials of squid jigging equipment aboard inshore and offshore F/V
- **September 2022 – December 2022:** Data analysis, drafting of informational materials (video and brochure), debrief meetings with F/Vs
- **December 2022:** CFRF hosted workshop for interested members of the fishing industry and stakeholders
- **February 7, 2023:** Final project presentation to Mid-Atlantic Fisheries Management Council

## **Project Results**

### **Gear Assembly and Installation**

A major component to this project was the installation and training to operate the squid jig machines. The CFRF procured six Belitronic BJ5000EX (<https://w97151.shop.textalk.se/sv/ex/fiskemaskin-ex.html>) automatic jigging machines with a full squid set up from Gaski Marine. Each machine came with a round reel mounted on the back of the unit. Additional rigging equipment and squid gear included the following: user manuals, elliptical squid replacement reel, chutes, rollers, pulleys, mounting poles and hardware, 200-pound monofilament for backing line on the reels, squid jigs (Figures 1 and 2), and lead weights for the lines. The majority of the equipment was in stock but minor pieces needed to be ordered from the manufacturer and the chutes were made-to-order. It was quickly discovered that there was a steep learning curve in setting up the jigging machines. Unexpectedly, the machines had to be powered directly from a battery. Since each machine possesses an electromagnetic drag, if weight on the line caused the drag to be pulled, then the machine would generate electricity. The generated electricity must be offloaded or else there would be damage to the machine's electronics. Further, the mounting hardware provided with each machine was intended for permanent installation of the jigging machines on vessels. This caused some logistical issues as the project team had planned for rotating the machines between the participating vessels and the

selected vessels continued to commercially trawl throughout the project timeframe. The jigging machine setups for the different project vessels are described in the next sections.



Figure 1: The 9.5 centimeter length red jigs included with the Gaski Marine squid jigging kits. The white strip is glow-in-the-dark. Photo from <https://gaskimarine.com/online-store/ols/products/squid-jigs-red-95-cm-5-bags-of-10bag>.



Figure 2: The 11 centimeter length white, glow-in-the-dark jigs included with the Gaski Marine mackerel jigging kits when two new machines needed to be purchased at the end of December 2021. Photo from <https://gaskimarine.com/online-store/ols/products/squid-jigs-11-cm-luminous-5-packs-of-10>.

### *F/V Miss Edi*

In early May 2021, Champlin Welding met with the project team and the captain and crew of F/V Miss Edi to configure a mounting system for the jigs. CFRF and F/V Miss Edi decided it would be best to install the jiggling machines to run bow to stern. This is a result of the fixed equipment on deck of the vessel. The sorting table and conveyor belt were fairly large obstacles to work around, so Champlin Welding fabricated attachment points to mount the machine support poles on the back of the hydraulic drum (Figure 3). To attach the jiggling line pulley, an aluminum bar with holes cut every 12 inches was mounted on the back of the wheelhouse, above where the jiggling machines would be set up (Figure 4). This allowed for the line to feed directly off the reel on the jiggling machine and be directed upwards. Champlin Welding fabricated and affixed mounting brackets to the underside of each chute to allow for quick setup and removal to the rail on the stern of the vessel (Figures 5 and 6). This configuration allowed for the jiggling lines to move along the length of the vessel with the least amount of fixed equipment in the way. Power was provided to the jiggling machines by hardwiring the power cable from each machine directly to the vessel's battery. The power cable from each machine was passed upwards, through the engine room vents, and dropped into the engine room below the deck (visible in Figure 4).



Figure 3: Jiggling machine mounting poles on the F/V Miss Edi. Mounting system is duplicated on both hydraulics on either side of the vessel so two machines could run simultaneously.



Figure 4: Jigging machine mounted on the support pole with line pulley above in the top right of the photo.



Figure 5: Fabricated brackets welded to the underside of each chute on the F/V Miss Edi. Each bracket slips over the rail and is held in place by tightening a threaded bolt.



Figure 6: Two chutes and rollers mounted off the stern of the F/V Miss Edi with a string of construction lights hung below the chutes.

#### *F/V Mattie and Maren*

Set up on the F/V Mattie and Maren was completed in June 2021 after the initial sea trials on the F/V Miss Edi. Because of its larger size, the deck was wide enough for the lines to run across the deck rather than bow to stern. The intention was to have the machines and chutes mounted right next to each other on the starboard side of the vessel (Figure 7) so that the line would come off the reel and pass through a roller mounted on the port side of the vessel, then double-back to the starboard side of the vessel, and go overboard on the chute mounted next to the machine unit (Figure 8). Champlin Welding fabricated all the mounting equipment so the machines and chutes could be mounted as individual units directly to the rail and removed easily for trawling activities during the day.



Figure 7: Squid jigging machines and chutes mounted as individual units on the starboard rail of the F/V Mattie and Maren.



Figure 8: Two squid jigging machines installed on the F/V Mattie and Maren. The line travels from the reel on the machine to the portside of the vessel, through the rollers in the top right of the photo, and then overboard on the starboard side mounted chutes.

The same equipment was used for both vessels except the pulleys used on the F/V Miss Edi were replaced with rollers bolted in place above the port rail. The reason the rollers were used was to allow for the jigs to easily pass over them and be brought directly back to the edge of the machine reel. The pulleys supplied with the jigging machine were too narrow for the jigs to reliably pass through without getting caught on the edges. The rollers are bow rollers for boat trailers and made out of hard rubber. A bolt was threaded through the middle of the rollers to allow it to freely rotate. Occasionally, the jig line would slip off the bow roller and would need to be reset.

The included chute rollers functioned at-sea, but some improvements were recommended. Since the diameter of the metal part of the roller is fairly narrow at four inches, the jig lines occasionally got snagged on the rollers as the line and was unable to make it over the roller smoothly. Sometimes, the slightly longer white jigs (Figure 2) were slower to come over the roller compared to the shorter red jigs (Figure 1). Adjusting some of the jig motor haul settings (e.g. hauling up speed, hauling up drag) could help make the jig rigs roll over the roller more smoothly. If a roller with a larger diameter was used or two rollers were mounted one above another, the jigging line would have an extended distance to make the 180-degree turn which would likely result in a smoother return back to the starboard side of the vessel.

The vessel's engine room and battery were located too far for the jigging machine's power cables to reach directly. To work around this, during operation, the machines' power cables were connected to a 12-volt marine battery, the battery was connected to a battery charger, and the battery charger was plugged into an outlet and powered by the vessel's generator. With the marine battery at full charge and the battery charger disconnected, the two jigging machines could be powered directly from the battery for only one hour before receiving



“low power” warnings. Unfortunately, the F/V Mattie and Maren caught fire and sank in October 2021, and the project team lost four of the Belitronic BJ5000EX machines. The project team was able to reconfigure the budget and purchased two new jig set ups that winter.

### *F/V Hadley Ruth*

The set up on the F/V Hadley Ruth generally mirrored that on the F/V Mattie and Maren. The machines and chutes were mounted on the starboard side of the vessel, the jigging line ran to the port side through a wheel, and returned to the chute to go overboard on the starboard side of the vessel. When the replacement machines were purchased from Gaski Marine, the squid chutes were out of stock. However, Gaski Marine had mackerel chutes at the same price which functioned similarly but were wider to accommodate a mackerel “stripper” which dehooks the mackerel. The “stripper” was not needed so only the mackerel chutes and appropriately sized wheels were purchased. Fortunately, the mackerel chutes came with a mounting plate (Figure 9., left side of the image) which allowed for a far simpler process of mounting the chute to the rail of the vessel. To save on set up costs and time, instead of contracting the welding services to fabricate a similar mounting system for the machines, a stand was constructed out of wood 2x4’s and 2x10’s to which the mount bracket and pole for each BJ5000EX machine were affixed (Figure 9).

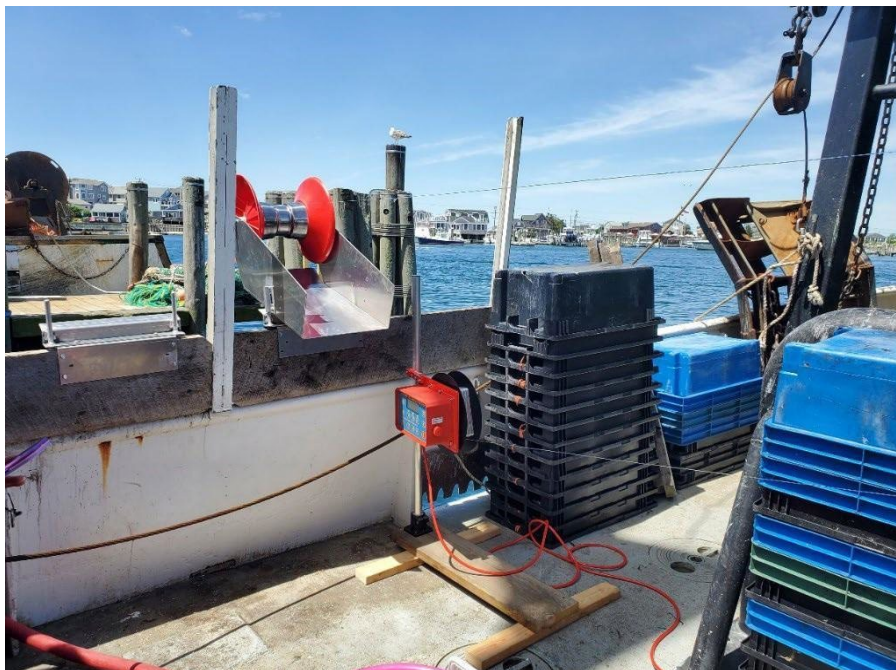


Figure 9: Belitronic BJ5000EX mounted on a custom-built frame with the chute mounted to the rail of the F/V Hadley Ruth.

The wide base of the stand provided a stable enough platform for the machine to operate detached from the rail, and the machine weighed enough to prevent the base from moving during operation. Since all jigging activities were conducted while the vessel was either anchored and/or drifting in relatively calm conditions, this base provided more ample stability. Further, the base was much quicker to set up and breakdown to make room for daytime commercial trawling. The bow rollers were mounted on the port side of the vessel (Figure 10). The rubber provided just enough friction on the line to keep it tight during line descent but was hard enough for the

jigs to pass through without hooking into the material. Large, stainless steel eye bolts were drilled through the wooden weatherboards and bolted in place. The orientation of the jiggling line helped keep the line tight on both the jig ascent and descent, preventing it from sagging while the jigs were onboard and hanging freely between the machine reel and wheel. Any other orientation and the jiggling line would sag once the jigs were onboard, causing frequent snags on the vessel which required manually stopping the machine and clearing the jiggling line of snags. The machines were powered by the vessel's battery, but extension cables had to be attached to the machines' cables to reach the battery in the engine room below deck.



Figure 10: Cross deck image of the complete squid jigging setup on the F/V Hadley Ruth. Wheels on the right-hand side of the image are bolted through a similar wooden plank rail as seen on the left-hand side of the image.

Although welding may be the preferred installation method for long term use, the handmade wooden bases and utilization of weather boards for mounting significantly decreased the cost of the installation process. The cost of welding totaled to an estimated \$950 per vessel for two jigging machine installations, and the wooden base setups were estimated \$50 per vessel for two machines. Overtime, the installation process and time to set up became quite streamlined. Initially, it took the project team and vessel crew a few hours to set up the machines and this decreased down to less than an hour for set up and break down. Again, this project was designed to allow for multiple vessels to trial the gear, so the installation process will differ between vessels. Ultimately, the installation needs and monetary commitment of a vessel will depend on a variety of factors. The size of the vessel, layout of existing equipment on the deck, and type/shape of rails will greatly influence the location of the jigging machines, the number of machines that can fit, and the direction of the lines. Other factors to consider include access to a power source and existing light sources on the vessel. Money and time along with a bit of innovation are necessary to retrofit a vessel to have a robust squid jigging operation, but it is certainly not outside of the scope of what commercial and recreational vessels encounter in their day to day operations.

## **Operation and Training**

The programmed operation of the jigging machines is fairly straightforward, as the two programs named “Mackerel and Squid Fishing Program” and “Mackerel Fishing with Jig” operate similarly. The first program drops the line to the programmed depth and then retrieves it back to the surface or zero point. The second program operates the same way but a “jig” can be added. Once the line drops to the programmed depth as in the first mode, the line is then raised to a programmed depth and then dropped back down to the bottom. This creates a jigging motion with the line and can be repeated as many times as programmed before being brought back to the surface. In both modes there are a multitude of settings which can be tweaked such as drag weight, reel retrieve speed, and depth reduction (where the maximum depth at which the line is dropped to and is decreased by a set amount until it reaches a minimum value). Initially, the CFRF staff tested more simple, straightforward machine settings. As the staff and crew spent more time on the water testing the machines, more machine settings and programs were tried out and altered. A variety of factors influenced how and when machine settings would need to be altered (e.g. fishing depth, sea state, jig length, tides/currents).

Despite the high programmability of the jigging machines, some limitations were uncovered during initial gear preparation work. First, the squid jigs are incapable of being wound back up onto the reel, because the double ring of hooks would become tangled together on the line (Figures 1 and 2). To remedy this issue, the length of the line which has all the jigs tied on to it can only be as long as the distance from the reel on the jigging machine to the point at which the line goes overboard the vessel from the chute mounted roller. However, since the jigging setup on the F/V Miss Edi directed the lines along the length of deck from bow to stern, there was sufficient distance to tie on an ample number of jigs per machine. Second, the jig lines tangle very easily. Originally, the plan was to hitch each jig to the line with drop loop knots tied at regular intervals. The intention was that this would create extra motion along the lines to attract the squid as the jig would only be attached on one end to the line, allowing the other end to move freely in the water. However, it was quickly realized during the first trial that this set up causes tangles in the line far too easily and frequently.

As a result, the line is broken down into two main components; the main line which is 200-pound monofilament tied directly on to the jigging machine reel and the jigging line which is connected to the main line with a 100-pound rated snap and swivel. A 40-pound fluorocarbon was used for the jigging line with each jig tied directly in line with improved clinch knots on each end. The jigs were tied, on average, 18 inches apart. At the end of each jigging line, about six feet (ft) of the 40-pound fluorocarbon was added with a drop loop knot tied on the end. This additional section of fluorocarbon served as the attachment point for the weight. Depending on depth and current in the area, 12-36 ounces of lead weights were added to the end of each jigging line. The length of the weighted line was meant to provide enough length so when the jigs were brought back on board, the weight would remain in the water, and therefore was equal to the approximate height from the end of the rollers to the water line.

Overall, the configuration on the F/V Mattie and Maren (i.e., lines running across from port to starboard) appeared to perform better from a functionality standpoint and resulted in far fewer jigging interruptions due to tangled or snapped lines. Further, due to the line doubling-back across the width of the deck, the length of the jigging line, and subsequently how many jigs could be tied on, was greatly increased. On the F/V Miss Edi, each jigging line consisted of approximately 15-18 jigs, and the number of jigs doubled to 30-36 jigs per machine on the F/V

Mattie and Maren. The jigging line on the Hadley Ruth was initially set up with 7 jigs per machine for shallow water fishing and increased to 15 jigs for deeper water trials.

As more trials were completed and different machine and knot configurations were explored, the number of line snags and entanglements seemed to decrease. Oftentimes, the machines ran quite smoothly for hours straight, requiring very little oversight. Thus, very few crew would be needed to monitor the jigs running overnight once the machines and lines were set up for the night. Although only up to two machines were running at one time throughout the project period, the CFRF staff could envision many more machines running at once without interruption given that there was more space available on deck. Ultimately, factors like fishing location, sea state, fishing depth, and bottom type should be taken into consideration when designing the jig line setup and machine configurations.

### **At Sea Trials**

At-sea trials were conducted from May – August 2021 and May – October 2022. Locations were chosen based on squid reports from and the fishing schedules of participating vessels, other commercial vessels, and recreational fishermen (Figure 11). Bottom depths at these locations ranged from 20 ft to 525 ft with jigging depths ranging from 13.5 to 250 ft.

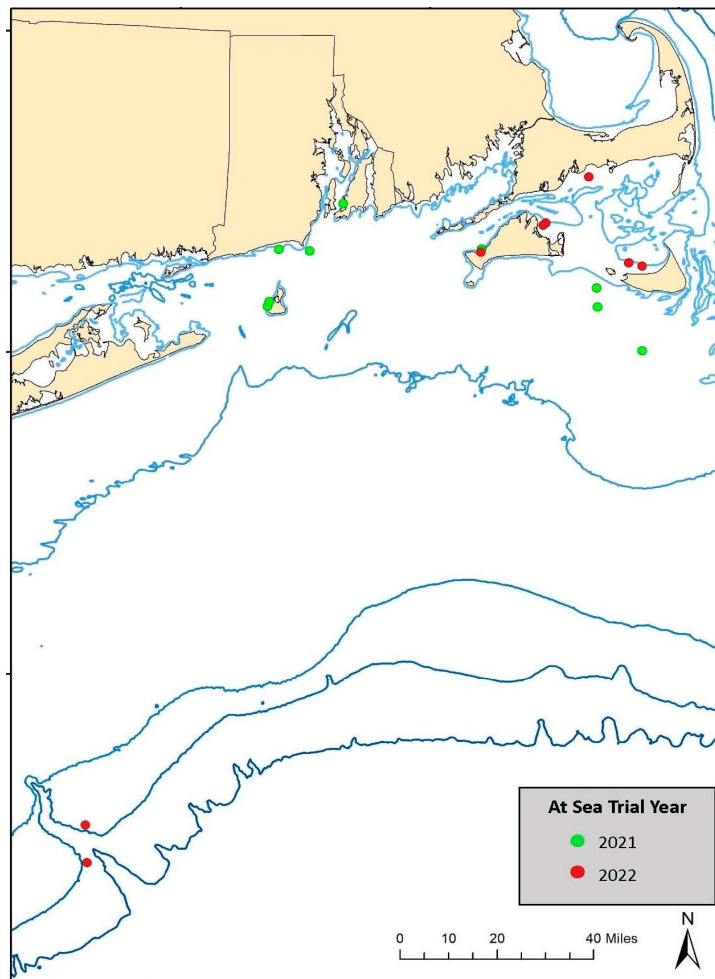


Figure 11: Map of 2021 (green circle) and 2022 (red circle) at-sea trial locations for testing automatic squid jigging machines.

### *F/V Miss Edi Trials, 2021*

The project team completed five at-sea gear trial days on the F/V Miss Edi in 2021. All jigging trials were completed overnight between the hours of 7:00 PM and 5:00 AM. The first and most successful trip throughout the project was conducted on May 19th. The F/V Miss Edi steamed to an area called Nebraska Shoal which is just off the south coast of Rhode Island (Figure 11). This trial area was selected due to communication with the local recreational and charter squid jigging fishermen. The F/V Miss Edi arrived at approximately 7:00 PM and anchored at a depth of 25 ft. There were a handful of recreational and charter vessels already at Nebraska Shoal jigging for squid with handlines. A string of 150-watt construction utility lights were strung underneath the chutes mounted off the stern. The jigging lines were attached to the main line and 24 oz lead sinkers were hitched to the end of the weighted line. Both jigging lines had 17 jigs spaced approximately 18 inches apart. Squid jigs were red, umbrella style, barbless jigs (Figure 1). The squid jigs were barbless to allow the squid to be easily released from the jig and dropped into the vessel. However, one jigging line had each jig tied directly in line with the clinch knots as described in the Operation and Training section, and the other jigging line had each jig hitched onto the jigging line via a drop loop knot. The machine with the jigs tied directly in line, was set to drop to 20 ft with no depth reduction and no jigging motion added. Once the first machine was up and running, the second machine was set up with the drop loop jigging line. However, it was quickly realized upon starting the second machine that the jigging line with the jigs hitched via drop loop knots was inadequate. The jigs had too much free motion and would tangle in the jigging line constantly. The machine with the jigging line with the hitched jigs was then stopped and trials proceeded with just the first machine for the rest of the evening.

Squid were seen sporadically on the surface around the vessel and shortly after the first squid appeared, the jigging machine caught the first squid of the night. The machine was left to operate on its own with the CFRF lead biologist and crew of the F/V Miss Edi paying attention to stop it and free the occasional tangle in the line. Due to the relatively shallow water, the jigging line would occasionally get caught on the bottom. The retrieve speed of the reel was lowered from 150 RPM to 90 RPM as a couple squid were witnessed losing tentacles as the jigging line was brought out of the water likely due to it being retrieved to the surface too quickly. The speed adjustment seemed appropriate, as the squid catch became more consistent shortly after. In total, 101 longfin squid were caught weighing 13.96 kg for the night from the one machine. Mantle length and individual weights were recorded for every squid caught with the squid ranging in size from 13 - 32 cm mantle length and 80 - 300 grams. The average mantle length and weight was 23 cm and 138 grams, respectively.

Initially, the project team intended to target at-sea trials on either side of the new moon. As gear trials continued, and to allow for some flexibility from the work plan, the project team agreed to extend the window to between the last quarter and first quarter of the moon phase each month. The project team continued to target Nebraska Shoals, areas around inside Narragansett Bay including Goat Island, the west coast of Block Island, the southeast of Point Judith lighthouse, and the west passage off of the southeast tip of Point Judith.

After the first trip's success, the following three trips did not catch or observe any squid at the surface. On the fourth trip, the lighting on the gallus frame for the trawl was turned outboard and shined over the jigging machine chutes in addition to the string of construction lights. However, this did not seem to help attract any squid to the machines or surface. The jigging machines were set up as previously described from the first night, 17 jigs spaced approximately

18 inches apart, but both jigging lines had the jigs tied directly in line. Various machine settings were tested, one jigging machine was set to fish closer to the bottom and the second machine was programmed with a depth reduction feature. The intent of fishing with a depth reduction is to pull the squid off the bottom, closer to the surface, to allow for faster retrieval of the jigs and therefore high catch rates. On each drop, the maximum depth was reduced by 1 or 2 ft until the machine was fishing at the minimum depth set (minimum depth ranging from 20 - 34 ft).

At-sea trials were put on pause due to poor results and lack of squid abundance. The project team decided to wait until squid catch rates across the fleet rose significantly. The project team decided to schedule any upcoming trips if catch rates/observed abundances of squid were high. Moon phase would be taken into account, but if catch rates from trawl gear were very high, a trip would still be scheduled even if the moon phase wasn't ideal. The project team obtained a new lighting system to test alongside the vessel's deck lighting to better attract squid. The system included 2-high powered LED lanterns, each producing 18,000 Lumens and two strings of portable construction lighting with 10, 150-watt LED lights. In total, the lighting system was providing about 80,000 additional lumens.

In the beginning of August, recreational reports started to come in of increasing catches at popular locations such as Goat Island and off of Block Island. Further, the F/V Miss Edi reported catching substantially more squid in their day-time trawls compared to the month prior. On August 11<sup>th</sup>, the F/V Miss Edi set out to complete their fifth at-sea trial. The plan was to target locations the vessel had trawled earlier in the day where they had success catching squid. All of the locations were inside of Narragansett Bay, from just north of the Jamestown bridge in the west passage. Depths varied between 25 ft and 65 ft. Jigs were deployed as described previously; depth reduction patterns were applied at locations deeper than 40 ft. Both the F/V's deck lights and the lighting system were powered on and positioned appropriately. Squid were quickly observed around the vessel and in fairly large numbers, and the schools of squid witnessed were probably the largest to date from all at-sea trials.

Squid were present around the vessel at all locations throughout the entire night. Unfortunately, only 17 squid were caught, sporadically. The jigs were in operation for 7 hours and squid was visibly observed on the surface the entire time. It is important to note, since squid were in such high abundance and observable for the entire night, the lack of catch did not appear to be related to jig malfunction/inability to hook the squid but rather appeared to be possibly a behavioral trait. In previous nights, when squid was observed around the vessel, even in low abundances, squid were observed actively pursuing the jigs. On this gear trial, however, the squid were schooled around the vessel but were not actively pursuing the jigs. Anecdotally, the squid observed schooling around the vessel appeared to be quite large and the few squid caught by the jigs were significantly smaller (9 – 19 cm) than the squid visible on the surface.

#### *F/V Matti and Maren, 2021*

After the third at sea gear trial night on the F/V Miss Edi, the project team discussed possibly deviating from the proposed work schedule and preparing the F/V Mattie and Maren for jigging trials. This was in response to the previous two nights of gear trials ending up with no squid caught. Further, the project team decided it was best to go when the squid were abundant rather than continue waiting for the moon phase we identified as being optimal. Since the automatic squid jigging fishery is new to this area, it is unknown what types of compounding factors (e.g. water clarity, sea state, cloud cover, etc.) may influence nighttime light levels in the

water. After returning from a fairly high catch squid trip on the 20th of June, the CFRF and F/V Mattie and Maren left for the first multi-day trip on the 23<sup>rd</sup>.

Anchoring in areas south of Nantucket, all fishing was conducted between 7:00 pm and 4:00 am. The F/V Mattie and Maren was equipped with a string of 150-watt construction lights and, initially, both jigs were set up identically with 30 jigs per jigging line spaced an average of 14 inches apart. Both jigs were set to start fishing with a 2-foot depth reduction per drop until a minimum fished depth of 20 ft. However, because the jigging line double-backed the width of the vessel, nearly half of the jigging rig was not being submerged in the water column when the jigging program reached the minimum depth of 20 ft. Further, the jigs would regularly get caught on the port side mounted rollers that the line would pass through, likely because the diameter of the roller was too small for the jigs to reliably make a 180-degree turn.

As a result, the jigging lines were cut in half so each was equal to the width of the vessel, preventing the jigging lines from double-backing through the portside roller to the jigging machine reel. This was done to ensure that gear was not lost in the event that the jigs got caught on the roller. Since the jigging line is relatively light at only 40-pound test and the retrieval speed was still quite fast at 90 RPM, it was common for the line to snap if the jigs became caught on something. Shortening of the jigging line remedied this issue and it continued to be operated without issue. Unfortunately, no squid were observed on the surface and no squid were caught.

The next night, the machines were set up with 15 jigs spaced 14 inches apart. One jigging machine was set to fish with a 2-foot depth reduction until a minimum depth ranging between 20 and 40 ft was reached. The second machine was set to run as the multiple jigging program. In the multiple jigging program, the jigging line is lowered to the maximum programmed depth, raised by a programmed number of feet, and then lowered back down to the maximum depth, resulting in what is referred to as a “jig.” The length of the “jig” is the height that the jigging line is raised in the water column prior to being dropped back to the maximum depth, and the number of “jigs” is how many times this process is repeated prior to the entire jigging line being retrieved to the surface or zero point. Similarly, a depth reduction can be added that reduces the maximum depth by a set amount of feet after each retrieval to the zero point. Again, no squid were witnessed on the surface or caught.

The third night of fishing, the F/V Mattie and Maren moved a little farther south than the previous nights. One machine was operating in the standard jigging mode and the other in the multiple jigging mode. The multiple jigging mode was slightly modified to only repeat the 10-foot “jig” once instead of twice per drop as was done the previous night. Shortly after commencing the jigging trials for the evening, squid were observed off the starboard side of the vessel. Even though very few squid were observed, the jigging machines managed to catch 4 squid—two from each machine. The squid were fairly large with the smallest having a mantle length of 26 cm and total weight of 145 grams and the largest a mantle length of 33 cm and weighing in at 323 grams. However, after midnight, no squid were observed around the vessel and no squid were caught.

On the final night of jigging trials, the F/V Mattie and Maren began steaming back to the west in the afternoon. The goal was to attempt jigging closer inshore near Martha’s Vineyard in an area that was productive earlier in the spring. The vessel anchored outside of Menemsha, an area on the southwest side of Martha’s Vineyard. Despite being two days after the full moon, that night was the only clear night of the trip and was by far the brightest night. The jigging set up was altered slightly from the previous night. Again, one machine ran the standard jigging program and the second ran the multiple jigging program with one 10-foot “jig”. However, the

jigging line on the standard jigging machine was altered and the distance between jigs was increased from 14 inches, on average, to 24 inches. This was done to be closer to the “industry standard” of one meter in the Japanese automatic squid jigging fishery. Further, additional weight was added to each line as the current was moving much faster than the previous nights and was pulling the lines underneath the vessel. The lines ended up dropping much more vertically when the weight was increased from 24 ounces to 36 ounces.

Squid were observed around the vessel almost immediately upon starting the jigging machines and in fairly large numbers. The schools of squid observed were substantially larger than observed any prior night of the project. The first squid was caught on the standard jigging machine with the lengthened jigging line. Throughout the night, 14 squid were caught. The smallest squid was 21 cm mantle length weighing 103 grams and the largest was 34 cm mantle length weighing 347 grams.

### *F/V Miss Edi Trials, 2022*

The project team intended for the gear setup to be completed on the F/V Miss Edi in time to conduct gear trials in the early season Vineyard Sound fishery. This time period was missed last year due to gear delivery delays and extensive setup required. The CFRF was in contact with the F/V Miss Edi throughout the spring to monitor conditions in Vineyard Sound and schedule vessel setup. The F/V Miss Edi was fully set up with the squid jigging gear at the end of April, just prior to the Sound fishery beginning for the season. Once set up, the CFRF maintained constant contact with the F/V Miss Edi to schedule the first trip of the season once squid catch picked up in the Sound. The F/V Miss Edi completed one trip to the Sound after gear setup was completed and noted fair catch rates of squid. The CFRF and crew of the F/V Miss Edi monitored catch reports from other commercial vessels and online through recreational fishing/squid jigging forums and Facebook groups for indication that squid catch was increasing in the Sound. A multi-day trip was scheduled with the F/V Miss Edi to complete the remaining days in the Sound Fishery from May 4<sup>th</sup> through May 6<sup>th</sup>, anchoring on the northern edge of Collier Ledge and off the southern end of Oaks Bluff, MA.

To begin jigging trials, one machine was set up with the same jigging rig as the previous trials last summer except with slightly reduced jig spacing. On average, jigs were spaced about 15 inches apart. The reduced jig spacing was to allow for more jigs per rig to enter the water as the depth was quite shallow at 6.7 m. The second machine was set up in a similar fashion, with the reduced spacing, however the newly purchased mackerel jigs were used (Figure 6). The jigs were the same umbrella style, barbless, squid jigs except were entirely white and luminescent and measured 11 cm in length instead of 9.5 cm. Both jigging lines were weighted with 24 ounces of lead.

Trials were started earlier than in previous trips due to the number of recreational boats in the area actively jigging and catching squid. Both jigging lines were deployed at 4:30 PM. Further, due to the relatively shallow water, jigging for squid off the bottom would be easier than on previous trips to deeper locations. Both machines were programmed to drop to just off the bottom at 20 ft. The machine with all red jigs was programmed to have one extra ‘jig’ of 1.5 m before returning to the surface. In practice, this meant the line was released to a depth of 20 ft, then be retrieved 1.5 m to a depth of 4.5 m, then released back to 20 ft deep after which it was hauled back to the surface. Shortly before sundown, at 7:30 PM, the machines were briefly paused and the lights on the stern of the vessel were turned on. Up until this point only 2 squid had been caught, both coming from the machine with the red jigs. The jigs were left to run



throughout the entirety of the night and did so without any issue or snags. Despite the jigs operating throughout the night without issue only 10 squid were caught, evenly split between both machines. Further, despite the use of the high-powered LED lights at the stern of the vessel, squid were never observed in high abundance around the vessel. The water around the vessel was periodically checked throughout the night for aggregations of squid, and although visibly present on the surface, squid were never observed in numbers greater than a dozen at any one time.

On May 6th, the F/V Miss Edi's final at-sea day, the project team took a slightly different approach than the night prior as no other vessels were in the area jigging for squid. Instead of starting the machines right away, the lights were set up prior to sundown at 6:00 PM and left on to attract squid to the vessel prior to starting the machines. Squid were observed around the vessel on the surface shortly after turning on the lights and well before sunset at 7:15 PM. Once squid were observed on the surface the machines were set up and jigging began at 7:20 PM. The same jigging rigs from the previous night were used and both machines were set with a straight drop and retrieve pattern to 7.6 m, no extra 'jigs' were programmed on either machine. The first squid were caught shortly after the machines started at 7:35 PM and squid were quickly observed around the vessel in greater abundance than the night prior. The machines were left to jig on their own, uninterrupted, and without issue throughout the night. Machines were checked occasionally throughout the evening and any squid on deck were placed in baskets under the respective chute/machine the squid was caught from. Throughout the entire night of jigging, the two machines using red jigs caught a total of 43 squid ranging from 20 – 36 cm.

#### *Mattie and Maren, 2022*

There was a fall trip planned in September. However, the trip was canceled just prior to departure as the captain tested positive for COVID-19 and was unable to fish for an extended period of time during recovery. As a result, the vessel was taken out of the water for maintenance while it wasn't fishing. The plan was then to attempt one last trip with the F/V Mattie and Maren at the end of the fall fishery if catch rates were good on the vessel's first trip after maintenance. The F/V Mattie and Maren was back in the water and ready to fish at the end of October. Unfortunately, on one of the first trips back, the vessel caught fire and sank off of Block Island. Luckily, nobody was harmed in the sinking and all crew were safely rescued by the Coast Guard.

#### *F/V Hadley Ruth, Spring 2022*

This trip was supported with funding from the Mid-Atlantic Fisheries Management Council. The F/V Hadley Ruth was chosen to replace the F/V Mattie and Maren as it was run by the same captain and crew. The F/V Hadley Ruth set out for their first trip on June 5, 2022, anchoring off Oak Bluffs, MA. Set up took a little bit of time as it was the first time setting up the electrical wires on the new boat. Two jigging machines and two high powered LED lanterns, each producing 18,000 Lumens and two strings of portable construction lighting with 10, 150-watt LED lights were set up on the F/V Hadley Ruth. One machine had a rig of seven red jigs and was running the Mackerel and Squid Fishing Program set to drop to a depth of 4.8 m. The second machine had a rig of seven glow-in-the-dark jigs running the Mackerel and Squid Fishing Program set to drop 16 ft with the Depth Reduction of 0 – 4 ft throughout the night. The machine with the red jigs performed slightly better, catching four out of the five squid caught. The jig machines seemed to be a little slow on the retrieval of the rig lines causing the rig line to bounce up and down out of the water. The glow-in-the-dark jigs are slightly longer than the red jigs and

couldn't breach the wheel as smoothly. A total of five squid were caught ranging in size from 12 – 25 cm mantle length.

The F/V Hadley Ruth then moved on to anchor in the Nantucket Sound on the second night of the trip. To counteract the slightly slow retrieval time, the following settings were adjusted: the Jig Soft Start function was increased from one to four seconds to allow the rig more time on the bottom before hauling up, and the Jig Speed and the Drag settings were increased to create faster and more smooth retrievals as the pull of the tide became stronger. One machine had a rig of seven red jigs and was running the Mackerel and Squid Fishing Program set to drop to a depth of 6.7 m, had a haul speed of 50 – 60 rpm, and 5 – 15% drag added. The percent drag was increased as the tide became stronger around 1:00 am. The second machine had a rig of seven glow-in-the-dark jigs running the Mackerel and Squid Fishing Program set to drop 22 ft, 60 – 70 rpm, and 10 – 30% drag added. Squid were visible on the surface and the two machines caught roughly the same amount of squid. A total of ten squid were caught ranging from 15 – 30 cm mantle length. In addition to squid, the first machine caught one female lady crab with a carapace width of 55 mm.

The third night of the trip, June 7<sup>th</sup>, was the most successful of the multi-day trip. The F/V Hadley Ruth anchored in the Nantucket Sound but the boat was left idling overnight because of the strong winds from a storm. The depth was around 3.9 fathoms and the machines were run for a total of 4 hours. A total of thirty-two squid were caught ranging from 11 – 28 cm mantle length. Three of these squid were hooked but did not make it over the wheel to be measured. Both machines had the same settings: seven red jigs per jig, 18 – 22 ft depth (one rig was slightly longer than the other), 20% drag added, a soft start of 4 seconds with a haul speed of 50 rpm. The first machine set up caught seven squid in the first five minutes of running. Surprisingly, squid were not very visible at the surface throughout the night.

The last night of the trip, the F/V Miss Edi anchored in the Menemsha Bight, where the depth was around 7.1 m. Both jig machines had the same settings: seven red jigs per jig, 18 – 20 ft depth (one rig was slightly longer than the other), 20% drag added, a soft start of 4 seconds with a haul speed of 50 rpm. One rig was lost around 1:07am and was replaced with a rig of seven jigs alternating between red and glow-in-the-dark. A total of five squid were caught ranging from 8 – 19 cm mantle length, four squid caught by the all-red rig and one squid caught by the alternating red-white rig.

#### *F/V Hadley Ruth Fall 2022*

The final at-sea trials were conducted on the F/V Hadley Ruth. On October 24, 2022 the F/V Hadley Ruth steamed to Hudson Canyon overnight to begin trawling and jigging the following day. There was a heavy fog present all day in the trawled area that lingered throughout the entire evening as well. The vessel laid up to drift throughout the night at the north end of the trawls completed along the west wall of Hudson Canyon in approximately 145 meters (m) depth. Two machines were set, one machine used exclusively white jigs with standard spacing (15 jigs each 24 inches apart) and the other used alternating white and red jigs with standard spacing. The machines were set to drop to 100 ft and perform two-10 ft jigs with a depth reduction of 5 ft to a minimum depth of 30 ft. Machines ran uninterrupted throughout the night. Squid were observed on the surface around midnight, in limited abundance, and shortly thereafter a pod of dolphins began circling the vessel – actively hunting the squid. Two squid were caught prior to the dolphins arriving, none were caught afterward.

The last night of at-sea trials, on October 26, the heavy fog from the previous night was still present in the area. The vessel laid up to drift for the night in approximately 160 m depth. Jigs and lights were set up in the same manner as the previous night. Initial target depth was set substantially deeper than ever before to 250 ft, with a depth reduction of 5 ft, two-25 ft jigs, and a minimum target depth of 50 ft. Squid were present around the vessel soon after jigging began and two squid were caught immediately after being identified on the surface. Unfortunately, dolphins showed up once again and circled around the boat throughout the night, feeding on the squid at the surface. Only one more squid was caught the entire night. A total of 5 squid were caught over the two nights, 12 – 20 cm in size.

### **Squid Catch**

In total the jigging machines were operated for a total of 109 hours and a total of 246 squid and two lady crabs were caught. The catch totals and other factors described in the “At Sea Trial” section for each trip is summarized in Appendix 1. No comparisons were made between squid and bycatch rates between jigging, coinciding daytime trawling, or federal observer data from Town Dock or collaborating vessels. Due to the low catch in the jigging trials these comparisons would have been at best informative and at worst potentially miss leading.

### **Squid Quality**

The quality of squid caught was anecdotally evaluated by the CFRF staff and vessel crew members. Participants noted that the squid caught from the jigs were nice and colorful when compared to the squid that were crushed and dragged in the trawls. Fishermen also noted that the squid caught on jigs seemed to be larger, overall, than squid caught in their trawls previously during the day. However, no direct quality comparisons were made between jig caught squid and trawl caught squid due to the discrepancy in catch size (10’s or less compared to thousands).

On the last multiday trip aboard the F/V Hadley Ruth, the landed squid were brought to The Town Dock to be evaluated. The Town Dock is a market leader in foodservice and retail calamari, with a dedicated fleet of fishing vessels, local fishermen, and global suppliers. Project PI and The Town Dock Fleet Manager, Mike Roderick, evaluated the squid based on size, color, thickness, odor, and overall appearance (Figure 12). Squid were evaluated on a grading scale: 1 – Excellent, 2 – Good, 3 – Fair, and 4 – Poor. The jig caught squid presented to The Town Dock overall were given a Quality Rating of 2 – Good.



Figure12: Longfin squid brought to The Town Dock for evaluation. Squid were given a Quality Rating of 2 – Good.

### **Estimated start-up and operational costs**

The estimated start up and operational costs were documented throughout the project (Table 1). The main costs included the jigging machines and squid fishing kits, lights, and mounting/welding for installation. The cost of each jigging machine and accompanied squid fishing kit totaled \$3,828.11. The grand total of squid jigging equipment and installation costs per vessel were estimated to be \$5,178.11. Installation and custom welding varied slightly by vessel but was average to \$950.00 per vessel. This cost can be considerably reduced if wooden platforms are used. Miscellaneous and indirect costs included power tools for installation of gear on vessels, washers/bolts/nails, wood, etc. Please refer to Table 1 for a detailed breakdown of squid jigging equipment per vessel. The operational costs were low. All jigging was done with the vessel anchored or drifting. Very few jigging lines were lost, especially after initial sea days

Table 1: Break down of gear costs of automatic squid jigging.

<b>Product/Description</b>	<b>Cost</b>
Belitronic BJ5000EX Jigging Machine	\$2,677.50
Belitronic Pole, 401 x 4 x 1200 mm	\$36.00
Belitronic Base for Pole	\$89.61
Mackerel roller/top wheel, 240 mm	\$97.00
Gaski Squid Aluminum Chute with supports and hardware	\$295.00
Belitronic Special Wheel Kit for Squid (includes spool)	\$350.00
Squid Jigs, 9.5 cm Red	\$8.00
Monofilament 5 lb. spool 200 test, 01.4 dia	\$265.00
Fipex Weight, 6 lb. 14"	\$10.00
Lighting System 2-high powered LED lanterns, each producing 18,000 Lumens and two strings of portable construction lighting with 10, 150-watt LED lights	\$400.00
Installation (Welding)	\$950.00
<b>Total</b>	<b>\$5,178.11</b>

### **Dissemination of Project Results**

The project team has maintained a [project website](#) throughout the project which featured a general overview of the project as well as updates as the project progressed. Communication with fishermen, seafood wholesalers and processors who are both directly involved with the project as well as those with general interest in the project was also maintained throughout all phases of the project. Articles and announcements on the project's progress were featured in the [CFRF November 2020](#), [November 2021](#), and [March 2023 newsletters](#) (Appendix 2). The project title and a link to the project website were included in all CFRF newsletters between November 2020 and March 2023. CFRF's newsletter reaches over 1,500 individuals involved in the fisheries/seafood system. Posts about the project were also made on CFRF Instagram, Twitter, and Facebook which have over 200, 315, and 1,900 followers, respectively. The four Facebook posts were viewed 2,513 times with about 215 engagements.

CFRF staff announced a workshop meeting that was held at CFRF on December 29, 2022 (Appendix 2). The project team presented a summary of the project methodology and results to interested fishermen and industry partners. The vessel captains, Clarke and John Resposa and one of the crewmembers from the F/V Miss Edi were in attendance. The presentation has been made available on the CFRF project website: “[Piloting a Low-Bycatch Commercial Squid Jig Fishery in Southern New England](#)”. There was a total of seventeen participants in attendance in person and virtually, twelve of which were commercial fishermen. There was ample interest and enthusiasm for the project despite the low levels of squid catch throughout the project period. The overwhelming majority agreed that more at-sea trials were required to better understand how to best utilize this gear in the area. Several suggestions came about from the fishermen to increase participation in trialing the jigging machines including: a machine loaning type program, a federally or state funded program in which machines could be purchased at low cost, and, a competition-type program that would provide prize money to vessel who can contribute significantly to fine-tuning the use of these machines.

In fact, there has been so much interest about a machine loaning program that the CFRF has been working on securing funds to initiate such a program. This program would allow interested fishermen to borrow the CFRF’s automatic squid jigging equipment to further test these machines, recording information about jigging machine settings and configurations used, methodology, environmental factors, and catch. The CFRF already has a waiting list of three fishing vessels eager to participate.

The project team also presented “[Lessons Learned -Piloting an Automatic Squid Jigging Machine in Southern New England](#)” at the Mid-Atlantic Fisheries Management Council Meeting (MAFMC) held February 7, 2023 (Appendix 2). This presentation highlighted the reasoning behind testing a new type of squid fishing gear, the steps taken to operate automatic jigs, project results, including the extensive regional interest in automatic squid jigging gear.

Pending positive project results, the CFRF had originally planned to develop an operational manual for a commercial squid jig fishery, including gear lists and prices (Table 1), schematics of installation and operation, expected outputs (squid catch rates) and benefits (bycatch rates), and feedback from the fishermen involved in piloting the gear. However, due to the substantial operational learning curve, the project team concluded more at-sea trials are required to produce and distribute an operational manual. The CFRF worked with students from the Rhode Island School of Design to create an informational video that is available on the CFRF project page ([Piloting Automatic Squid Jigging Project Video](#)) which highlighted the installation process and provided a summary of trialing automatic squid jigging machines. Also available on the project webpage is a document featuring photos of the varying jig machine setups on the different participating vessels (Appendix 2).

## **Conclusions**

Over the course of this project, the jigging machines were operated for a total of 109 hours and a total of 246 squid and two lady crabs were caught. Due to the very low levels of squid caught by the jigging machines during at-sea trials, the project team was unable to calculate some of the anticipated results. Namely, the project team was unable to compare catch rates and species composition of catch to the commercial daytime trawling and to federal observer data. Also, there was no thorough comparison of squid meat quality comparing trawl-caught and jig-caught squid due to the low volume of jig harvest. At the conclusion of the project period, the project team was also unable to provide a thorough set of recommendations and

provide a “how-to” guide to the fishing industry on best practices and applications for automatic squid jigging in Southern New England squid fisheries. There was a significant amount of time and energy invested in getting the jig machines up and running smoothly. Once there was a better handle on the machines, then came the complicated process of trying to grasp an understanding of the potential environmental, logistical, and squid behavioral factors in the allotted days at sea.

Simply stated, there needs to be substantially more time spent on the water and more involvement from both the commercial and recreational fishing industries to fully realize the operability of this fishing gear in the area. The sampling design of chartering commercial trawling vessels so that the jig machines could operate at night is believed to have been a more restrictive factor than initially intended. Additionally, it is believed that participating in knowledge exchange exercises with members of international automatic squid jigging fisheries could drastically improve the outcomes of the gear trials. The timing of the multi-day trips were heavily influenced by local commercial fishing conditions which may not be optimal for nighttime jigging. It was difficult to balance long steam times with maximizing nighttime jigging hours within the allotted budget. Perhaps chartering shorter, closer inshore recreational boats would have allowed more frequent testing of the gear, albeit the commercial comparison component would be absent.

On a positive note, the project team received a lot of feedback from the fishing industry and other stakeholders and scientists when the project results were disseminated. The commercial fishing industry members still see promising results with this gear in the future that could have a positive impact on local fisheries in terms of diversifying fishing portfolios and creating new or better access to fishing habitats that are currently off limits to squid fishing by trawling (e.g. area closures, crowded fishing grounds, and offshore windfarm turbine areas). The CFRF has been working on several research initiatives to keep collaborating with members of the fishing community and continue to test this gear in Southern New England.

## Appendix 2: Summary information for each squid jigging trial day

Vessel	Date	Squid Caught	Weight (kg)	Total Hours of Jigging	Number of Jig Machines	Catch Rate (number/hr)	Mantle length Range (cm)	Weight Range (g)	Bycatch Species	Jig Depth Range (ft)	Bottom Depth (ft)	Squid Present at Surface	Location	Extra Lighting
Miss Edi	5/19/2021	101	13.96	3	1	33.67	13 - 32	80 - 300	0	20	25	Yes	Nebraska Shoal	String of 150-watt construction light
Miss Edi	6/3/2021	0	0	7.5	2	0	0	0	0	20	20	No	North Goat Island	Same as previous
Miss Edi	6/10/2021	0	0	8	2	0	0	0	0	34 - 60	37, 45, 70	No	West side of Block Island, moved to	Same as previous
Mattie and Maren	6/23/2021	0	0	8	2	0.00	0	0	1 lady crab	20 - 40	55	No	South of Nantucket	Same as previous
Mattie and Maren	6/24/2021	0	0	8.5	2	0.00	0	0	0	40 - 76	85	No	South of Nantucket	Same as previous
Mattie and Maren	6/25/2021	4	0.986	7.75	2	0.26	26 - 33	145 - 323	0	40 - 76	90	Yes, part of the night	South of Nantucket, little more south	Same as previous
Mattie and Maren	6/26/2021	14	3.064	7.25	2	0.97	21 - 34	103 - 347	0		55	Intermittently	Outside Menemsha	Same as previous
Miss Edi	7/7/2021	0	0	8	2	0	0	0	0	35 - 70	60, 80	No	Outside Block Island Harbor, farther inside of Narragansett Bay, from just North of the Jamestown Bridge in the West Passage to off the Southeast tip	2-high powered LED lanterns, each producing 18,000 Lumens and two strings of portable construction lighting with 10, 150-watt LED lights
Miss Edi	8/11/2021	17		7	2	1.21	9 -19cm		0		25 - 65	Yes, entire night	West Passage to off the Southeast tip	Same as previous
Miss Edi	5/5/2022	10	2.693	11.30	2	0.44	27-33	224 - 317	0	13.5 - 20		Yes	Collier Ledge	Same as previous
Miss Edi	5/6/2022	43	9.634	8.17	2	2.63	20-36	101 - 367	0			Yes	Southern end of Oaks Bluff	Same as previous
Hadley Ruth	6/5/2022	5		4	2	0.63	14 - 25		0	14 - 16	20.4	Yes	Oaks Bluff	Same as previous
Hadley Ruth	6/6/2022	10		4	2	1.25	15 - 30		1 lady crab	21 - 22	27	Yes	Nantucket Sound	Same as previous
Hadley Ruth	6/7/2022	32		4	2	4.00	11 - 28		0	18 - 22	23.4	Intermittently	Nantucket Sound	Same as previous
Hadley Ruth	6/8/2022	5		4.17	2	0.60	8 - 19		0	18 - 20	23.3	Yes, later in night	Menemsha Bight	Same as previous
Hadley Ruth	10/25/2022	2	*0.658	7.5	2	0.13	*12 - 20cm		0	30 -100	475.6	Yes	Hudson Canyon	Same as previous
Hadley Ruth	10/26/2022	3	*0.658	7.5	2	0.20	*12 - 20cm		0	50 - 250	524.8	Yes	Hudson Canyon	Same as previous

**Notes**

Blank cells represent missing or unavailable data.

\*Weight and mantle length range were averaged over the two days of fishing 10/25/22 - 10/26/22.

# Appendix 2: Outreach Documents



## CFRF NEWSLETTER

November 2020

ISSUE 13

### COMMERCIAL FISHERIES RESEARCH FOUNDATION

*The Commercial Fisheries Research Foundation is a non-profit, private research foundation founded and directed by members of the commercial fishing industry. The CFRF's primary mission is to conduct collaborative research and education projects that assist in the achievement of sustainable fisheries and vibrant fishing communities.*

#### MESSAGE CORNER:

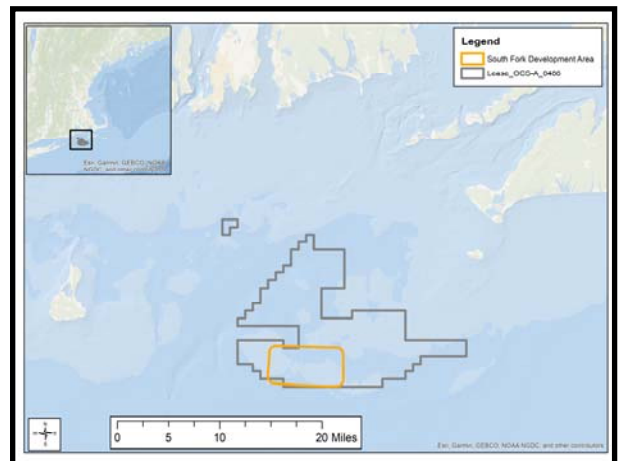
This year has been the most challenging and demanding year in many of our life times as we navigate through this unprecedented Pandemic. A true test of survival, literally, as fishermen struggle to preserve their businesses and demonstrate once again their resilience; never wavering to stay engaged and committed to collaborate in our research. The CFRF team was amazingly steadfast and compelled to maintain their research efforts for months at home, in the office and out in the field. A true testament of Leadership by Dr. Bethoney and awe-inspiring staff (Terry, Aubrey, Tom & Michael). This allows me to welcome two new researchers to the CFRF staff, Carl Huntsberger, M.Sc and Dr. Susan Inglis, both with years of experience working with industry and science. I am elated to acknowledge CFRF's key new project in 2020; South Fork Wind Farm Fisheries Monitoring. For 2 years CFRF will work with South Fork Wind LLC and local fishermen to conduct pre-construction monitoring surveys in the waters on and around Cox's Ledge. CFRF will be grateful for our growing sense of trust and cooperation among fisheries stakeholders as we progress on this project.

Fred Mattera, CFRF President

#### NEW PROJECT: SOUTH FORK WIND FARM FISHERIES MONITORING

In partnership with local fishermen the CFRF is conducting pre-construction fisheries monitoring surveys of the South Fork Wind Offshore Wind Farm near Cox's Ledge. The South Fork Wind Farm is an offshore wind energy project located in federal waters on the Outer Continental Shelf. It includes up to 15 wind turbine generators, submarine cables between turbines and an offshore substation (see map pictured). Our project aims to collect pre-construction data on 1) the abundance, size structure, and distribution of marine species and 2) oceanographic data that can be used to characterize the conditions in the South Fork Wind Farm lease area and adjacent waters. Monitoring will be conducted using fishing vessels and a suite of survey methods targeting different fish and invertebrate species. Most of the surveys will start in the spring of 2021, but a beam trawl survey was started in October.

The beam trawl survey will help determine the spatial scale of potential impacts on bottom dwelling animals. The beam trawl was designed to match the gear used for the ecosystem survey conducted in this area in 2015 and will be conducted with the same vessel; the F/V Mister G.



Three 20-minute tows in the development and two reference areas are conducted monthly to document the benthic animal diversity, distribution and abundance in each area prior to construction. In addition, we're examining what the commercially important fish species are eating and monitoring the health of scallops. The first trip showed one reference area to be dominated by crabs and skate with a handful of flatfish, while the second reference area was rocky with many small invertebrates and dominated by scallops (pictured). The development area was predominantly little skate, scup and scallops. Stay tuned for more results after a winter of sampling. Visit the CFRF South Fork Wind Farm Fisheries Monitoring website ([www.cfrfoundation.org/south-fork-wind-farm](http://www.cfrfoundation.org/south-fork-wind-farm)) to stay up to date on this survey and others. Funding for this monitoring is provided by South Fork Wind LLC.

Learn more about CFRF at [www.cfrfoundation.org](http://www.cfrfoundation.org)



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## **PROJECT UPDATE: BLACK SEA BASS RESEARCH FLEET**

The Black Sea Bass Research Fleet was able to record catch, effort, and biological data from over 3,500 black sea bass since May and bring the total number sampled by the Fleet since December 2016 to over 26,000! Through the summer, the Research Fleet wrapped up the Sarah K. DeCoizart Charitable Trust funded expanded collection program and, with the help of the Rhode Island Department of Environmental Management, complete the remaining stomach content analysis of the collected black sea bass. Research Fleet members F/V Johnny B, F/V Harvest Moon, F/V Priority Too, and F/V Matrix also assisted in the collection of juvenile black sea bass for genetic analysis by Northeastern University. These accomplishments were made possible by the dedication of the Research Fleet members despite the impacts of COVID-19 on our local fishing communities.



The Research Fleet will continue data collection, with support by the Atlantic Coastal Cooperative Statistics Program, through August of 2021. Currently, the Research Fleet is expanding and looking to bring on additional vessels from Rhode Island and the New Jersey fish pot fishery. If you are interested in applying, visit the project website at [www.cfrfoundation.org/black-sea-bass-fleet](http://www.cfrfoundation.org/black-sea-bass-fleet) to find more information and an application form.

## **PROJECT UPDATE: LOBSTER AND JONAH CRAB RESEARCH FLEET**



The Lobster and Jonah Crab Research Fleet provides year-round biological data and environmental data from lobster and Jonah crab caught on commercial trips. Since our last update in May, the Research Fleet has sampled over 12,063 lobsters and 9,108 Jonah crabs. In total, our fleet has sampled over 161,300 lobsters and 92,990 Jonah crabs since June 2013! Despite COVID-19, this summer CFRF welcomed three offshore vessels to the fleet: F/V Timothy Michael and F/V Endeavour out of Newport, RI and F/V Kristin & Michael out of Portland, ME. CFRF is also excited to announce that in September, the Northeast Fisheries Science Center provided funding to the Atlantic States Marine Fisheries Commission to support the research fleet's work! The CFRF will be working to add additional biological data parameters to our sampling protocols and expand the analysis of our data to further support sustainable management. We will continue to share data with participant fishermen, stock assessment scientists, fishery managers, and regional ocean modelers. Lastly, CFRF staff were excited to be involved in the discussion and present the work our fleet is doing to support the management and sustainability of the Jonah crab fishery at the Pre-Assessment Data Workshop for Jonah Crab. For more information, visit the project website at [www.cfrfoundation.org/jonah-crab-lobster-research-fleet](http://www.cfrfoundation.org/jonah-crab-lobster-research-fleet).

## **PROJECT UPDATE: PILOTING A N-VIRO DREDGE IN THE SOUTHERN NEW ENGLAND SCALLOP FISHERY**

The N-Viro dredge is used in Europe and can potentially reduce bycatch and habitat impacts, while improving fuel efficiency in the U.S. scallop fishery. CFRF staff and participating fishing vessels were busy throughout the summer completing all research trips with the N-Viro dredge on both Limited Access General Category (LAGC) and Limited Access (LA) vessels. The three participating LAGC vessels (F/V Brooke C, F/V Harvest Moon, and F/V Mister G) completed 10 research sampling trips each from February – September 2020; over the course of the 30 total trips, 120 tows were conducted with the N-Viro dredge and 120 tows were conducted with the vessels' own New Bedford style dredges. The F/V Karen Elizabeth completed the LA research sampling trip in July 2020, which consisted of 80 paired tows of the N-Viro dredge and a New Bedford style dredge in open bottom around Cox Ledge and the Nantucket Lightship Access Area.

Preliminary results from both LAGC and LA vessel data show improved fuel efficiency and reduced bycatch rates and habitat impacts for the N-Viro dredge compared to New Bedford style dredges, but reduced scallop catch rates were also observed for the N-Viro dredge. Underwater GoPro video showed scallops avoiding the dredge both under and between the tines and over the top of the bag and twine top; however, there was also video of the dredge successfully avoiding flatfish, rocks, and other large debris on the bottom more efficiently than New Bedford style dredges. CFRF staff are continuing to analyze data to compare the N-Viro and New Bedford style dredges, and participant fishermen have several ideas of how to improve the scallop catch efficiency on the N-Viro dredge while maintaining its positive characteristics. To find out more about the N-Viro dredge, receive updates on an N-Viro dredge workshop, and follow along with project final results, visit the project website at [www.cfrfoundation.org/piloting-novel-dredge-type](http://www.cfrfoundation.org/piloting-novel-dredge-type).



## **PROJECT UPDATE: SHELF RESEARCH FLEET**

The Shelf Research Fleet, in partnership with scientists from Woods Hole Oceanographic Institution (WHOI), collects oceanographic data to better understand how environmental changes may impact the distribution and abundance of key fisheries resources. As of November 1<sup>st</sup>, over 662 salinity, temperature and depth profiles have been collected by the Shelf Research Fleet off the coast of Rhode Island. In the past six months, CFRF welcomed the F/V Finast Kind II and the F/V Stormy Elizabeth to the Research Fleet. In the late summer, oceanographic data displayed some very active intrusions of warm, salty water. During that time, our fishermen reported sightings of Portuguese man o' wars, as well as noted catching many octopus this year. Lastly, Mark Sweitzer, a fleet member of the CFRF/WHOI Shelf Research Fleet, was interviewed by WBUR NPR Boston this summer about his involvement in data collection. While traditional scientific surveys were postponed or canceled this year due to COVID-19, we are grateful to have fishermen still collecting real-time data for our Research Fleets and other scientific groups! More information on the Shelf Research Fleet can be found at [www.cfrfoundation.org/shelf-research-fleet](http://www.cfrfoundation.org/shelf-research-fleet).



## **NEW PROJECT: ASSESSING VULNERABILITY OF THE ATLANTIC SEA SCALLOP SOCIAL-ECOLOGICAL SYSTEM**

The Atlantic sea scallop fishery is worth more than \$500 million per year and Northeast fishing communities are increasing reliance on the fishery. At the same time, the coastal ocean ecosystem of the Northeast is experiencing dynamic changes in temperature, precipitation and ocean acidification. Ocean acidification can potentially require scallops to need more energy to make and grow their shells and impact their metabolism, factors which have potential consequences for the fishery. This project's objective is to determine the vulnerability of the sea scallop fishery, both the scallops and the communities that rely on them, to ocean acidification and temperature changes. We will also investigate ways in which the fishery could become more resilient, specifically testing if a spatially explicit regional projection of changes reflecting scallop fishing areas can inform fishery management. The study relies on a social ecological system vulnerability approach using data from stakeholder workshops, lab experiments, and biological and oceanographic models. Two industry collected data sets from CFRF will be used to evaluate historical simulations. Further, CFRF will organize and facilitate a series of workshops between scientific partners and the fishing community during year of this project. Visit [www.cfrfoundation.org/atlantic-sea-scallop-social-ecological-system](http://www.cfrfoundation.org/atlantic-sea-scallop-social-ecological-system) to find out more. Funding for this project is provided by the NOAA Ocean Acidification Program, partners include the National Marine Fisheries Service, the University of Connecticut, and Rutgers University.



## **NEW PROJECT: PILOTING A LOW-BY-CATCH COMMERCIAL SQUID JIG FISHERY IN SOUTHERN NEW ENGLAND**

In partnership with The Town Dock, CFRF is pleased to announce a new project piloting the use of automatic squid jigging gear. The intent of the project is to investigate the feasibility of automatic squid jigging machinery, used in other large-scale squid fisheries worldwide, in the southern New England Longfin squid fishery. Automatic squid jigging has almost no by-catch, is less expensive to operate than a traditional trawler, and allows vessels to fish in areas inaccessible with trawl gear. Further, jig caught squid can fetch a premium price on the international market. The CFRF and Town Dock will be purchasing automatic squid jigging machinery and installing it on two vessels, a larger trip vessel and a smaller day trip vessel, and undertaking at-sea trials in the spring and summer of 2021. Throughout the project we will be tracking the catch rates, squid quality, operational procedures as well as startup expenses with the aim of developing a "best practices" guide for interested fishermen. Stay tuned to the [CFRF website](http://www.cfrfoundation.org) for further announcements about the project when it officially begins in January 2021! Funding for this project is provided by the NOAA Bycatch Reduction Engineering Program.



## **CFRF BOARD OF DIRECTORS**

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*Commercial Fisheries Center of Rhode Island*

**John Kennedy**  
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**Christopher Roebuck**  
*F/V Karen Elizabeth*  
*F/V Yankee Pride*

**Norbert Stamps**  
*Commercial Lobsterman*

**Mark Sweitzer**  
*F/V Erica Knight*

## **CFRF STAFF**

**N. David Bethoney, PhD**  
Executive Director

**Terry Winneg**  
Business Manager

**Aubrey Ellertson**  
Research Biologist

**Thomas Heimann**  
Research Biologist

**Carl Huntsberger**  
Research Biologist

**Susan Inglis**  
Research Associate

**Michael Long**  
Research Biologist

## **OFFICE LOCATION:**

2<sup>nd</sup> Floor, Building #61B  
Commercial Fisheries Ctr of RI  
East Farm Campus, URI  
Kingston, RI 02881  
**Phone:** (401) 515-4892  
**Fax:** (401) 515-3537

### **MORE ON-GOING PROJECTS:**

- **A Pro-Seafood Climate Action Agenda:** A group of Rhode Island and Massachusetts fishing organizations initiated a process to craft a narrative on climate solutions that places wild seafood production at its core. Contact Mike Roles (mtroles@gmail.com) and Sarah Schumann (schumannsarah@gmail.com) for more information.
- **Development of a Marketable Seafood Product from Scup:** This project is developing a frozen scup fillet product that meets consumer, fisherman, fish processor, and chef needs. More information can be found at [www.cfrfoundation.org/scup-fillet](http://www.cfrfoundation.org/scup-fillet).
- **River Herring Bycatch Avoidance Program:** This project provides area specific information to help fishermen stay under river herring bycatch limits. Information on the this program can be found at [www.umassd.edu/smast/bycatch/](http://www.umassd.edu/smast/bycatch/)
- **Salinity Maximum Intrusions:** This project will map intrusions of warm, salty water that may influence fish distributions in Southern New England. Information on this project can be found at [www.cfrfoundation.org/salinity-max](http://www.cfrfoundation.org/salinity-max)

### **EDUCATION AND OUTREACH:**

- In August, Aubrey Ellertson presented about CFRF's collaborative research fleets and the Northeast Fisheries Observer Program to the Commercial Fisheries Center of Rhode Island Apprenticeship Program trainees.
- In November, Aubrey Ellertson and Michael Long teamed with Fred Mattera from the Commercial Fisheries Center of Rhode Island to share information about CFRF projects and seafood education with 40 students from 38 nations. The students were from the U.S. Naval War College, Naval Command College International Program.
- In November, Carl Huntsberger and Aubrey Ellertson presented at the Atlantic States Marine Fisheries Commission Jonah Crab Pre-Assessment Workshop about Jonah Crab growth and the CFRF Lobster and Jonah Crab Research Fleet.

### **RECENT RELEASES, PUBLICATIONS, AWARDS AND UPCOMING EVENTS:**

- Mark Sweitzer, CFRF Board member and lobsterman, was interviewed by WBUR NPR Boston for the article "[Fishermen and Scientists Join Forces to Track Effects of Climate Change](#)". Visit [www.cfrfoundation.org/news-releases](http://www.cfrfoundation.org/news-releases) to read the article.



## COMMERCIAL FISHERIES RESEARCH FOUNDATION

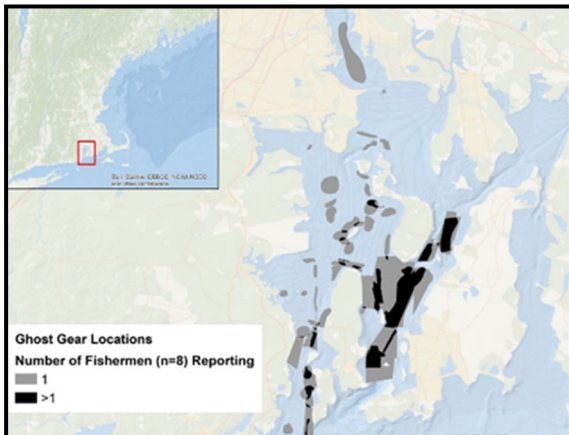
*The Commercial Fisheries Research Foundation is a non-profit, private research foundation founded and directed by members of the commercial fishing industry. The CFRF's primary mission is to conduct collaborative research and education projects that assist in the achievement of sustainable fisheries and vibrant fishing communities.*

### MESSAGE CORNER:

This is the time of year where gratitude and reflection are paramount. The CFRF is fortunate to have a skillful team of researchers. They have allowed us to increase the amount of research and education we are conducting and therefore our impact on the communities we hope to support. We are grateful for all the members of the fishing community who make this research possible through their contributions on land and sea. Our work is also made possible due to collaborations with fishery scientists, managers, and culinary professionals. Thank you all! As I reflect upon this past year, my thoughts go to Norbert Stamps who passed away a few months ago. Norbert was a champion of collaborative research who played a key role in the founding of our Lobster-Crab and Shelf Research Fleets. As a Board member of CFRF, he was never short on new ways for CFRF to pursue its mission. We'll keep working to make Norbert and all of our supporters proud in this upcoming year. Happy holidays to all and make sure you enjoy some local seafood during your celebrations!

Fred Mattera, CFRF President

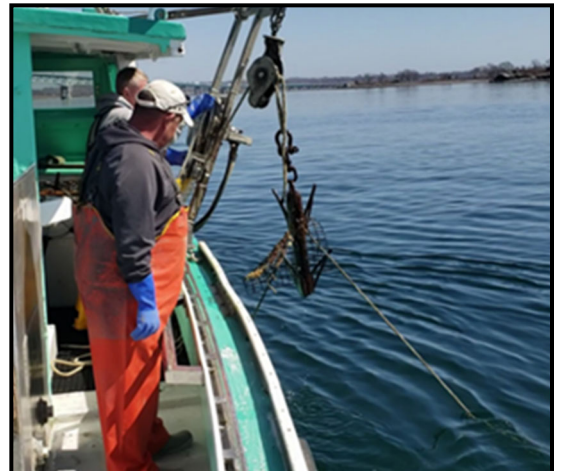
### PROJECT RESULTS: MAPPING HOTSPOTS AND PILOTING UNDERWATER VIDEO TECHNOLOGY



This project tested and confirmed the use of fishermen's knowledge and underwater video as a method to refine ghost gear (discarded or lost fishing gear) locations for removal. A map of ghost gear locations was generated for Narragansett Bay using nautical charts and interviews with eight commercial fishermen that use lobster traps, fish pots or trawl. The map, pictured left, was then used to navigate to ghost gear hotspots during two surveys, one in June aboard the trawler Christopher Andrew and a second in August aboard the lobster vessel Catherine Anne (pictured). Two live-feed camera systems were deployed and evaluated for utility during these surveys. We were able to find ghost gear on the sea floor and learned a lot about ways to improve this approach. To test reproducibility of finding gear identified by camera, we used a waypoint location from the June survey to relocate a ghost gear rope during the August survey. We were successfully able to renavigate to the location. The less expensive GoPro camera system performed the best during the surveys. The survey results were developed into an interactive ghost

gear image map of Narragansett Bay. This map and a video produced by 11th Hour Racing that summarizes the project can be viewed at the [project webpage](#). This project also provided us with an opportunity to network with other organizations working on ghost gear removal both regionally and internationally. We jointly hosted a webinar with the Global Ghost Gear Initiative that brought together local ghost gear removal programs in Maine (Gulf of Maine Lobster Foundation) and Cape Cod (Center for Coastal Studies). Thank you to all the fishermen that helped with this project and the funder, 11th Hour Racing.

The results from this project were key to our next step in ghost gear work; a sustainable plan for its removal from Rhode Island waters. Next month we will begin developing this plan with a Southeast New England Program Watershed grant!



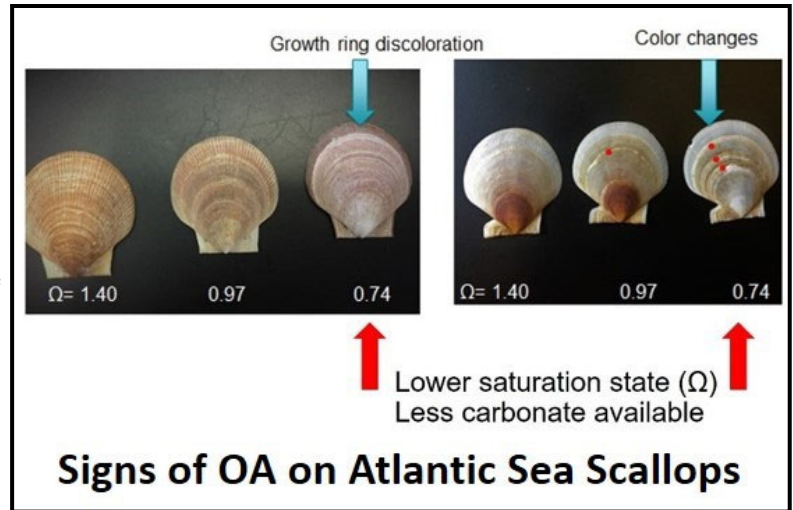
Learn more about CFRF at [www.cfrfoundation.org](http://www.cfrfoundation.org)



Follow us on Facebook!

## **PROJECT UPDATE: ASSESSING THE VULNERABILITY OF THE ATLANTIC SEA SCALLOP SOCIAL-ECOLOGICAL SYSTEM:**

This project's objective is to determine the vulnerability of the sea scallop fishery, both the scallops and the communities that rely on them, to ocean acidification (OA) and temperature changes. A focus of the first year was a set of workshops in New Bedford, MA, Point Judith, RI, and Barnegat Light, NJ to establish interest in the project and create positive partnerships with sea scallop fishermen. We wrapped up our last fishing community workshop for year one of the project earlier this month. The workshops generated lively and constructive discussions that continued on site after the end of their designated times. Although each workshop had some regional differences in comments from the participants, the workshops also revealed some common perceptions on the impact of ocean warming and acidification on the scallop fishery that we will address in year two. Other feedback focused on improving the workshops including increasing the length of the workshops to allow more time for question and answers. Initially we assumed that a shorter workshop would provide a more positive experience for the participants. Further, we will modify the presentations for each workshop to include more local and regional results from the project. Lastly, based on feedback from a pilot workshop, we moved the timing of the workshops this year to late summer early fall and we plan to hold the workshops next year in the late fall period. For more information on this project visit the [webpage here](#). We look forward to updating everyone on the progress of the different project components in next year's workshops.



## **PROJECT UPDATE: DEVELOPMENT OF A MARKETABLE SEAFOOD PRODUCT FROM SCUP**



This project seeks to develop a frozen scup fillet product that meets consumer, fisherman, fish processor, and chef needs. Efforts for this project have largely been on hold since the spring of 2020 due to the Covid-19 pandemic. The project team recently partnered with Chef Joshua Berman of J.B. Cuisine to promote the scup fillet product at the Rhode Island Seafood Festival. CFRF managed a vendor booth at the festival, and 500 free samples of “Crispy Narragansett Bay Scup Tacos” prepared by Chef Berman were distributed to festival attendees. At the booth we also discussed and promoted the project and local sustainable seafood. All patrons gave positive feedback on the scup tacos and indicated that they would be open to buying and cooking scup in the future. Extra frozen scup fillets were donated to the Jonnycake Center Food Pantry in South Kingstown, RI. The project team is now preparing to promote the frozen scup fillet product to a global audience at the Seafood Expo North America in Boston this March. If you'd like to follow along with our scup processing and marketing efforts, visit the CFRF project [webpage here](#).

## **PROJECT UPDATE: PILOTING A LOW-BY-CATCH AUTOMATIC SQUID JIG FISHERY IN SNE**

This project investigates the feasibility of automatic squid jiggging machinery, used in other large-scale squid fisheries worldwide, in the southern New England Longfin squid fishery. We faced initial delays when the jig equipment was caught up in customs on its way over from Sweden. Once the equipment arrived, some quick thinking and working with Champlin Welding was required to make the squid jigs fully operational on both vessels piloting the gear. We completed five at-sea trials aboard our in-shore collaborating vessel, the F/V Miss Edi, between May 19 to August 12. Sampling occurred between the hours of 7:00 pm to 5:00 am in waters off Rhode Island with waning success as spring progressed to summer. We also completed a four-day trip aboard the F/V Mattie and Maren south of Nantucket, MA in late June. The automatic squid jigs ran overnight, similar to the inshore trips. Functionally, the squid jigs ran very smoothly aboard both vessels, however, we had limited success in catching squids. We believe that the squid's summer time reproductive behaviors made them less likely to attack and be caught by our jigs. We will see how this theory pans out as we complete the rest of the at-sea trials in the spring. Check out the project [webpage here](#) for more information and updates. Thanks to our partners at Town Dock and support from the NOAA Bycatch Reduction Engineering Program and the Mid-Atlantic Fishery Management Council.



## **PROJECT UPDATE: SOUTH FORK WIND FARM FISHERIES MONITORING— BEAM TRAWL SURVEY**

Year one of the beam trawl survey was completed this October! The goal of the survey is to help determine potential impacts of wind farm development on bottom dwelling animals. The South Fork Wind Farm development area and two reference areas to the east and west are monitored. The main takeaway from the year one data is that our eastern control area is very different from the impact area and the western control area. The eastern area has a muddy bottom that is dominated by rock crab and little skate, while the other two areas have more hard structure and higher biodiversity. We have also observed some minor seasonal changes particularly with the higher catch of fish during the spring in all areas, more details on the seasonal changes can be viewed on the survey webpage [here](#). A big thank you to the F/V Mister G and all those who participated in year one of the survey. Stay tuned for what the next year will bring!



## **PROJECT UPDATE: SOUTH FORK WIND FARM FISHERIES MONITORING — VENTLESS TRAP SURVEY**

From May through November of 2021, we worked with University of Rhode Island Graduate School of Oceanography students, the F/V Amelia Anne, F/V Ashley Ann II, and F/V Erica Knight out of Point Judith, RI to complete the first year of this survey. The goal of the survey is to assess the seasonal abundance, distribution, movement, and habitat use of lobster and Jonah crab in the South Fork Wind Farm development area and two reference areas to the east and west. Through the first few months of the survey, the wind farm area and western control had relatively low catch rates of lobster, Jonah crab, and rock crab, while the eastern control area was dominated by rock crabs, regularly getting over 100 crabs in each ventless trap. As the survey moved into late summer and fall, the catch rates of all three areas became more comparable with higher catch rates and a mix of lobster, Jonah crab, and rock crab dominating the catch in all three areas. In addition to the survey, in each of the three survey areas 500 lobsters were tagged to monitor their movement and occupancy behaviors. These green t-bar tags are designed to stay in the lobsters through at least one molt, so all Southern New England lobstermen should keep their eyes out for tagged lobsters while hauling gear! We would like to thank all the fishing vessel captains, crews, and research staff who contributed to the first year of data collection for survey. If you'd like to find out more about the survey, visit the CFRF survey [webpage here](#).



## **NEW PROJECT: WHELK RESEARCH FLEET**

We are pleased to announce the latest expansion of the Research Fleet model; the Whelk Research Fleet. Whelk (conch) are notoriously difficult to manage due to their slow maturation and growth rate coupled with localized larval and adult distributions. Despite the relatively high value of the fishery in both Rhode Island and Massachusetts there is substantial uncertainty around whelk populations and management due to a lack of biological data. The Whelk Research Fleet will seek to fill data gaps in the combined Knobbed and Channeled Whelk fishery across southern New England through fishermen collected data. The same



principles and at-sea protocols established by our other Research Fleets will be applied. We officially began work on this Atlantic Coastal Cooperative Statistics Program funded project in September and are looking forward to commencement of sampling in the spring fishery. The Whelk Research Fleet will be cooperatively run with the Rhode Island Department of Environmental Management and the Martha's Vineyard Fishermen's Preservation Trust. If you are interested in learning more about the project or are interested in applying, please visit the project [webpage here](#).

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Research Biologist

**Susan Inglis, PhD**  
Research Associate

**Michael Long**  
Research Biologist

**Noelle Olsen**  
Research Biologist

**Hannah Verkamp**  
Research Biologist

## **MORE ON-GOING PROJECTS:**

- **A Pro-Seafood Climate Action Agenda:** A group of RI and MA fishing organizations initiated a process to craft a narrative on climate solutions that places wild seafood production at its core. Contact Sarah Schumann (schumannsarah@gmail.com) for more information.
- **Black Sea Bass Research Fleet:** In partnership with RI DEM, the Black Sea Bass Research Fleet produces year-round estimates of black sea bass catch, bycatch, and biological data for seven different gear types in the Southern New England and Mid-Atlantic regions. More information can be found on the project webpage [here](#).
- **Catalyzing the Restoration of the Bay Scallop:** This project seeks to help develop a restoration plan for bay scallops in Rhode Island. Information on this project can be found [here](#).
- **Lobster and Jonah Crab Research Fleet:** This Research Fleet provides year-round biological data and environmental data from lobster and Jonah crab traps. Please visit our project webpage [here](#) to find more information about this project and the Lobster and Jonah Crab Research Fleet.
- **Phase II Piloting a N-Viro Dredge in the Scallop Fishery:** This project builds on previous work to utilize this dredge to reduce bycatch, including small scallops, in the sea scallop fishery. To follow along with the N-Viro dredge project and read the Phase I project report, visit the CFRF project webpage [here](#).
- **Salinity Maximum Intrusions:** This project will map intrusions of warm, salty water that may influence fish distributions in Southern New England. Check out the [blog](#) and our project webpage [here](#) for more information and stay tuned for the meeting announcement.
- **Scallop Research Fleet:** The main goal of this pilot Research Fleet is to develop and test methods of collecting individual weights and spawning condition of scallop during normal fishing operations. For updates visit the project webpage [here](#).
- **Shelf Research Fleet:** In partnership with Woods Hole Oceanographic Institution the Shelf Research Fleet collects oceanographic data along the continental shelf. More information can be found on the shelf research fleet the project webpage [here](#).
- **South Fork Wind Farm Fisheries Monitoring—Fish Pot Survey:** This survey is designed to determine the spatial scale of potential impacts on the abundance and distribution of structure associated finfish in the immediate area around the wind farm installation. More information on this project can be found at the survey webpage [here](#).
- **South Fork Wind Farm Fisheries Monitoring—Gillnet Survey:** This survey is designed to assess the seasonal abundance and distribution of monkfish and winter skate in the South Fork Wind area and two reference control areas to the east and west. More information on this project can be found at the survey webpage [here](#).

## **EDUCATION AND OUTREACH:**

- In September, David Bethoney presented “The Commercial Fisheries Research Foundation: Who we are and what we do” at the University of Massachusetts Dartmouth School for Marine Science graduate student seminar
- In October, Michael Long presented to thirteen Indonesian government officials attending the Science for Sustainable Fisheries Policy in Indonesia course at the University of Rhode Island.
- In October, David Bethoney gave “An overview of annual Atlantic sea scallop management and the science behind it” to Roger Williams University students as part of their Marine Resource Management course.
- In November, we made presentations on the Research Fleets (David Bethoney), characterizing Black sea bass discards (Hannah Verkamp), and the wind farm surveys (Carl Huntsburger) at the American Fisheries Society Annual Meeting. Noelle Olsen moderated the collaborative research symposium and coordinated student volunteers at the meeting.

## **RECENT RELEASES, PUBLICATIONS, AWARDS AND UPCOMING EVENTS:**

- Video Release: Check out the new CFRF introductory video [here](#).
- Video Release: In the summer of 2021, Charlie Enright of the 11th Hour Racing Team took an excursion out on his local waters of Narragansett Bay with the Commercial Fisheries Research Foundation onboard the fishing vessel Christopher Andrew to learn about the problems ghost gear causes for local habitats and commercial fishermen. The video of that June 28, 2021 ghost gear survey can be viewed [here](#).
- Upcoming Event: Seafood Expo North America, Boston, MA, March 13-15, 2022.
- Upcoming Event: Massachusetts Lobstermen’s Association Meeting, Hyannis, MA, March 24-27, 2022.

### **MAILING ADDRESS:**

**P.O. Box 278, Saunderstown, RI 02874**

**Fax: (401) 515-3537**

**Phone: (401) 515-4892**

### **OFFICE LOCATION:**

**2<sup>nd</sup> Floor, Building #61B  
Commercial Fisheries Ctr of RI  
East Farm Campus, URI, Kingston, RI 02881**

# CFRF NEWSLETTER

MARCH 2023

ISSUE 21

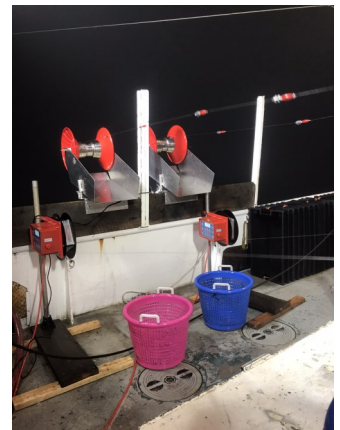
## Project Results: Planning a Ghost Gear Removal Program for Rhode Island



Ghost gear impacts in coastal waters are acknowledged as a serious problem, and ghost gear removal projects have been initiated worldwide. Rhode Island has an active commercial and recreational fishery with fishermen reporting thousands of abandoned traps and piles of ghost gear near Rhode Island fishing ports and coastal waters. With support from the Southeast New England Watershed Grants Program, we recently completed a project that developed a sustainable plan for removing abandoned or lost fishing gear, or ghost gear, from Rhode Island waters. In developing this plan, and increasing public awareness of ghost gear and the importance of a coordinated effort for removal and recycling/disposal, we developed a project website, held a stakeholder workshop and community meetings, and developed digital outreach materials. Following the procedures outlined in this planning document, we started successfully [removing ghost gear from Narragansett Bay](#) in February and March 2023 with support from 11th Hour Racing. You can read the full planning document [here](#).

## Project Results: Piloting a Low-Bycatch Automatic Squid Jig Fishery in Southern New England

CFRF partnered with The Town Dock and the Mid-Atlantic Fishery Management Council to pilot automatic jigging machines in Southern New England squid fisheries. We collaborated with the F/Vs Mattie and Maren, Miss Edi, and Hadley Ruth to test the gear on single and multi-night trips in 2021 and 2022. Thank you to the captains and crew for your help! The project team faced challenges troubleshooting the machine settings at-sea and understanding optimal environmental conditions for automatic jigging at night in conjunction with daytime trawling activities. Overall, the squid catch was very low, however, the jig-caught squid were of a high-grade quality. The project team concluded that more knowledge exchange and at-sea trials will be required to understand how to best apply this technology to local squid fisheries. This pilot project sparked interest from the fishing industry, so we are working to develop a gear lending program to allow vessels to borrow and test the jigging machines to further advance this knowledge!



This project was supported by the Mid-Atlantic Fishery Management Council. For more information on this project, including photos of the jig machine set-ups on the vessels, please check out the [webpage](#).

## Project Update: South Fork Wind Farm Fish Pot Survey



The South Fork Wind Farm (SFWF) pre-construction fish pot survey began in June 2021 and was completed in January 2023. This survey utilizes a Before-After-Gradient sampling design targeting structure-associated finfish species such as black sea bass, scup, and tautog using ventless fish pots. This survey is investigating the spatial scale of the potential impacts on the abundance and distribution of fish species before, during, and post-construction of the SFWF wind turbines. Black sea bass and scup are the top two fish species that we caught, but we also frequently saw conger eels, cunner, and red hake. The construction phase of the SFWF fish pot survey is scheduled to begin June 2023.

Thanks to captain Joe Baker and his crew Evan Adams of the F/V Harvest Moon for their hard work and assistance throughout this survey! For more information, check out the [webpage](#).



## Introducing Our Newest Staff Members

We are excited to welcome our newest staff members at the CFRF, Tori Thomas, Doug Brander, and Erika Mincarelli!

Tori is leading the Whelk Research Fleet and assists with our Ghost Gear Removal, Salinity Maximum Intrusions, and Sea Scallop Social-Ecological System projects.

Doug is working on our Scallop Research Fleet and new citizen science scallop pilot project, as well as our South Fork Wind Farm Fisheries Monitoring Surveys.

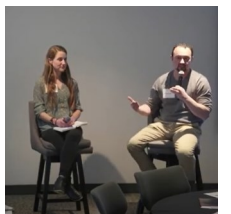
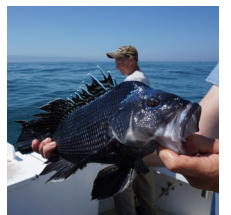
Erika is working on the Spider Crab Fishery pilot project as well as our South Fork Wind Farm Fisheries Monitoring Surveys.

Check out our [CFRF Staff webpage](#) to read their full bios!



## Education and Outreach

- In March, several staff members attended the [Maine Fishermen's Forum](#) in Rockport, ME. In addition to our general outreach booth, our director, David Bethoney, participated in panels regarding windfarm fisheries monitoring surveys and working with the fishing industry to collect environmental data. Susan Inglis also participated in a panel on working with fishermen to remove ghost gear from the ocean!
- In February and March, Susan Inglis and Tori Thomas, in collaboration with our partners from NMFS, University of Connecticut, and Rutgers University, hosted three workshops for our project to [assess the vulnerability of the Atlantic sea scallop community to climate change](#). These workshops were held in Newport News, VA, Barnegat Light, NJ, and New Bedford, MA. Thanks to all of the fishermen who participated!
- We are excited to share our newest scientific publication! We recently published a paper on our [Black Sea Bass Research Fleet](#) project in *Frontiers in Marine Science* titled, "Mobilizing the fishing industry to address data gaps created by shifting species distribution." Check out the [full paper](#) to learn more about our fishing industry-based Research Fleet and how this data is collected and used! Thank you to the 20 participating fishing vessels that have made this project possible!
- In case you missed it: David Bethoney recently participated in a panel regarding Cooperative Research in New England Fisheries for the Sustaining Our Seas Symposium at the Museum of Science! You can watch the full discussion online [here](#)!
- Don't forget to follow us on [Instagram](#), [Facebook](#), and [Twitter](#) for regular updates on our work!



### CONTACT Us

**Mail: P.O. Box 278, Saunderstown, RI 02874**  
**Fax: (401) 515-3537 Phone: (401) 515-4892**  
**Office: 2<sup>nd</sup> Floor, Building #61B**  
**East Farm Campus, URI, Kingston, RI 02881**

## Lessons learned: Piloting an automatic jigging machine in Southern New England squid fisheries



*Two Belitronic BJ5000x jig machines set up to jig (left), and a long-finned squid caught by the jigs (right).*

In partnership with The Town Dock, the Commercial Fisheries Research Foundation (CFRF) was awarded funding from the NOAA Fisheries Bycatch Reduction Engineering Program and the Mid-Atlantic Fishery Management Council to pilot automatic squid jigging machines in the Southern New England squid fisheries. We sought to compare the utility of these machines to more traditional trawl methods as a possible supplemental squid fishing gear. We collaborated with the Rhode Island F/Vs Miss Edi and Hadley Ruth to test the jig machines in the Vineyard Sound, Narragansett Bay, and Long Island Sound in 2021 and 2022.

The CFRF staff will be hosting an in-person meeting for the commercial fishing industry to share the preliminary results, challenges faced, and lessons learned from this project. There will also be an option to join remotely. We will have a Belitronic BJ5000x jig machine and user manual available for viewing and demonstration purposes. Afterwards, there will be ample time for questions and discussion. Refreshments will be served. For more information, please contact Thomas Heimann ([theimann@cfrfoundation.org](mailto:theimann@cfrfoundation.org)) or Noelle Olsen ([nolsen@cfrfoundation.org](mailto:nolsen@cfrfoundation.org)).

**When:** Thursday December 29, 4:00-5:30 PM

**Where:** The CFRF office (61 E. Farm Rd. Kingston, RI)

**Video call link:** <https://meet.google.com/rbk-niru-uuv>

**Or phone number:** 347-305-5920 PIN: 888 286 268#

# Piloting a Low-Bycatch Commercial Squid Jig Fishery in Southern New England

Thomas Heimann<sup>1</sup>, Noelle Olsen<sup>1</sup>, David Bethoney<sup>1</sup>,  
Mike Roderick<sup>2</sup>, Katie Almeida<sup>2</sup>, and Jason Didden<sup>3</sup>

<sup>1</sup>Commercial Fisheries Research Foundation, <sup>2</sup>The Town Dock, <sup>3</sup>Mid-Atlantic Fishery Management Council



# Background

## Robust International Fisheries



## High Seas



## Coastal Waters

## History of Regional Trials

### Experimental Jigging for Squid off the Northeast United States

DOUGLAS LONG and W. F. PATHEEN

#### Introduction

Light attraction jigging is a fishing technique specifically developed for catching squid. Jigging for squid is one of the most important methods used in coastal squid fisheries in Japan. In Japan about 95 percent of the common squid, *Loligo pealeii*, which represents a major part of the squid catch, is caught by Jigging (Ogino and Misugi, 1976).

In North America there has been a traditional fishery for squid in Newfoundland where recent catches have approached 90,000 t annually. Experimental squid fishing using jigging and light attraction has also been conducted in near-shore New England situations through the New England Fisheries Development Program (Amers and Carr, 1980) and in the Gulf of Mexico (Bathen et al., 1979). During 1978 and 1979 the Canadian Government sponsored commercial level demonstration fishing for squid using Rigs in the waters east of Nova Scotia. Early reports of this experience suggested substantial catches could be made on a regular basis.

In 1973, the Japan Marine Fishery Resource Research Centre sent the R/V *Hosoi-Maru No. 43* in 1974 and 1975 to conduct exploratory squid jigging there.

G. V. Dufley, Department of Fisheries and Oceans, St. John's, Nfld., Canada, Principal Investigator, New York Sea Grant (1981), (Ogino, James, Andrew, Kawahara and Misugi, 1976), Department of Fisheries and Oceans, P.O. Box 500, Halifax, Nova Scotia, Canada, Principal Cooperator.

Cape Hatteras in the Grand Banks. Fishing south of Georges Bank along the edge of the continental shelf yielded 105,475 kg (232,545 pounds) of *Illex illecebrosus* in 112 days of fishing (Hidkawa and Sato, 1976). These catches were taken in July and September of 1973 and 1974, respectively.

The Polish Deep Sea Fisheries Company Ultra equipped three of their vessels with Japanese squid jigging gear to conduct exploratory fishing. Their investigations began in May near the

Falkland Islands in the South Atlantic. Successful catches of *Illex argentineus*, with daily catches in excess of 8,000 kg (17,600 pounds) were made. Each vessel spent about 45 days working there, after which two of the vessels proceeded to the Fishery Conservation Zone (FCZ) off the U.S. northeast coast to investigate areas along the continental slope from Cape Hatteras to southeast of Cape Cod. The following is a presentation of observations of their squid jigging operations made while on board these Polish vessels during August and September 1979.

#### Fishing Vessels and Gear

The *Wigry 589-472* (Fig. 1), built in 1962, is a 61-m (200-foot) side trawler of 792 gross tons powered by a 1,275 horsepower engine. The *Marewa 587-192* is a 69-m (226-foot) B-25 class

*Douglas Laid* is a 470 West Avenue, Orono, N.Y. 13824. W. F. Patheen is with the Fisheries Development Branch, Natural Resources Service, NOAA, P.O. Box 1099, Gloucester, MA 01930.



Figure 1.—Polish research vessel Wigry, 61 m long. Jigging gear is on the well deck.

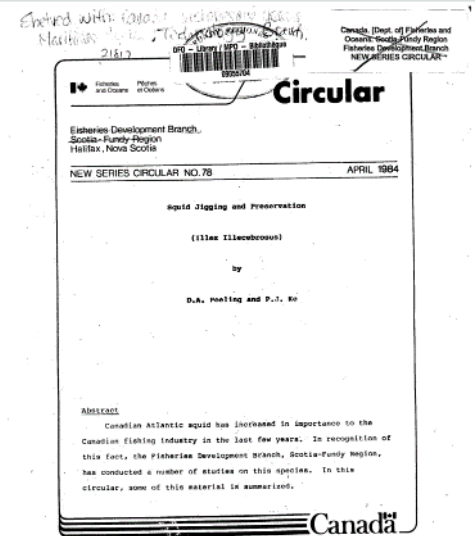


A report prepared by:

Captain Kenneth Theobald  
Captain Melvin Scullberg  
Royal T. Fishing Corporation  
2 Mainville Street  
Fairhaven, MA 02719

and

ROBERT SCULLBERG  
Coonamessett Farm Foundation, Inc.  
277 Southville Street  
Fair Haven, MA 02724  
NARRAGANSETT (FAV 763-6240)  
(603) 853-6141



## Japan's Squid Fishing Industry

WILLIAM G. COURT

### Introduction

Dried-squid (surime) has been an item of commerce, ceremony, and diet

Korea, Thailand, and Taiwan have established squid fisheries, a quality product, and good access to Japan's markets, and many other nations are

oceanographic changes, but it is now widely attributed to overfishing.

Increased catches by Japanese boats overseas has characterized the past 10

# Rationale

## Low Bycatch



## Area Access

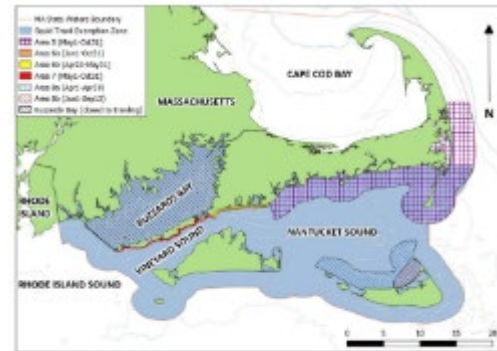


Figure 1. Massachusetts coastal waters spatial level management areas. Source: STATEM.



## Full Utilization/Market Expansion

- Longfin squid quota reached in only 31% of trimesters
- Potential for high value market



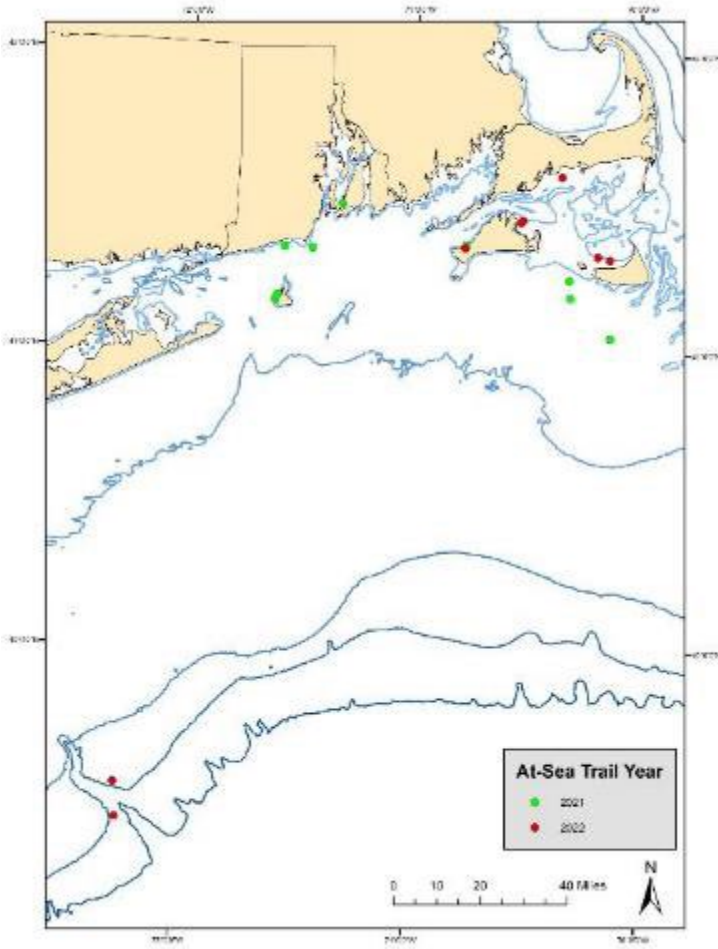
# Gear



- 6 Squid Setups from Gaski Marine
  - \$3,850 each kit
- 100 lb – monofilament backing line
- 20-60 lb – monofilament jigging line
- 12-36oz Lead weights
- Swivel snapped to backing line
- Wired directly to boat battery

# At-Sea Trials

- May – August 2021
- May – October 2022



F/V Hadley Ruth



F/V Miss Edi

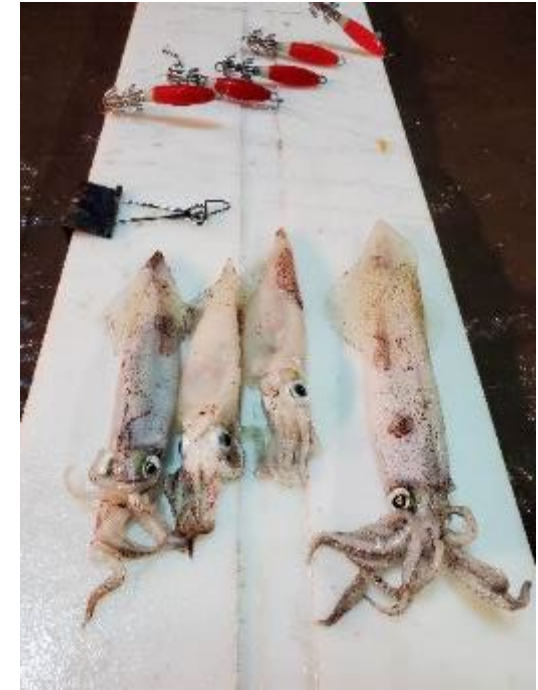


F/V Mattie and Maren



# Catch

- Beginners luck
- No landings of commercial significance
- Size range: 8-30cm mantle length
- Could outperform w/ R&R
- High quality squid
- No Illex caught





# Challenges: set-up, operations, & costs

- Little institutional knowledge
- Timing sea trials with daytime commercial trawling
- Jigs lacked precision
  - Look into alternative machines used in international fisheries
- Retrofit portability
  - High, unexpected costs for custom welding
  - Needed to redesign when gear was lost
- Industrial lighting fixtures were expensive



# Challenges: set-up, operations, & costs

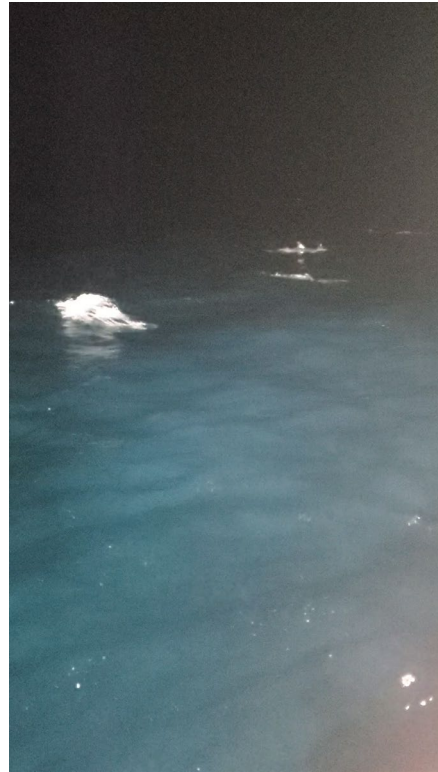
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  - Needed to redesign when gear was lost
- Industrial lighting fixtures were expensive



# Challenges: environmental & biological

## Environmental Factors

- Moon Phases
- Tide
- Temperature
- Swell/wind
- Salinity
- Surface conditions



## Biological

- Predation
  - Dolphins (Long Island Sound)
  - Seabirds
- Life/reproductive cycles



# Next Steps & Discussion

- Knowledge exchange
- Seek expert industry input
  - International fishing fleets
  - Charter boats
- Trial other commercially used gear
- Develop/Investigate market niche for large, high-grade squid



# Thank you!

- Clarke and John Reposa owners/captains of the F/Vs Miss Edi, Hadley Ruth, and Mattie and Maren
- Crew of the vessels

## Funding Sources

- NOAA Fisheries Bycatch Reduction Engineer Program (BREP)
- Mid-Atlantic Fishery Management Council (MAFMC)



# Lessons Learned - Piloting an Automatic Squid Jigging Machine in Southern New England

*Dr. N. David Bethoney*

*Mid-Atlantic Fisheries Management Council  
February 2023 Council Meeting, February 9, 2023*



# Project Team

## Research Staff

Thomas Heiman

Noelle Olsen

Me



## Advisory Team/co-Investigators

Katie Almeida

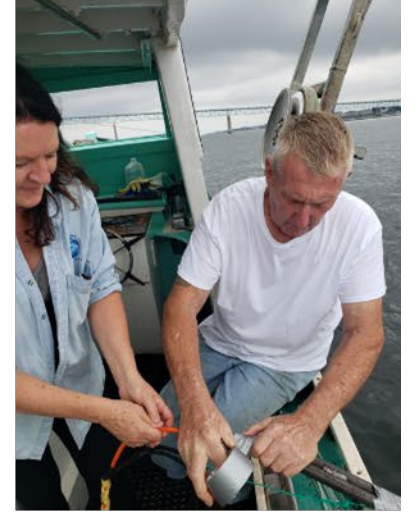
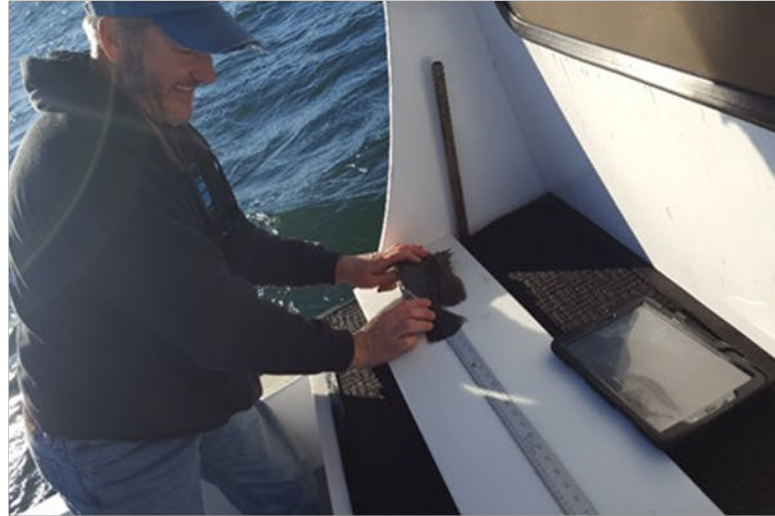
Jason Didden

Mike Roderick



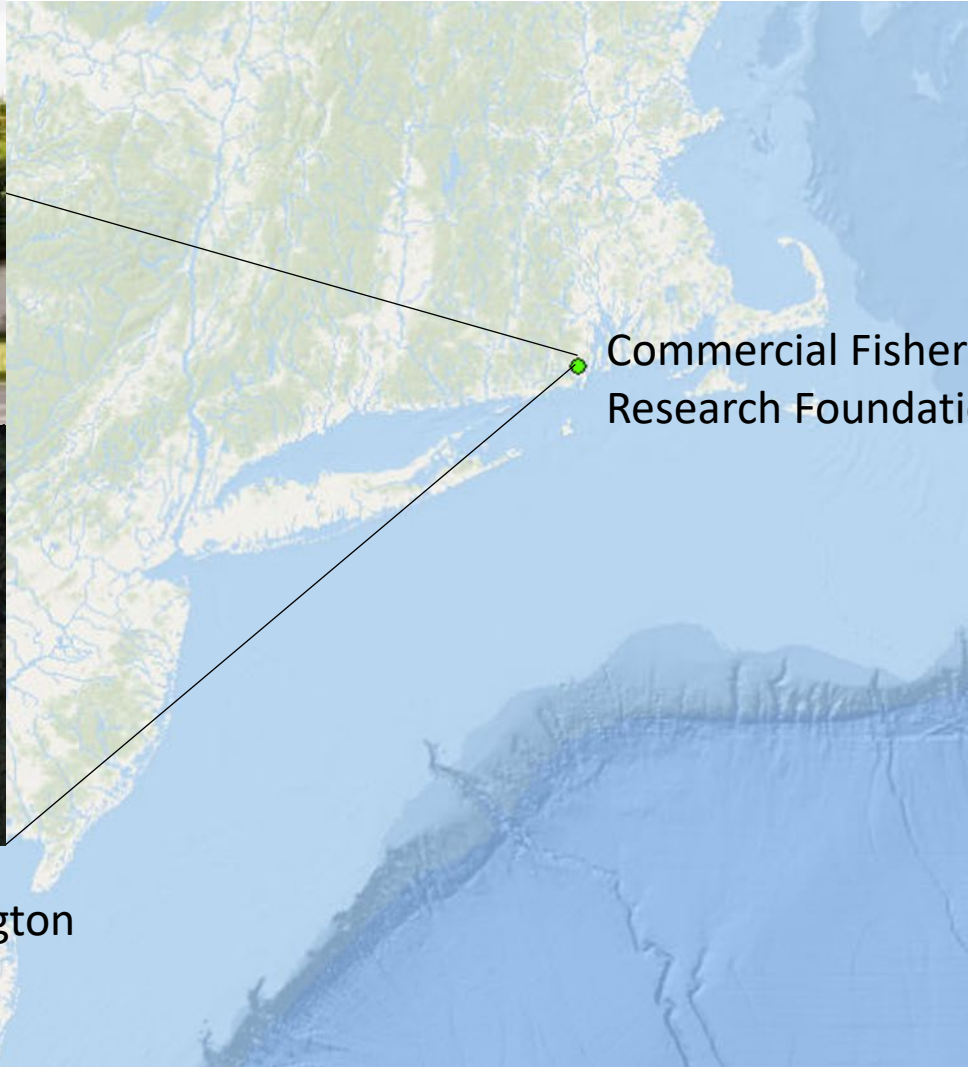
# What is CFRF?

*A non-profit, private foundation established by commercial fishermen that promotes sustainable fisheries through collaborative research and education.*





# Where is CFRF?



Commercial Fisheries  
Research Foundation

Hotel Washington

# Vessels: Captains, Crews, Owners

## Johan Crab and American Lobster

F/V Anna Mary – Montauk, NY  
F/V Barbara Ann- Point Judith, RI  
F/V Catherine Ann - Newport, RI  
F/V Carol Coles- Newington, NH  
F/V Dilligaf, Scituate, MA  
F/V Direction - Fairhaven, MA  
F/V Erica Knight - Point Judith, RI  
F/V Endeavour - Newport, RI  
F/V Excalibur - Newport, RI  
F/V Gladys Elaine - Newington, NH  
F/V Karen Ann - Point Judith, RI  
F/V Kristin & Michael - Portland, ME  
F/V Linda and Laura - Block Island, RI  
F/V Miss Julie - Sandwich, MA  
F/V Nathaniel Lee - Newport, RI  
F/V Rachel Leah - Newington, NH  
F/V Revolution - New Bedford, MA  
F/V Select - Point Judith, RI  
F/V Terri-Ann - Sandwich, MA  
F/V Timothy Michael - Newport, RI  
F/V Virginia Marie - Sandwich, MA

## Sea Scallops

F/V Brooke C - Point Judith, RI  
F/V Harvest Moon- Point Judith, RI  
F/V Mister G - Point Judith, RI  
F/V Karen Elizabeth - Point Judith, RI  
F/V Yankee Pride - Point Judith, RI  
F/V Georges Banks- New Bedford, MA  
F/V Clean Sweep - Provincetown, MA  
F/V Midnight Our - Harwich, MA  
F/V Northern Light - Portland, ME  
F/V Glutton- Provincetown, MA  
F/V Sweet Misery - Newport, RI  
F/V More Misery - Newport, RI  
F/V Johnny B - Portsmouth, RI  
F/V Laura Lynn - Point Judith, RI  
F/V Matrix - Wickford, RI  
F/V Lucy Rose - Wickford, RI  
F/V New Hope - Point Judith, RI  
F/V Nancy Beth - Point Judith, RI  
F/V Virginia BAE – Newport, RI  
F/V Kayna and Kerstin – Newport, RI

## Black sea bass

F/V Johnny B - Point Judith, RI  
F/V Priority Too - Point Judith, RI  
F/V Ragged Edge- Point Judith, RI  
F/V Debbie Sue - Point Judith, RI  
F/V Harvest Moon - Point Judith, RI  
F/V X-Terminator - Little Compton, RI  
F/V Catherine Ann - Newport, RI  
F/V Blue Label – Newport, RI  
F/V Savanna Paige – Cape May, NJ  
F/V Ruthless – Cape May, NJ  
F/V Brooke C – Point Judith, RI

## Whelk

F/V Elisabeth Mae – Vineyard Haven, MA  
F/V Ragged Edge- Point Judith, RI  
F/V Yes I am – West Greenwich, RI  
F/V Bad Habit – Dartmouth, MA  
F/V Johnny B - Newport, RI  
F/V Rock & Roll – Edgartown, MA  
F/V Peggy-B II – West Dennis, MA  
F/V Haul-In – Bristol, RI

## Ghost gear

F/V Catherine Ann - Newport, RI  
F/V Megan & Kelsey -Newport, RI  
F/V Johnny B - Newport, RI

## Shelf

F/V Brooke C - Point Judith, RI  
F/V Menemsha Rose- New Bedford, MA  
F/V Finast Kind II - Tiverton, RI  
F/V Excalibur - Newport, RI  
F/V Mister G - Point Judith, RI

## Squid

F/V Miss Edi- Point Judith, RI  
F/V Hadley Ruth - Point Judith, RI

## Wind Farm Surveys

F/V Amelia Anne - Point Judith, RI  
F/V Ashley Anne II - Point Judith, RI  
F/V Erica Knight- Point Judith, RI  
F/V Harvest Moon- Point Judith, RI  
F/V Mister G - Point Judith, RI  
F/V Cailyn & Maren - Little Compton, RI  
F/V More Misery- Newport, RI

# Why interested: Global Picture

High Seas Jigging Vessel



Coastal Jigging Vessel



Photo: R. Yamada

Japanese flying squid: 1.2 billion pounds in landings annually

Tasmanian arrow squid fishery: About 2 million pounds annually

# Why interested: Regional Picture

Stalled past efforts



Oceanic Squid Fishery Development



A report prepared by:

Captain Kenneth Thorsrud  
 Captain Melvin Kurlberg  
 K and T Fishing Corporation  
 2 Middle Street  
 Fairhaven, MA 02719

and

Ronald Thorsrud  
 Coonamessett Farm Foundation, Inc  
 277 Sandwell Road  
 Easton, MA 02525  
 508-458-0288 FAX 508-868-0713  
[cooni@psd.net](mailto:cooni@psd.net)

## Experimental Jigging for Squid off the Northeast United States

DOUGLAS LONG and W. F. PATRICK

### Introduction

Light attraction jigging is a fishing technique specifically developed for catching squid. Jigging for squid is one of the most important methods used in coastal squid fisheries in Japan. In Japan about 95 percent of the common squid, *Loligo pealeii*, which represents a major part of the squid catch, is caught by jigging (Yajima and Mitugi, 1976).

In North America there has been a traditional fishery for squid in Newfoundland where recent catches have approached 50,000 t annually<sup>1</sup>. Experimental squid fishing using jigging and light attraction has also been conducted in nearshore New England situations through the New England Fisheries Development Program (Ameal and Carr, 1980) and in the Gulf of Mexico (Ratjen et al., 1979). During 1978 and 1979 the Canadian Government sponsored commercial level demonstration fishing for squids using jigs in the waters east of Nova Scotia. Early reports of this experience suggested substantial catches could be made on a regular basis<sup>2</sup>.

In 1973 the Japan Marine Fishery Resource Research Center sent the RV *Hoto-Maru No. 51* followed by the RV *Hoto-Maru No. 63* in 1974 and 1975 to conduct exploratory squid jigging from

Cape Hatteras to the Grand Banks. Fishing south of Georges Bank, along the edge of the continental shelf yielded 100,475 kg (227,545 pounds) of *Illex illecebrosus* in 112 days of fishing (Kikawa and Sato, 1976). These catches were taken in July and September of 1973 and 1974, respectively.

The Polish Deep Sea Fisheries Company Ultra equipped three of their vessels with Japanese squid jigging gear to conduct exploratory fishing. Their investigations began in May near the

Falkland Islands in the South Atlantic. Successful catches of *Illex illecebrosus*, with daily catches in excess of 8,000 kg (17,600 pounds) were made. Each vessel spent about 45 days working there, after which two of the vessels proceeded to the Fishery Conservation Zone (FCZ) off the U.S. northeast coast to investigate areas along the continental slope from east of Cape Hatteras to southeast of Cape Cod. The following is a presentation of observations of their squid jigging operations made while on board these Polish vessels during August and September 1979.

### Fishing Vessels and Gear

The *Wary 589-172* (Fig. 1), built in 1962, is a 61-m (200-foot) side trawler of 797 gross tons powered by a 1,175 horsepower engine. The *Marek 589-182* is a 69-m (226-foot) B-23 class

Douglas Long is at 4299 West Avenue, Orono, ME 04468. W. F. Patrick is with the Fisheries Development Division, National Marine Fisheries Service, NOAA, P.O. Box 1309, Gloucester, MA 01930.



Figure 1.—Polish research vessel Wary, 61 in long. Jigging gear is on the well deck.

Marine Fisheries Review

Recreational effort

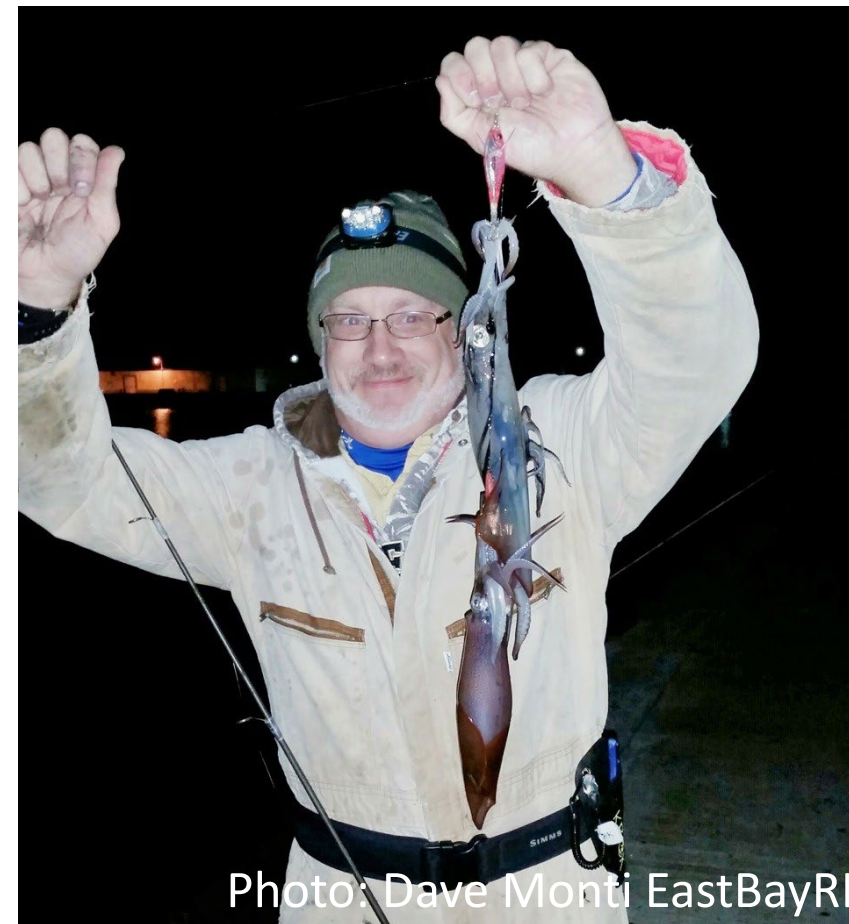
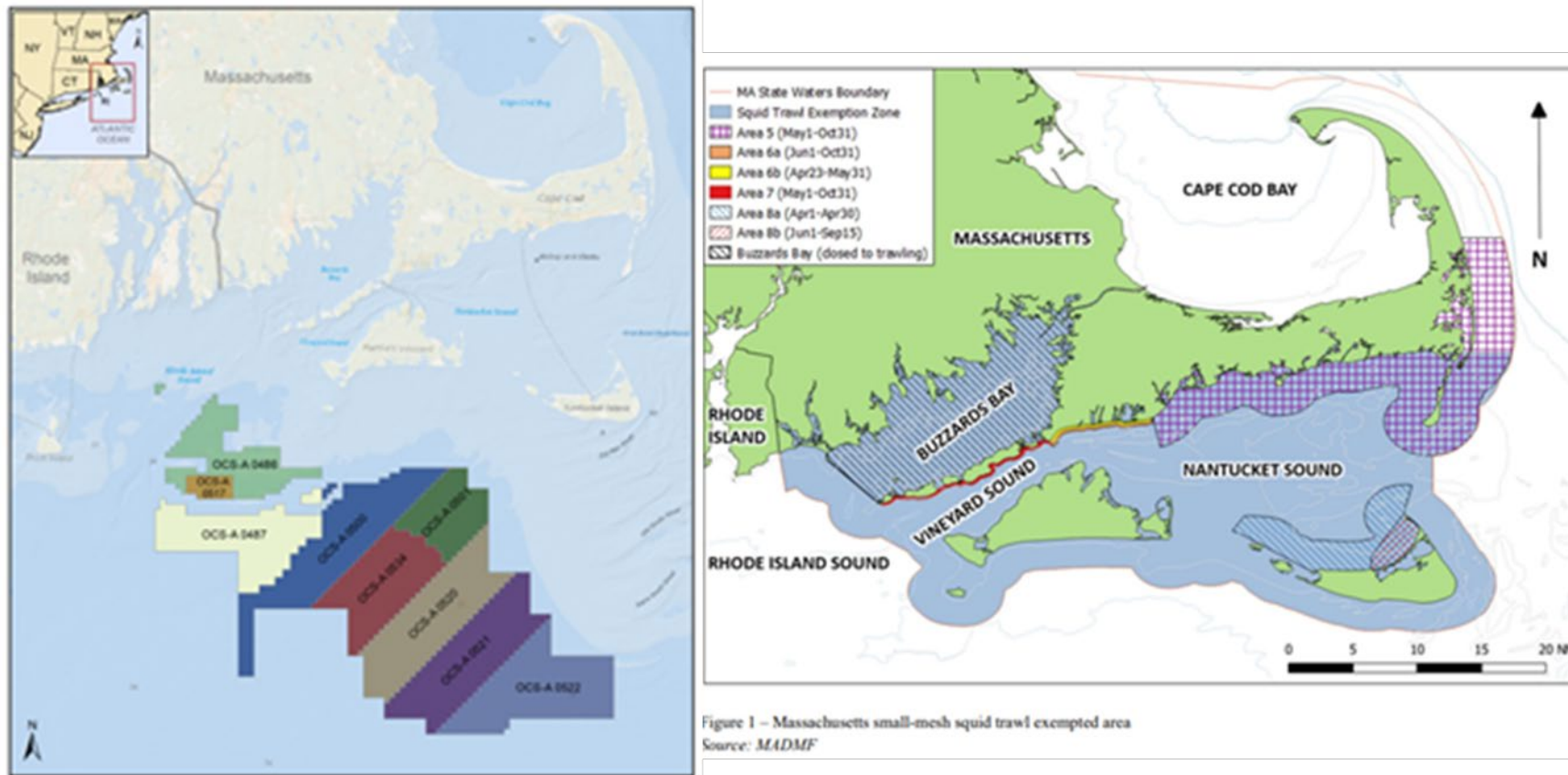


Photo: Dave Monti EastBayRI

# Why interested: A Tool for Current Challenges

## Access



# Why interested: A Tool for Current Challenges

## Bycatch Reduction and Utilization



Longfin squid quota reached in only 31% of trimesters



# Project Goals and Objectives

Overall goal: Pilot automatic jigging machinery for commercially harvesting squid in U.S. Atlantic

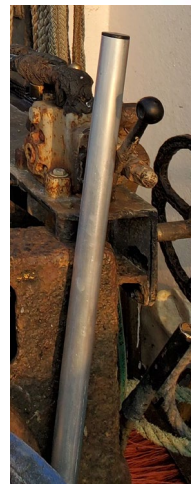
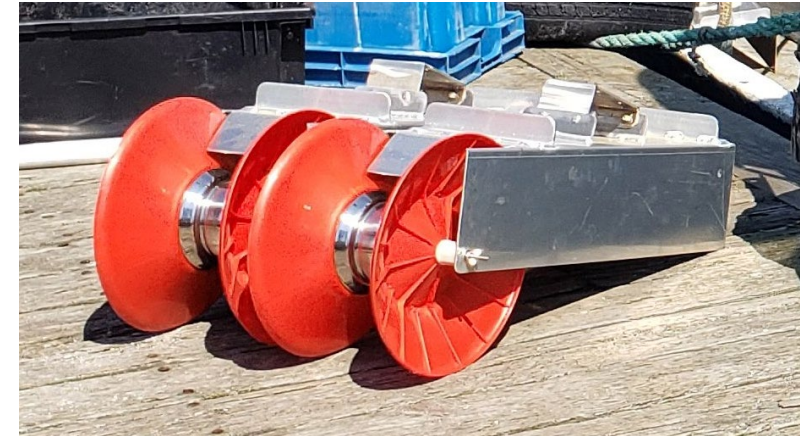
The objectives were:

- 1) Use automatic squid jigging machinery aboard commercial F/Vs
- 2) Compare the bycatch rates, catch rates, and product output to concurrent squid trawl;
- 3) Estimate start-up costs;
- 4) Communicate findings to the fishing and management communities

# Project Actions: First 6 months

## January 2021-June 2021

- Equipment Purchase
  - Belitronic BJ5000EX automatic jigging machines
    - Shipping delay
  - 150Watt LED Utility Lights
- Vessel recruitment
  - F/V Determination sinking
- Gear Installation
  - More complex than expected
- At-sea trials
  - Trawl during day, jig at night
  - Initial success then frustration





# Project Actions: First 6 months

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# Project Actions: First 6 months

## July 2021-January 2022

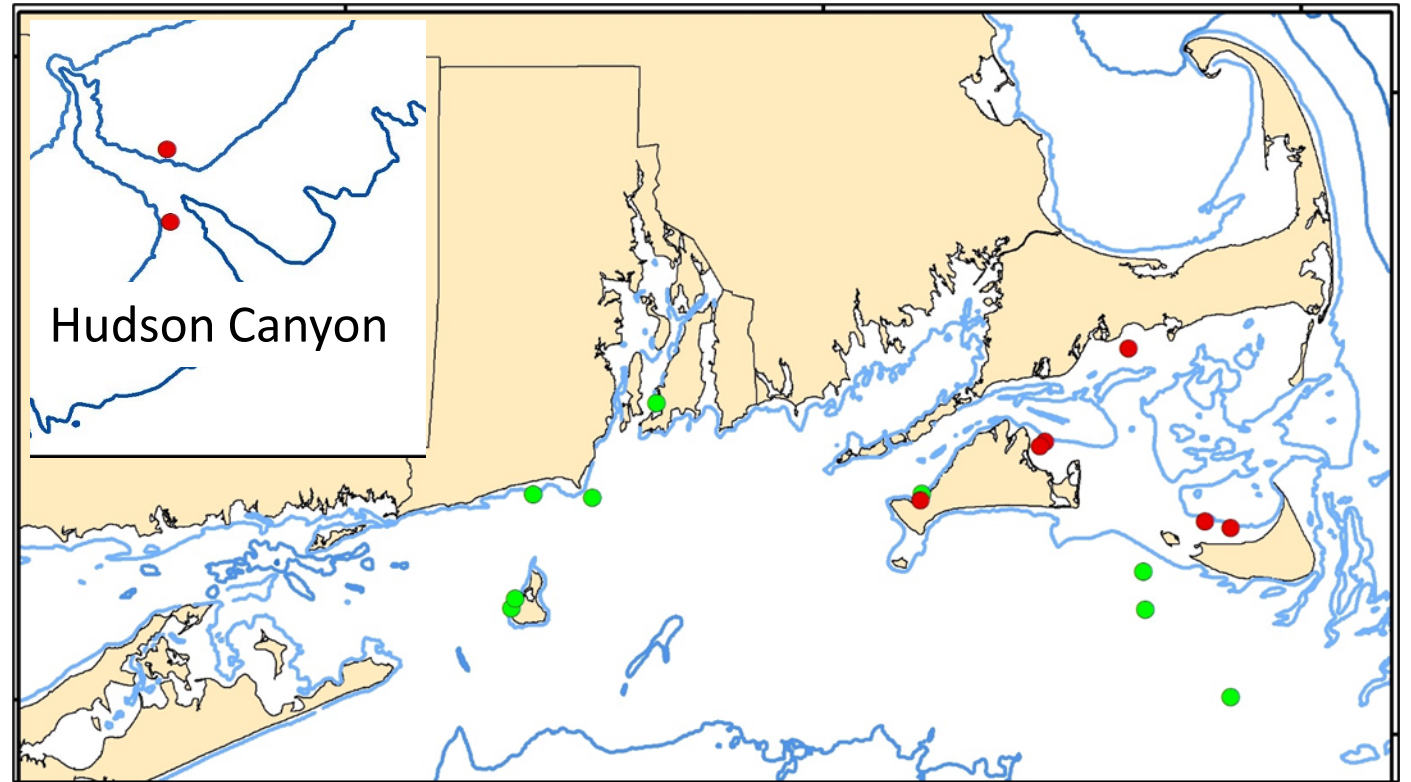
- At-sea trials
  - Similar results
  - Operational improvements
  - Effort Reallocation
- Disaster
  - Sept. trip canceled - COVID
  - F/V Mattie and Maren sinks
    - Four machines lost
- Regroup
  - New Equipment
  - New Vessel



# Project Actions: Final Year

## January 2022-December 2022

- At-sea trials
  - Similar catch results
  - Little operation oversight
  - Off-shore and fall
- Gear Installation
  - Complexity reduced
- Workshop
  - 17 participants
  - RI and MA



At-Sea Trial Year

- 2021
- 2022

# Project Actions: Final Year

## January 2022-December 2022

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# Project Actions: Final Year

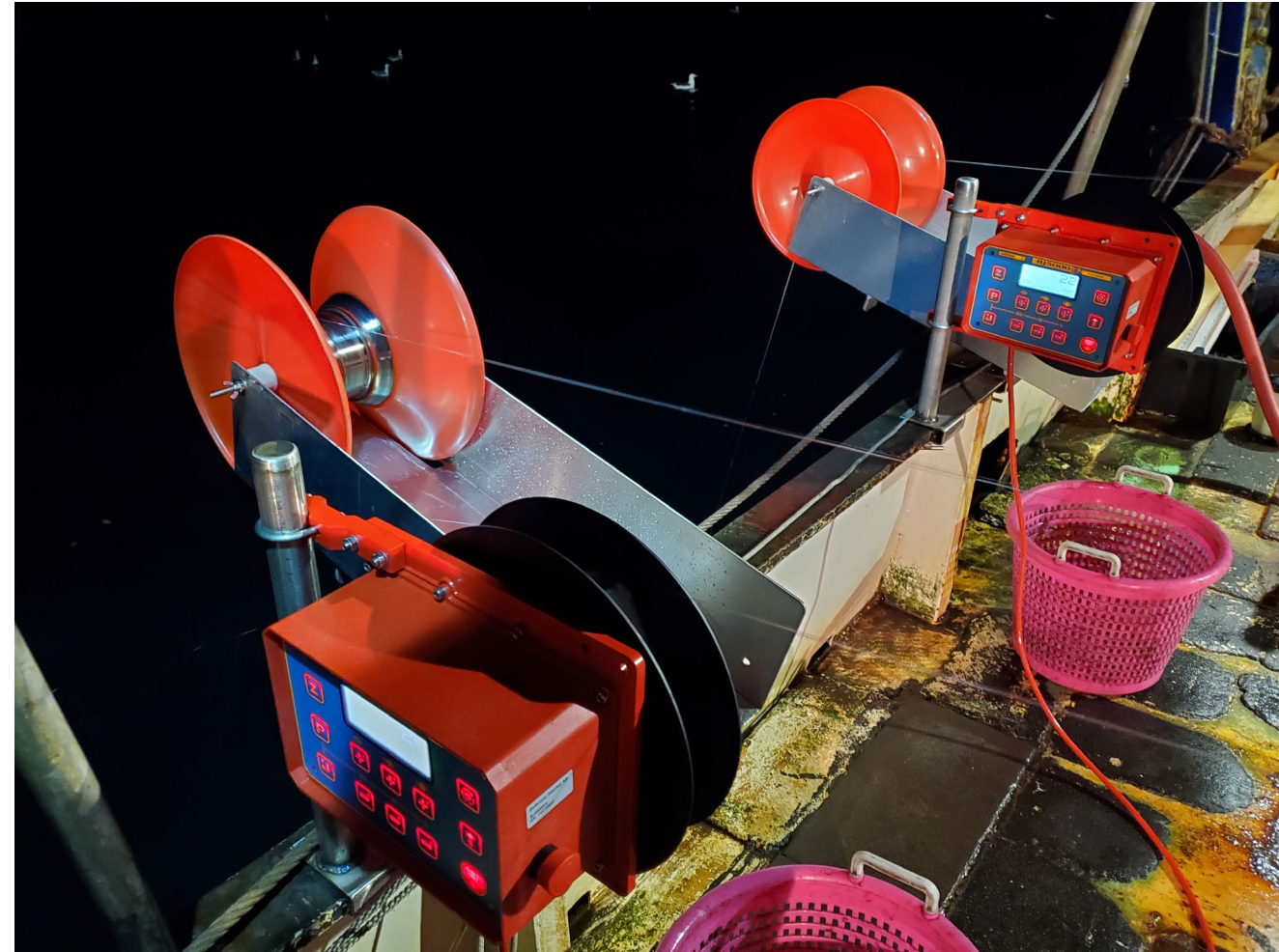
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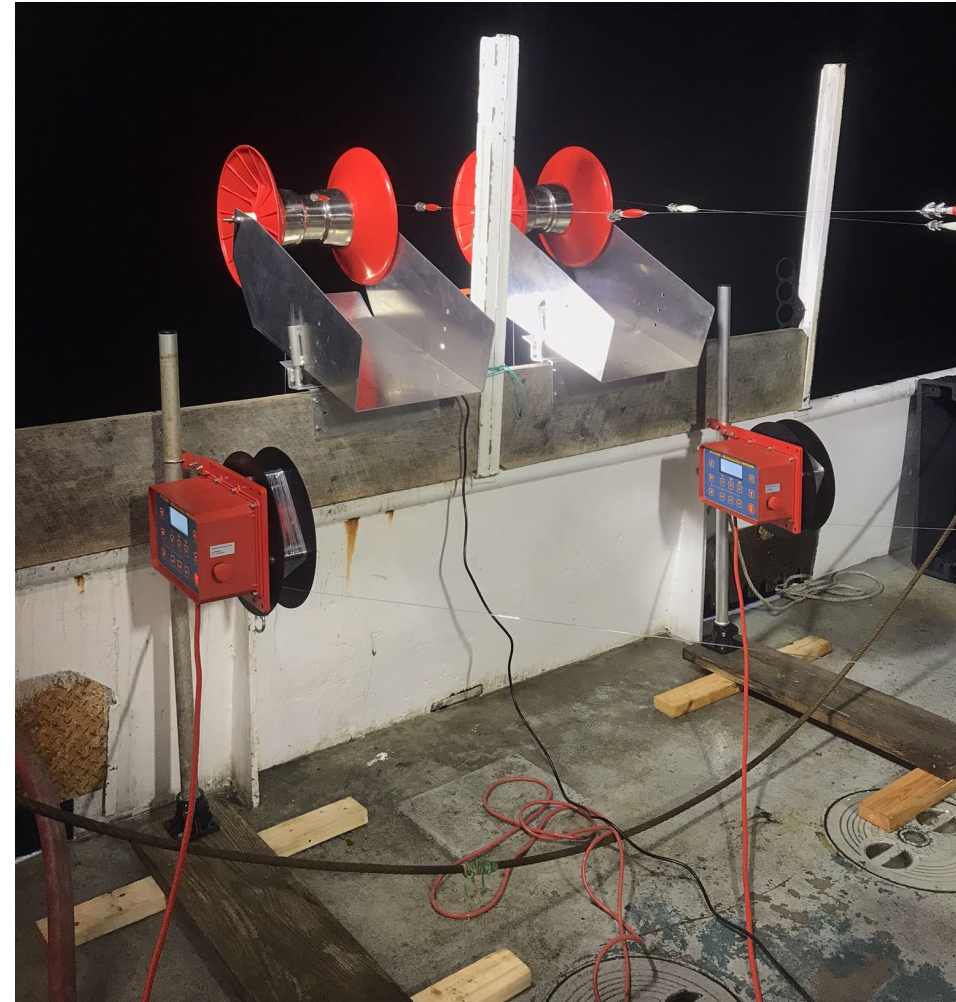
# Lessons Learned: Gear

- Cost per machine
  - Machine and kit - \$3,850
  - Lights - \$400
  - Mounting! -\$950
  - Time
- Installation
  - Not ready to use
  - Each vessel different
  - Concepts carry over
- Operation
  - Can go awry quickly
  - Set up right – little attention needed



# Lessons Learned: Gear

- Cost per machine
  - Machine and kit - \$3,850
  - Lights - \$400
  - Mounting! - \$<50
  - Time
- Installation
  - Not ready to use
  - Each vessel different
  - Concepts carry over
- Operation
  - Can go awry quickly
  - Set up right – little attention needed



# Lessons Learned: Catch

First Trip/Day

- Expectation
  - Squid function
    - Improving from baseline catch
  - Fine tuning
- Reality
  - Need “Squid function”
  - Operational focus
  - Lights got squid to vessel
- Lots of variables
  - Squid behavior
  - Shadow zone



<b>Squid Caught</b>	101
<b>Weight</b>	30 lbs
<b>Hours</b>	3



# Lessons Learned: Catch

All other trips/days

- Expectation
  - Squid function
    - Improving from baseline catch
  - Fine tuning
- Reality
  - Need “Squid function”
  - Operational focus
  - Lights got squid to vessel
- Lots of variables
  - Squid behavior
  - Shadow zone



Adobe Stock | #293039677

<b>Squid Caught</b>	122
<b>Weight</b>	50 lbs
<b>Hours</b>	A lot more than 3 (19 DAS)

# “Lessons Learned”: Catch

- No bycatch
  - Two lady crabs
  - Other fish around
- Squid rated “good”
  - poor, fair, good, excellent
- Rod jig “won” on a trip



# Lessons Learned: Interest

- Participating fishermen
  - Tried on own
  - See value
  - Don't want to give up
- Regional interest
  - Local RI
  - Cape Cod
  - Gloucester
  - Nantucket

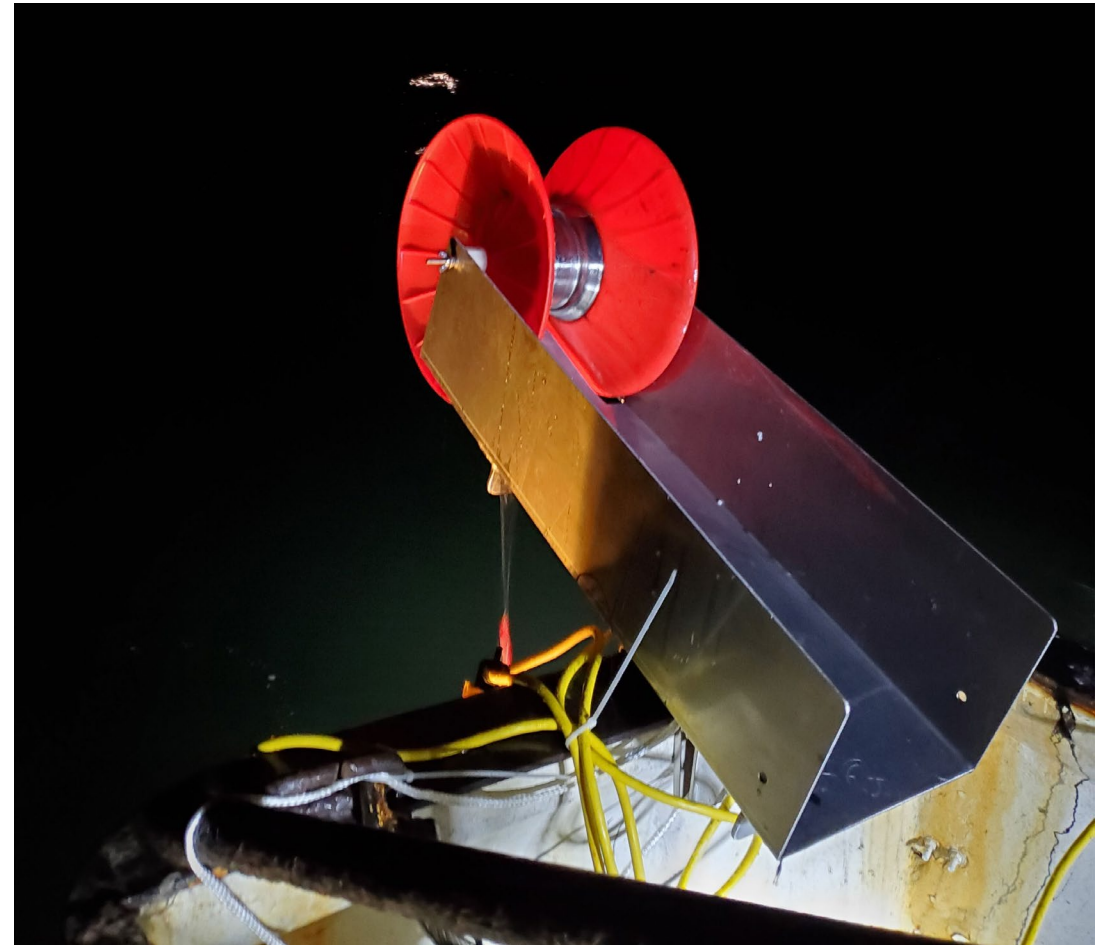


# Lessons Learned: Interest



# Lessons Learned: Perseverance

- Low Morale
  - Failure: Part of research and development
- Major problems
  - Demonstrated growth



# Next Steps

- Knowledge exchange
- Seek expert industry input
  - International fishing fleets
  - Charter boats
- Japanese connections
  - Richard Yamada -> Industry connections
  - Hiro Uchida -> Fisheries Research and Education Agency
  - Lisa Hendrickson -> Japanese colleagues



# Thank you!

- Clarke and John Reposa owners/captains of the F/Vs Miss Edi, Hadley Ruth, and Mattie and Maren
- Crew of the vessels

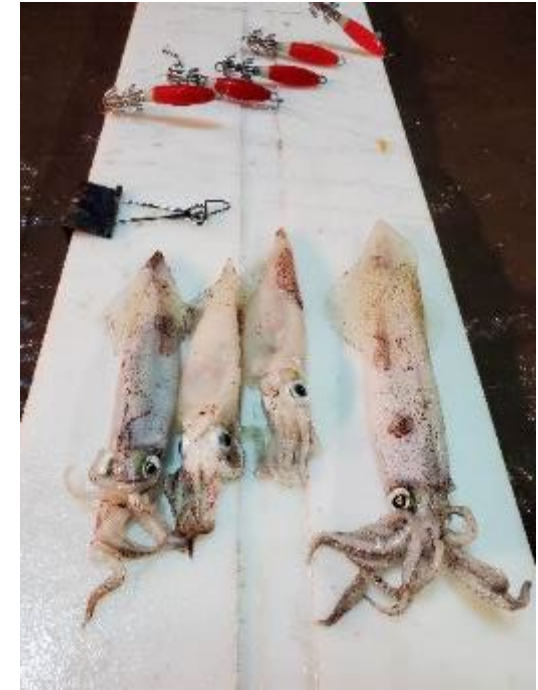
## Funding Sources

- NOAA Fisheries Bycatch Reduction Engineer Program (BREP)
- Mid-Atlantic Fishery Management Council (MAFMC)



# Catch

- Beginners luck
- No landings of commercial significance
- Size range: 8-30cm mantle length
- Could outperform w/ R&R
- High quality squid
- No Illex caught





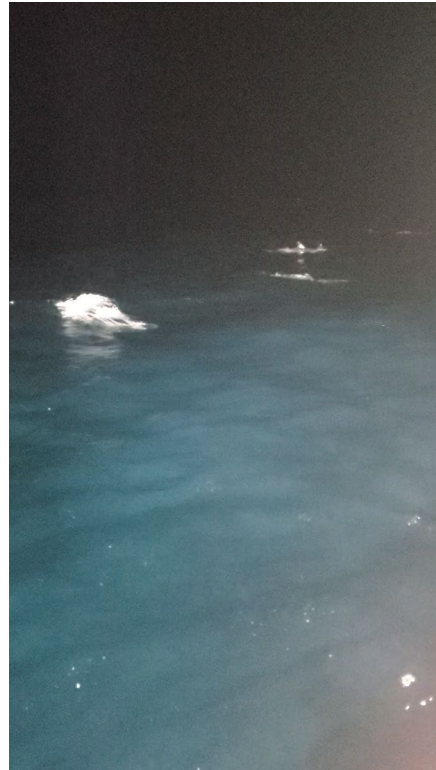
# Challenges: environmental & biological

## Environmental Factors

- Moon Phases
- Tide
- Temperature
- Swell/wind
- Salinity
- Surface conditions

## Biological

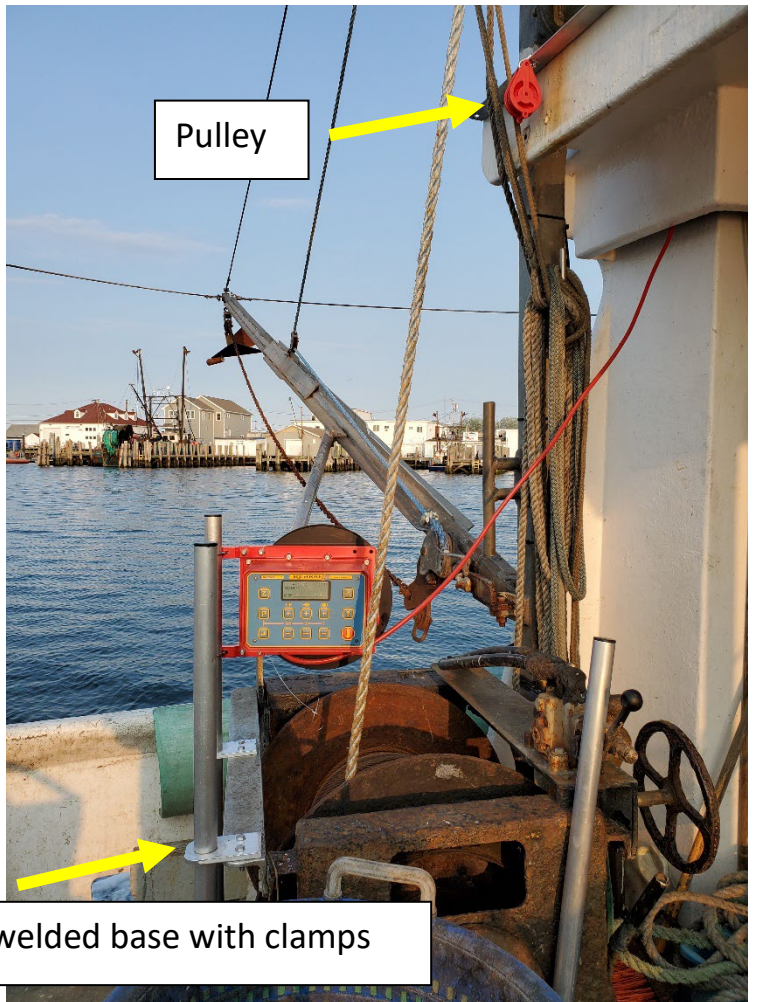
- Predation
  - Dolphins (Long Island Sound)
  - Seabirds
- Life/reproductive cycles



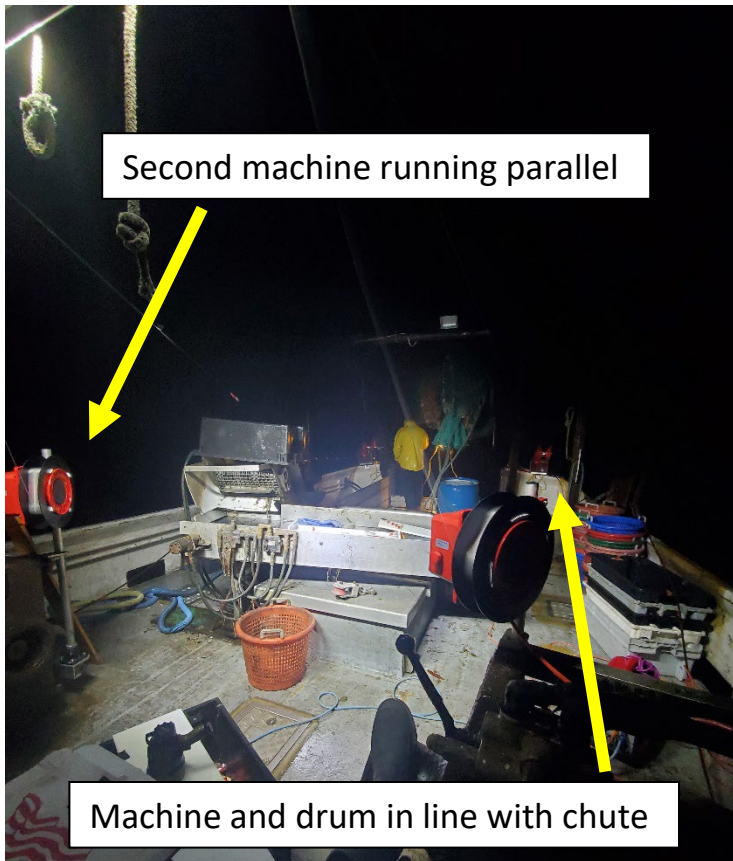
Off the Stern (F/V Miss Edi)



Custom welded base with clamps

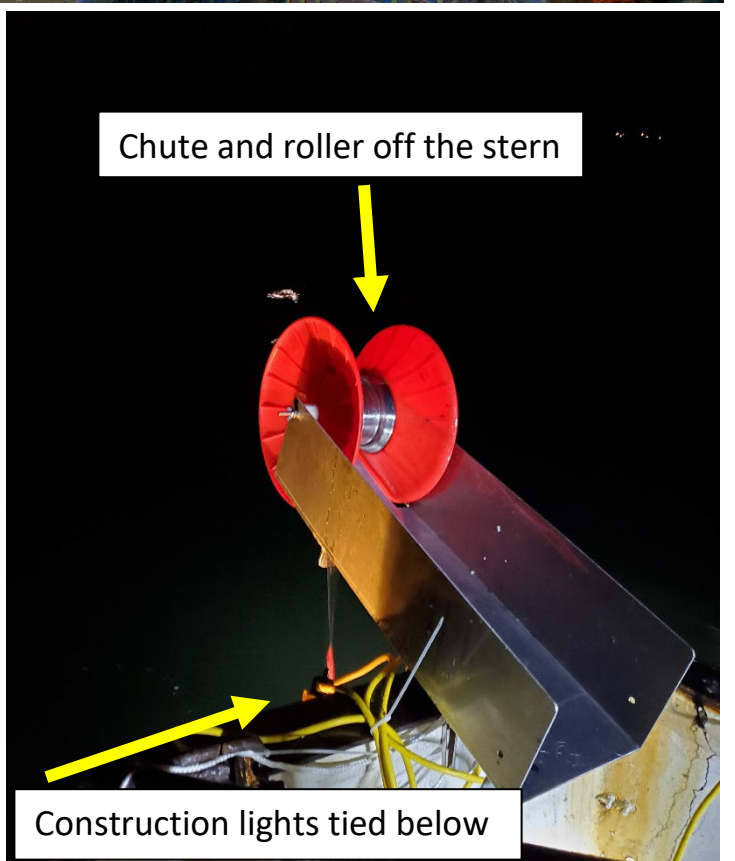


Pulley



Second machine running parallel

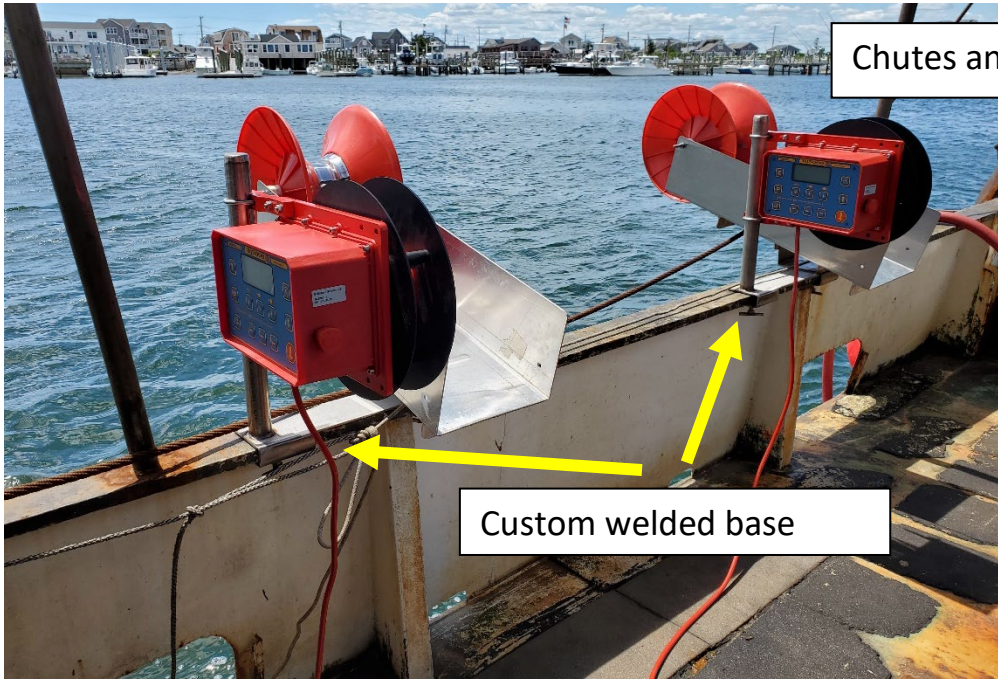
Machine and drum in line with chute



Chute and roller off the stern

Construction lights tied below

Off the Starboard side (F/V Mattie and Maren)

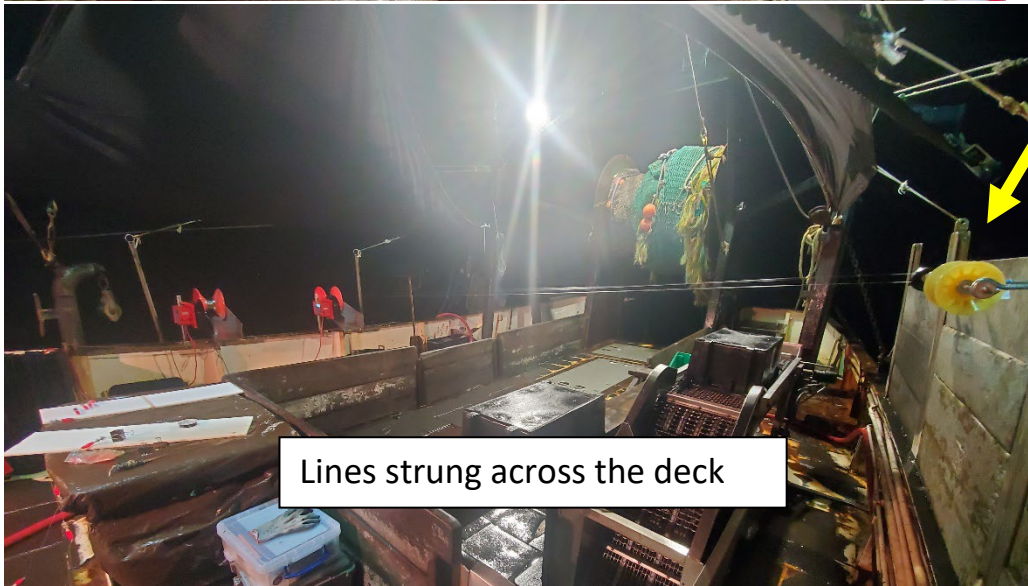


Chutes and rollers off the side

Custom welded base



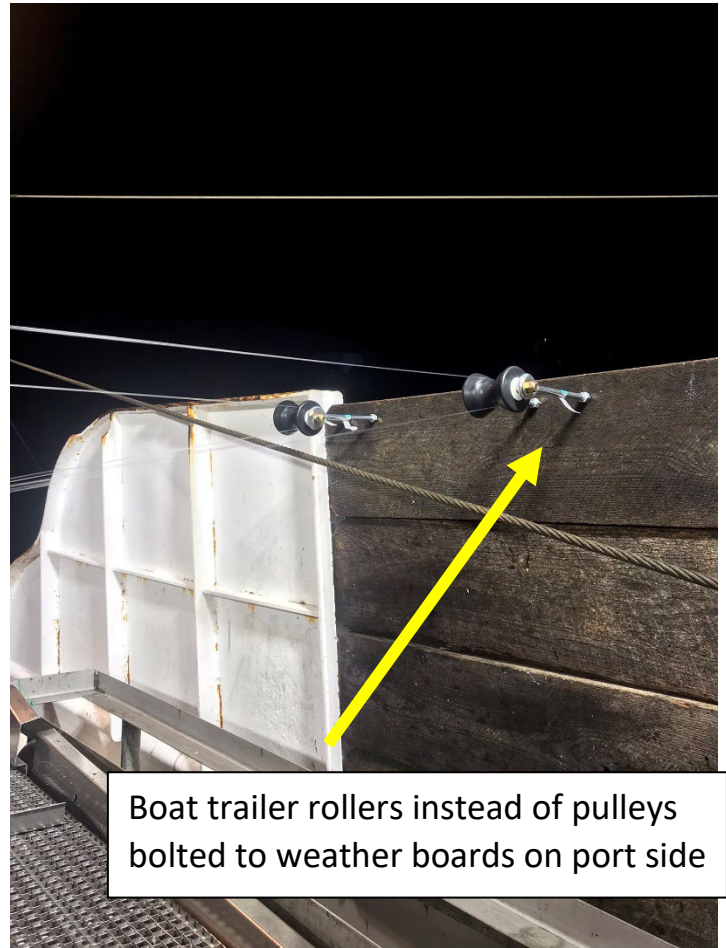
Boat trailer rollers instead of pulleys bolted to weather boards on port side



Lines strung across the deck

## Off the Starboard side (F/V Hadley Ruth)

\*\*\*Similar set-up to the F/V Mattie and Maren, but we had to redesign a base for the machine because we lost the custom welded bases when the F/V Mattie and Maren sank with the machines. We ended up bolting the stands for the chutes directly into the weather boards.



Improvised bases made out of scrap wood



## Close-ups of welding modifications



Support pole bases we drilled into the wooden bases on the Hadley Ruth



Clamp system to fit the rail

