SFW01-0097 South Fork Fisheries Monitoring Plan
WP4: Fish Pot Survey
Year 2 Report

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Summary

The Commercial Fisheries Research Foundation (CFRF) in collaboration with the fishing vessel Harvest Moon have completed the South Fork Wind Farm pre-development ventless fish pot survey for demersal fisheries resources. The survey was conducted to determine the spatial scale of potential impacts on the abundance and distribution of juvenile and adult fish species, particularly structured associated finfish such as black sea bass, scup, and tautog as a result of South Fork Wind Farm development. In particular, the survey was designed to determine if the immediate areas, closest to the turbines, will experience alteration in the distribution and abundance of the above identified structure associated fish species as a result of the turbines creating a "reef effect" due to the addition of new structure in the South Fork area. As in 2021, the South Fork Wind development area was intended to be sampled once per month from June through December but due to poor weather conditions the 2022 survey was unable to sample in November and instead did a sampling trip in January 2023. Within the development area, eight turbine locations were sampled with a single string of ventless fish pots at each location. Each string of ventless fish pots consisted of 18 identical ventless fish pots evenly spaced at 50-meter increments with the first pot of the string set on the exact location of a potential turbine and the last pot of the string set due south of the turbine. Monthly, each pot was baited and left to soak for 24-hours prior to sampling. Sampling consisted of speciating the catch from each pot and recording total number of individuals and total weight of each species per pot. Individual lengths were recorded for the above identified target species as well as other fish species. Individual weights were also recorded when feasible for target species. Oceanographic data was obtained at each sampling stations with a conductivity, temperature, and depth cast and temperature loggers. The catch throughout the second year of sampling exhibited a strong seasonal component and was dominated by a handful of species. Catch was relatively low the first two months of the survey and was largely comprised of rock crabs. Catch increased substantially in August, remained high in September and October, and then decreased for the months of December and January. Black sea bass and scup were the most prevalent fishes caught. Overall, no substantial differences were noted between year 1 and year 2 results.

Introduction

The CFRF, in partnership with local fishermen, conducted pre-construction fisheries monitoring surveys for the South Fork Wind Farm development area. Monitoring was aimed towards collecting baseline fisheries abundance and distribution data to assess potential anthropogenic impacts on resources as a result of wind farm development and construction. Unlike the other three surveys undertaken by the CFRF, the ventless fish pot survey utilizes a different approach to assess these impacts; the Before-After-Gradient design (BAG). The survey was designed to sample at increasing distances from turbine locations to examine the spatial scale of effects from construction and operation of turbines on the surrounding habitat and structure associated fish species. Unlike the other surveys operated by the CFRF, the BAG design eliminated the need for control areas as the sampling effort is focused along a spatial gradient within the South Fork development area (Figure 1). This design allowed for the investigation of spatial variation in fisheries resources and does not assume homogeneity across sampling locations. Specifically, the ventless fish pot survey was designed to collect data on the abundance, distribution, and biological makeup of the fishery communities immediately around potential turbine sites with specific target species of black sea bass, scup, and tautog. This report details the methods of the survey, summarizes the results from the second year of survey activities conducted from June 2022 through January 2023 and presents comparisons of 2021 and 2022 survey data.

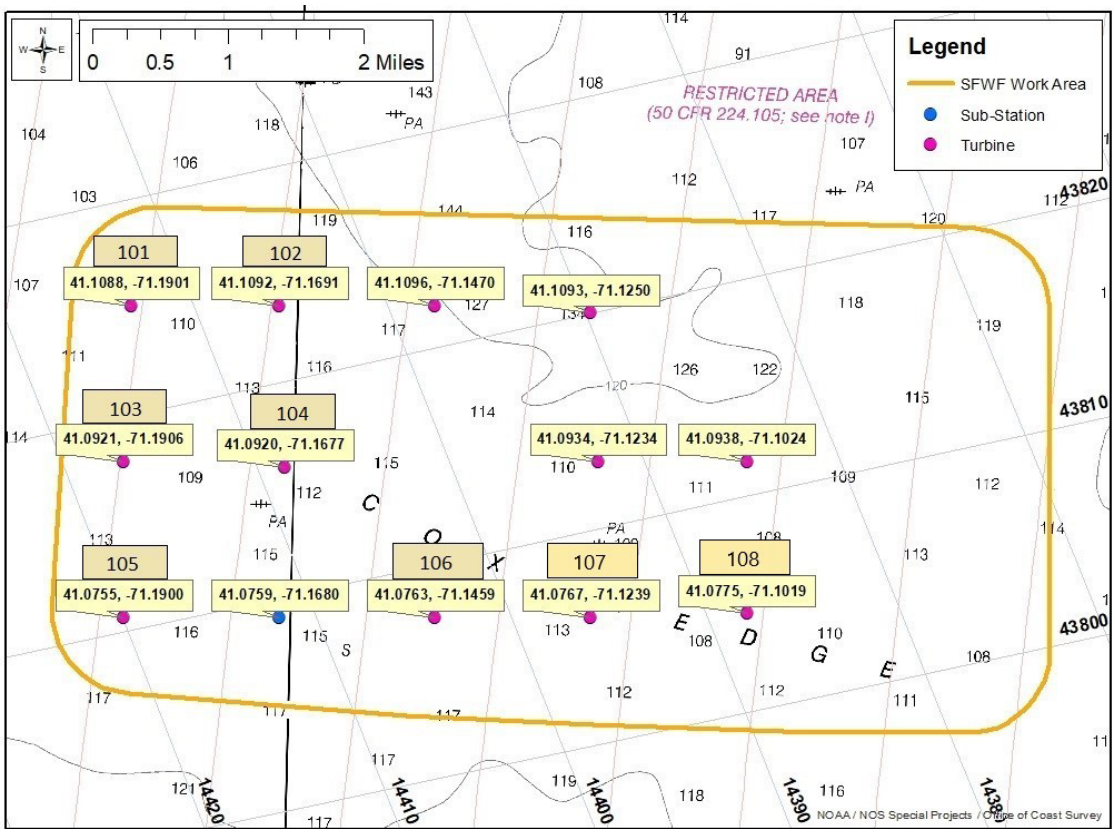

Figure 1. The South Fork Wind Farm development area with all potential turbine locations. Turbines selected for monitoring by the ventless fish pot survey are identified and numbered 101 through 108.

Methods

All survey activities completed by the CFRF for the ventless fish pot survey were done in collaboration with the crew and fishing vessel (F/V) Harvest, Moon which is home ported in Point Judith, Rhode Island. The eight survey locations were selected from the potential turbine locations within the South Fork Wind Farm development area (Figure 1). Due to the ventless fish pot survey being the last of the four pre-construction surveys to start and the proximity of the other CFRF surveys already operating within the South Fork area, the eight turbine locations selected for sampling allowed for ample distance between the ventless fish pot survey and the gillnet and beam trawl surveys to minimize gear conflicts.

Each of the eight stations was surveyed with a single string of 18 ventless fish pots. All fish pots are identical and were purchased from Ketcham Traps in New Bedford, MA. The ventless fish pots measure 43.5 inches long, 23 inches wide, and 16 inches high and are made from 1.5-inch coated wire mesh and are standard lobster-pot-style scup pots. Squid offcuts were used as bait throughout the entire survey.

Once per month, starting in June 2022, the F/V Harvest Moon would haul each string of gear at each turbine location, bait each pot, close the escape vents on each pot, and reset each string of gear. The survey utilized wet storage of the gear and kept the fish pots in the water each month between survey trips and the traps remained un-baited and open. A Research Biologist was on all fish pot survey set days to act as a protected species observer. When setting the gear, the first pot of the string was deployed on the proposed turbine location and the last pot of the string due south. Each pot is evenly spaced from the previous pot by 50 meters of sinking groundline. Pots were left to soak for a 24-hour period. On each set day, the CFRF Research Biologist on board would retrieve a HOBO temperature logger secured in the first pot of each string, offload all temperature data, and then redeploy the logger in the same pot, logging the temperature every 30 minutes.

After the 24-hour soak period each month, the F/V Harvest Moon returned to haul and sample the gear with CFRF scientists. Upon arrival to each station, and prior to hauling any gear, a conductivity, temperature, and depth probe was lowered to the bottom and slowly retrieved to the surface using the vessel's pot hauler. The crew of the F/V Harvest Moon would empty the catch out of each individual fish pot into a fish basket for processing by the CFRF scientists. Prior to processing the catch, the CFRF scientist would collect the following station related data at each of the eight survey locations;

- Trawl Number - Sequential tow of the trip
- Station ID (Trip + Station Label)
- Start pot (1-18, the pot closest to the turbine location was deemed 1 and the furthest 18)
- Start Position (latitude and longitude of first pot hauled)
- Start Water Depth (feet)
- Start time: Time the trawl was set (24-hour format)
- End Position (latitude and longitude of last pot hauled)
- End Time: The moment the first pot leaves the bottom on sampling day (24-hour format)
- Beaufort Sea State
- Wind Direction (Cardinal Directions)

After the station related data was recorded, the CFRF scientists would begin processing the catch and collecting biological data from each individual pot. The total number of individuals per species and total weight of all individuals of each species per pot was recorded. Up to 10 individuals per pot of each species of target fin fish (black sea bass, scup, and tautog) were measured for either total (black sea bass and tautog) or fork length (scup). For the first and last three pots of each string, the individual weight of target species was also recorded to analyze the length-weight relationship. Individual weights were not always feasible to record due to

high catch rates as it would slow the data collection process considerably or bad weather as the scales would not accurately provide a consistent weight in heavy seas. Total or fork length was recorded for up to 10 individuals of all non-target fish species per pot. The total number of individuals and total catch weight of each species of invertebrate per pot was recorded as well. All the above mentioned biological and catch data is recorded alongside the individual pot number (1-18) at each station so all data can be attributed to a specific pot. After the processing and data recording of the catch from each pot, all individuals were returned to the water prior to moving on to the next pot. This process was repeated for all 18 pots per string of gear for all eight strings.

All data was imported or entered into an Access survey database for the fish pot survey. Prior to submission of data to INSPIRE Environmental, all data was given a one-to-one check against the paper data logs for quality assurance. For this report the biodiversity was calculated using the Shannon diversity index ($H = \sum_{i=1}^{S} \mathrm{p}_i \ln(p_i)$, where s is the number of species, and p is the proportion of individuals of one species to the total number of individuals) using the aggregated catch by station of all species for all survey trips in the second year.

Preliminary Results

The targeted 24-hour soak period was achieved for every survey each month. Each survey was planned to occur at roughly the same time each month, however this became difficult to achieve in the fall months as the weather began deteriorating. This was, in part, due to the 24-hour soak period which necessitated a 48-hour good weather window for a vessel of smaller size than compared to the others used in the South Fork Wind monitoring surveys. As a result, a survey did not occur in November and, instead, a trip went out in early January 2023 (Table 1). Monthly bottom water temperatures and salinity readings were taken each month and were similar between stations. Results were also similar between 2021 and 2022 however, September 2021 was notably warmer and saltier than in 2022 (Tables 2 and 3).

Table 1. SFWF ventless fish pot survey set and sample date for the first year of survey activities.

Survey Month	Trip Dates	
	Date Set	Date Sampled
June	6/21/2022	6/22/2022
July	7/14/2022	7/15/2022
August	8/11/2022	8/12/2022
September	9/16/2022	9/17/2022
October	10/10/2022	10/11/2022
December	12/20/2022	12/21/2022
January	01/06/2023	01/07/2023

Table 2. Average monthly bottom water temperature from HOBO temperature logger secured in the first pot of each string of the 2022 SFWF ventless fish pot survey set. No survey was completed in November, so a make-up survey was completed in January 2023.

	2021	2022	2023
June	10.2	10.3	
July	11.6	11.3	
August	15.6	14.5	
September	18.8	15.8	
October	16.4	15.9	
November	14.9		
December	10.1	10.7	
January			8.0

Table 3. Average monthly bottom water salinity from conductivity, temperature, and depth probe taken during the 2022 SFWF ventless fish pot survey set. Average (PSU). No survey was completed in November, so a make-up survey was completed in January 2023.

	2021	2022	2023
June	32.6	32.6	
July	32.7	32.8	
August	32.7	33.2	
September	33.4	32.9	
October	33.1	32.7	
November	33.1		
December	33.2	33.0	
January			32.6

The catch throughout the second year of sampling changed exhibited a strong seasonal component and was dominated by a handful of species (Figure 2). Catch was relatively low in the months of June and July, and the dominant species was rock crabs (Figure 2). In June and July, Cunner were the most caught finfish species by number, followed by black sea bass, and then red hake. Only one scup was caught in June and two scups in July. Similar to 2021, no tautog were caught in Year 2. Overall catch increased substantially in August. Jonah crab was the dominant species starting in August, and scup became the dominant finfish species. As the amount of scup decreased over the next several months, the amount of black sea bass increased (Figures 2 and 3). No scup were caught in January 2023. The total amount of finfish decreased for the months of December and January while Jonah crabs remained the top species caught and accounted for over half the weight of fish caught in the winter months (Figure 2). Aside from black sea bass and scup, cunner, conger eels, and red hake were the most common fish species caught.

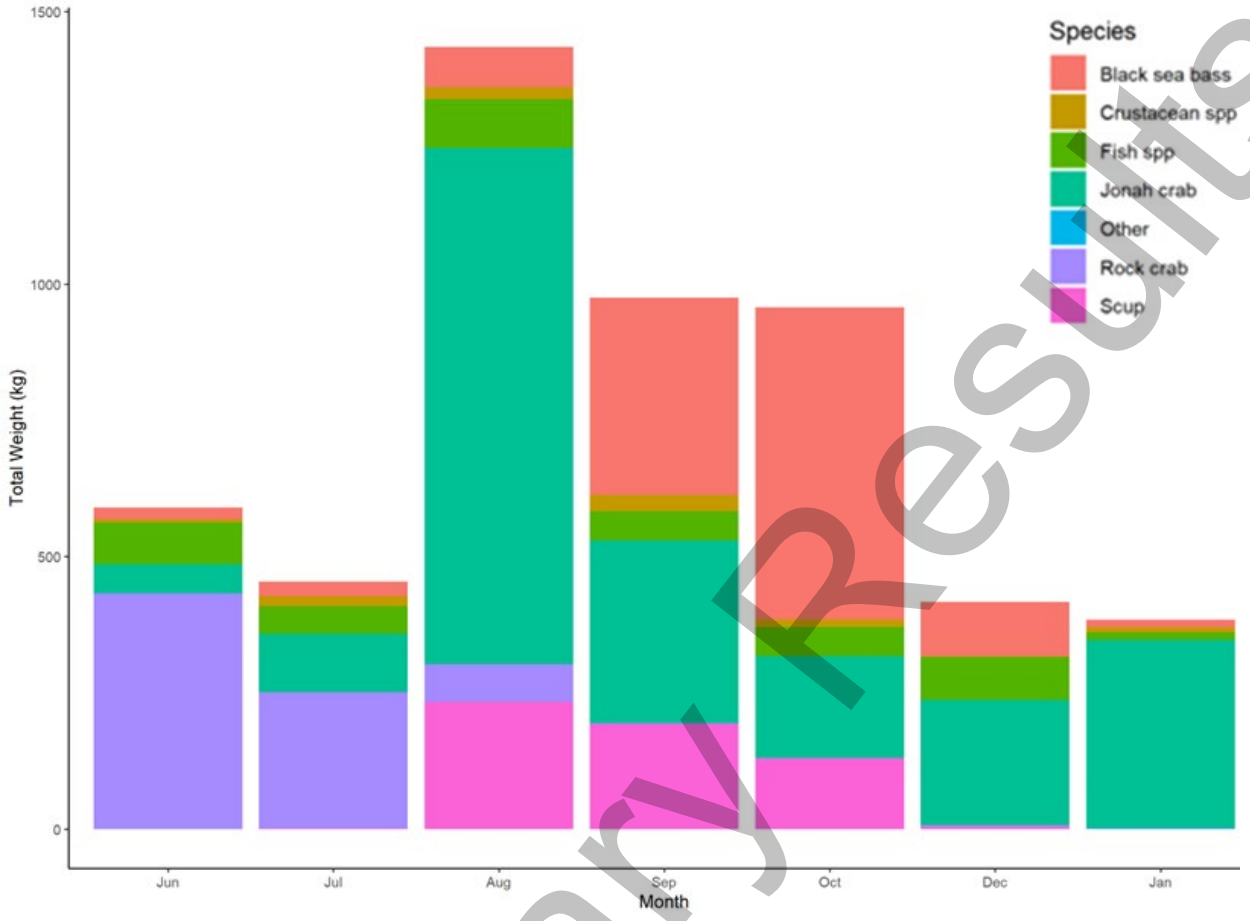

Figure 2. Total catch weight per month from the ventless fish pot survey. Crustacean spp is comprised almost entirely of American lobster. By weight, Fish spp is largely dominated by cunner, conger eel, and red hake; however, other species such as ocean pout, trigger fish, longhorn sculpin, sea raven, Atlantic cod, and spiny dogfish were also present. Other species included asteria spp., Atlantic sea scallops, and sand dollars.

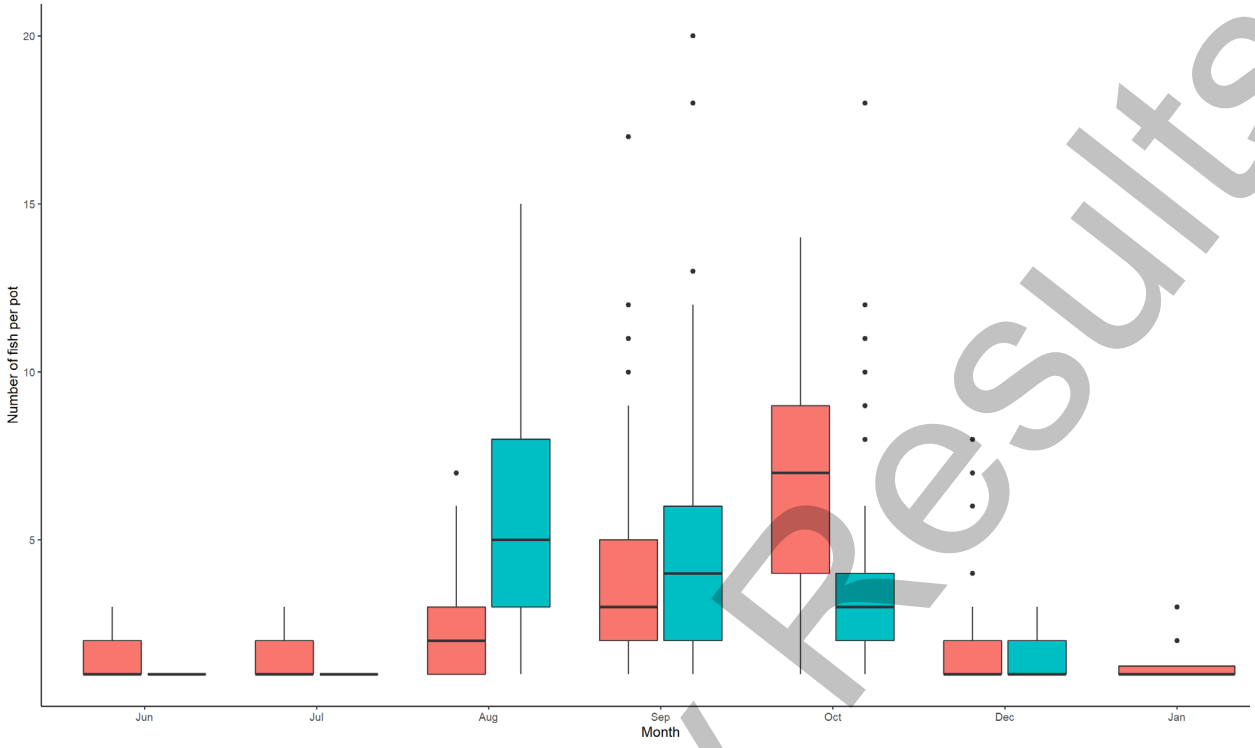

Figure 3. Monthly box plots of median number of black sea bass (pink) and scup (blue) caught per pot from the Year 2 SFWF ventless fish pot survey.

Black sea bass exhibited a wide size range throughout Year 2 of the survey (Figure 4). In general, the median size of black sea bass increase throughout the summer with the largest individual black sea bass seen in the month of September. The median size decreased during the winter as the more juveniles became present migrating offshore through the development area (Figure 4). There were similar size ranges exhibited in Year 1 of the survey for black sea bass (Figure 4). Similar to black sea bass, median scup size was highest in September, and there was a similar size range of scup throughout Year 2 (Figure 5). Similarly sized scup were present in Year 1 of the survey (Figure 5). Species diversity between each station was relatively similar, with station 108 being the highest and station 101 being the second highest in both survey years (Figure 6). In general, the Shannon Diversity Index was slightly higher at all stations in Year 1 when compared to Year 2.

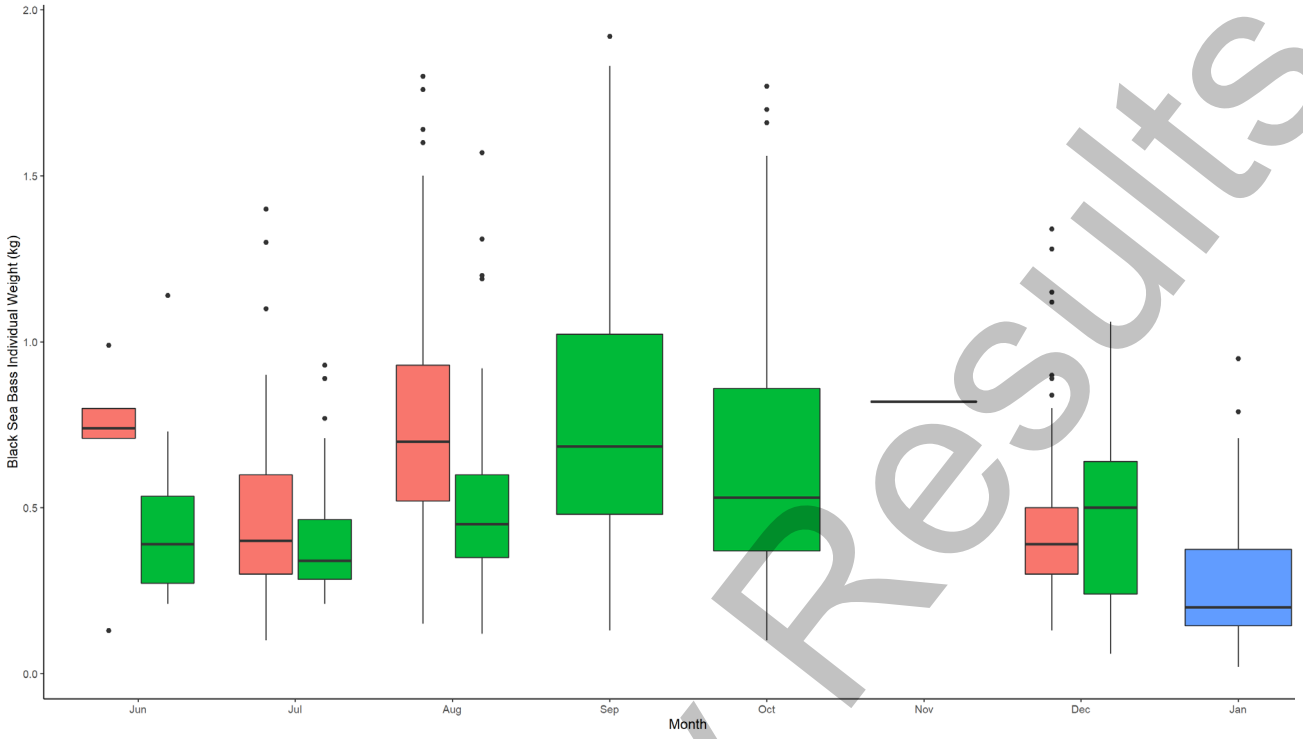

Figure 4. Individual weight of black sea bass per month from Years 1 (pink) and 2 (green and blue) of the South Fork Wind Farm ventless fish pot survey. Due to poor weather condition, no individual black sea bass weights were recorded in September and November 2021.

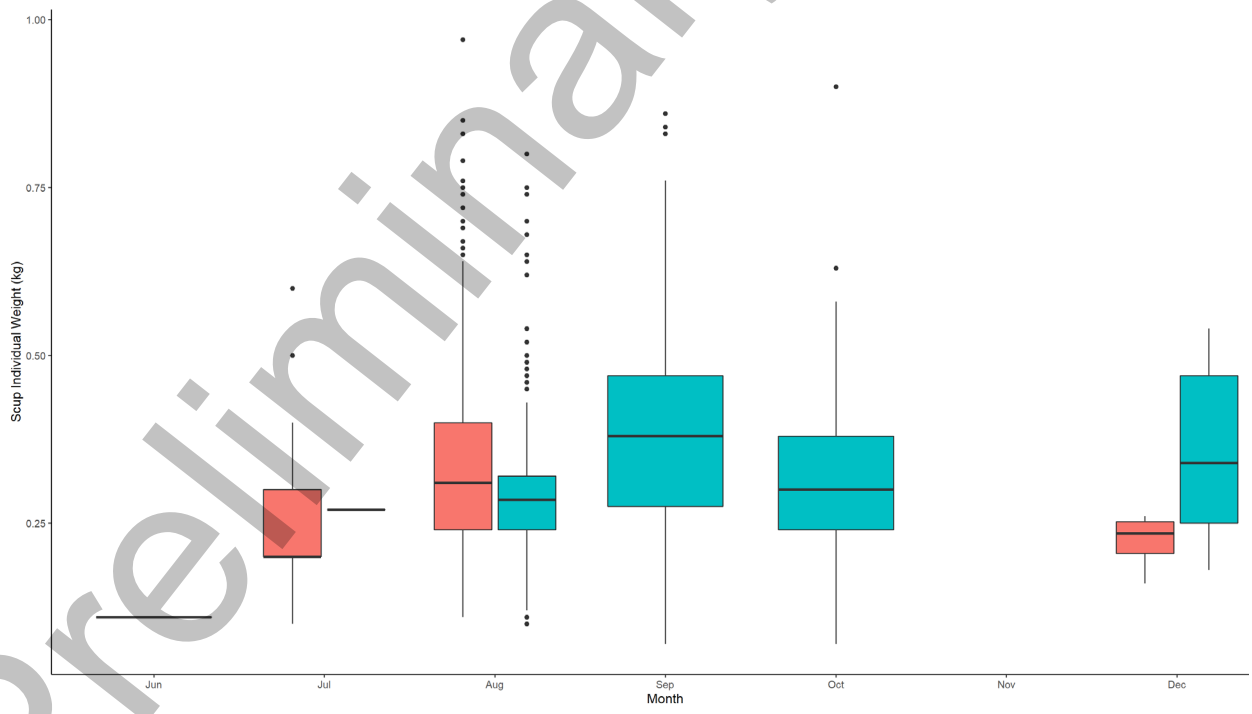

Figure 5. Individual weight of scup per month from Years 1 (pink) and 2 (blue) of the South Fork Wind Farm ventless fish pot survey. Due to poor weather conditions, no individual scup weights were recorded in September through November 2021.

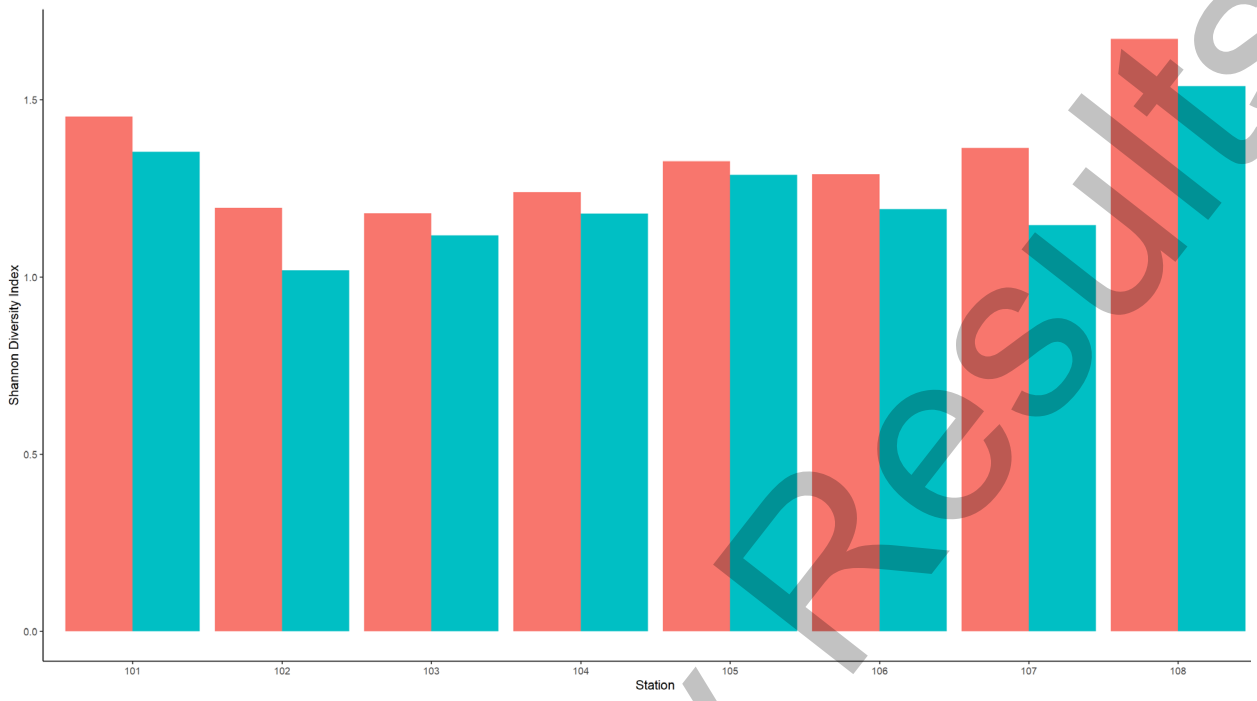

Figure 6. Shannon Diversity index values for each South Fork Wind Farm ventless fish pot survey stations across the entire survey year in Year 1 (pink) and Year 2 (blue).