Final Report

GILLNET CONFIGURATIONS AND THEIR IMPACT ON ATLANTIC STURGEON AND MARINE MAMMAL BYCATCH IN THE NEW JERSEY MONKFISH FISHERY: YEAR 1

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Summary

Monkfish (*Lophius americanus*) support a lucrative fishery primarily centered in the waters of the mid-Atlantic and northeast US. Monkfish are targeted primarily through trawls and sink-gillnets. Overharvest coupled with habitat loss and alteration led to a decline of Atlantic sturgeon *(Acipenser oxyrinchus oxyrinchus)* in the early 1900s. Atlantic sturgeon is currently being considered for listing under the Endangered Species Act. A formal status review concluded that bycatch in otter trawls and sink-gillnets including those used in the monkfish fishery are a significant hurdle to Atlantic sturgeon conservation and recovery. The manner in which gillnets are fished including the use of tie-downs, as well as long soak durations, is believed to be influencing how Atlantic sturgeon interactions. Additionally, tie-downs on large mesh (17.8-45.7 cm) gillnet gear are seasonally required in the mid-Atlantic region under the Harbor Porpoise Take Reduction Plan (HPTRP) as one component within a suite of gear modifications designed to reduce interactions between harbor porpoises and commercial gillnet gear in this area.

In an attempt to provide resource managers information on the influence of tie-downs employed in the monkfish fishery on Atlantic sturgeon and marine mammal bycatch we employed two gillnet configurations (control: 12 meshes x 30.5cm stretch mesh with four mesh tie-downs, experimental: 12 meshes x 30.5cm stretch mesh without tie-downs) in an experiment off northern New Jersey during November and December of 2010. Cooperating monkfish harvesters fished paired replicates of each gillnet configuration totaling 120 hauls in accordance to normal monkfish fishing operations. Atlantic sturgeon bycatch (CPUE) did not differ significantly (p=.1158) between gillnet configurations, likely due to relatively low statistical power (.1708) in the current study. The experimental nets (without tie-downs) significantly

decreased ($p<.0001$) landings of the target species, monkfish and resulted in a number of marine mammal (e.g. common dolphin (*Delphinus delphis*)) mortalities, which were not encountered in tied-down nets. Our findings provide much needed information to managers on the role that net configuration plays in targeted landings and bycatch of Atlantic sturgeon and marine mammals in the sink-gillnet monkfish fishery. Although there was no significant difference in Atlantic sturgeon encounter rates for experimental nets, they did result in significantly lower catch rates of targeted species and unacceptable levels of marine mammal mortalities. However, due to the low statistical power, additional control and experimental hauls need be observed in the future to provide a confident conclusion.

Background

In the late 1800s Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) became the target of fisheries primarily focused on spawning adults in all large river systems along the Atlantic Coast (Ryder 1890). This fishery originated in the Delaware River which historically supported the largest Atlantic sturgeon population (Secor and Waldman 1999) and rapidly expanded to other river systems in the mid-Atlantic Bight before collapsing after just over a decade of high fishing effort (Cobb 1900). Following almost a century most noted by the lack of recovery in Atlantic sturgeon populations, the Atlantic States Marine Fisheries Commission (ASMFC) produced a Fishery Management Plan (FMP) for Atlantic sturgeon with a goal of restoring a sustainable fishery throughout its range (ASMFC 1998). At the same time, a coast-wide ban on harvest in state waters was implemented and followed shortly by a National Marine Fisheries Service (NMFS) ban in federal waters. In 2005, the NMFS established a status review team consisting of NMFS, FWS, and U.S. Geological Survey (USGS) scientists. The team completed their status review of Atlantic sturgeon and released their recommendations in February 2007. The review team recommended that three of the five distinct population segments (DPS)s of Atlantic sturgeon be listed as threatened under the ESA, including the New York Bight and Chesapeake Bay DPSs (ASSRT 2007). On October 6, 2010, NMFS published notice in the Federal Register proposing to list four of the Atlantic sturgeon DPSs, including the New York Bight and Chesapeake Bay DPSs, as endangered, and the Gulf of Maine DPS as threatened (75 FR 61872 and 75 FR 61904). A final listing determination for each DPS is due in the fall of 2011.

Atlantic sturgeons are anadromous and spend a large proportion of their life in the marine environment. In both the status review and FMP documents there are calls for more directed research on the marine phase of Atlantic sturgeon life history which has been underrepresented in the scientific literature (Stein et al. 2004a). The lack of information for management causes problems for fisheries professionals working within the confines of state jurisdictional boundaries, and is especially problematic for Atlantic sturgeon as they are known to suffer from interactions with coastal marine fisheries (Stein et al. 2004b, ASMFC 2007).

Harbor porpoise (*Phocoena phocoena*) co-occur with Atlantic sturgeon in marine and estuarine waters and are a protected species under the Marine Mammal Protection Act (MMPA). Due to high rates of incidental take in commercial fisheries, NMFS was required to reduce the number of harbor porpoise deaths in accordance with the MMPA. NMFS convened a group of federal, state, academic, and industry representatives and developed the Harbor Porpoise Take Reduction Plan (HPTRP), which was implemented in December 1998. The HPTRP mandates spatial and temporal modifications to commercial gillnets in the Gulf of Maine, southern New England, and the mid-Atlantic during periods of time when harvesters are likely to encounter harbor porpoises. One such modification required in the mid-Atlantic gillnet fishery is the use of tie-downs in the large mesh (17.8-63.7 cm stretch mesh) gillnet fishery in an attempt to lower the net profile thus decreasing the probability of harbor porpoise entanglement.

Monkfish (*Lophius americanus*) support a lucrative commercial fishery primarily centered in the waters of the mid-Atlantic and northeast US. Monkfish are targeted primarily through trawls in the northern management area and sink-gillnets in the mid-Atlantic. Sink gillnets, which include the monkfish fishery have been identified as a source of bycatch mortality for Atlantic sturgeon during their marine phase of their life history (Stein et al. 2004b, ASMFC 2007). As such, it is believed that changes in fishing practices in the monkfish fishery may have the potential to decrease the overall bycatch of Atlantic sturgeon. Unfortunately, data on the influence of monkfish specific practices (e.g. tie-downs) on Atlantic sturgeon bycatch are lacking resulting in the need for field studies to examine the influence of gillnet configuration on sturgeon bycatch.

Objectives

As outlined in the contract solicitation the objectives of our study were as follows 1) compare the bycatch rates of Atlantic sturgeon encountered in both control and experimental gillnets in NMFS Statistical Area 612, 2)[1] interrogate the NEFOP data to examine the effects of tie-downs on harbor porpoise bycatch, 3) compare the catch rates of the target species (monkfish) in each gillnet configuration, and 4) record the bycatch of other NMFS regulated or protected species.

Methods

Field Studies: The recent ASMFC (ASMFC 2007) report on bycatch of Atlantic sturgeon in coastal commercial fisheries of New England and the mid-Atlantic identified the

[1] This work was provided and is available in a separate report upon request.

NMFS Statistical Area 612 as a region which supports robust landings of monkfish that has been identified as a potential problem area for Atlantic sturgeon bycatch (Stein et al. 2004, ASMFC 2007). Through cooperative agreements with participating commercial harvesters, we examined catch rates of targeted species (e.g. monkfish) and bycatch of Atlantic sturgeon for two gillnet configurations. We utilized NMFS supplied gillnets which were 91.4m in length and consisted of 12 meshes x 30.5 cm stretch mesh with four mesh tie-downs (control) and 12 meshes x 30.5cm stretch mesh without tie-downs (experimental). Panels were constructed using Chatham green webbing (0.90mm) with a 0.50 hanging ratio, 9.5 mm poly float line with five 463.6 kg weak links per panel spliced into a 7.9 mm float line, and a 34.1 kg leadline (34.1kg/182.8m spool). If required, tie-downs were placed every 7.3m. In total, each vessel deployed 40 panels of gillnet configured in 10 panel strings (914m). Each string was comprised of either tie-downs present (control) or tie-downs absent (treatment) strings. Cooperating monkfish harvesters fished the strings of gillnets as paired replicates, where the pair was set of both the control and treatment gillnets strings set in a similar location, at a similar depth, and for a similar amount of time. A total of 120 hauls with the control and treatment net strings randomly selected at the start of the study was completed. A copy of the haul schedule was kept on board each vessel and confirmed by the vessel master and NMFS trained observer.

Monkfish harvesters employed normal gillnetting operations with soak times dependent upon fishing and weather conditions. Sampling operations were initiated in mid-November and ran through mid-December, thus the probability of encountering other protected resources (e.g. harbor porpoises and sea turtles) were thought to be low while the possibility of encountering migrating Atlantic sturgeon still existed. During periods of poor weather and/or poor fishing (i.e. low catch rates) harvesters could opt to leave their nets soaking for longer periods. Harvesters may also reduce soak times because of external factors including high catch rates or concerns over large amounts of bycatch or increased processing times when winter skate (*Leucoraja ocellata*) are encountered. In the event of snags or tears gillnet panels were either replaced entirely or repaired on site.

The harvesters were also allowed freedom to sample in regions of Statistical Area 612 that have historically supported the monkfish fishery. Captain Kevin Wark (F.V. Dana Christine) fished primarily inshore waters (depth range 20-40m) in an area that supported large monkfish landings as recent as 2008. Captain Wark selected these inshore waters not to maximize monkfish encounters as information gained from the fishing fleet suggested this area supporting a large biomass of winter skate. Instead, Captain Wark selected these inshore waters as he thought the probability of fishing in deeper waters, where the 2010 monkfish fishery in Area 612 was centered, would severely limit our chances for encountering Atlantic sturgeon. The Fishing Vessels Eliza and Endeavor were operated by Michael Karch and he fished in depths ranging from 21-100m of depth and sought to maximize monkfish landings.

Fishing operations were monitored by NMFS trained observers (AIS Inc.) who recorded total weight and length measurements for all monkfish and other commercially landed species. In instances where the number of individuals per net string exceeded 100, a sub-sample (n=100) was randomly selected and the total weight recorded. Due to problems securing an Exempted Fishing Permit for retention of prohibited species, all Atlantic sturgeon and other prohibited species (e.g. marine mammals) were quickly photographed and immediately released at the site of capture. In these instances the disposition (i.e. live/mortality) was recorded in addition to vertical and horizontal placement in the net panel although these data are not reported here.

Raw data sheets were signed by both the vessel captain and fishery observer and then scanned to ensure quick data entry and secure back up of raw data (available upon request). Data sheets were then entered into a relational database for generation of tables to facilitate report writing and statistical analyses. All statistical analyses were conducted using JMP Version 9.0 (2011) using ANOVA to test for differences between gear types except for the analyses of Atlantic sturgeon bycatch (CPUE) when a non-parametric analog was used. Statistical significance was inferred at $\alpha \leq 05$.

Results and Discussion

All field sampling was conducted in NMFS Statistical Area 612 (Figure 1) and was initiated on Nov. 14, 2010 by the commercial fishing vessels F.V. Endeavor, and the F.V. Dana Christine. On Nov. 16 2010, the F.V. Eliza started fishing operations. Operations were concluded on Dec. 18, 2010 at the completion of 120 net hauls (Table 1). Soak times for control (tie-down) gillnets averaged 38.3h (range= 2.5-143.0h) while the soak times for treatment gillnets averaged 37.4h (range 3.0-143.8h). There was no significant difference in the duration of soak time of control and treatment gillnets based on a one-way ANOVA (p=0.4467).

A total of 16 identified species were encountered, although due to permitting restrictions we were not able to handle (i.e. measure or weigh) Atlantic sturgeon or marine mammals. A total of 25,119 kg was landed with monkfish (11,044 kg) and winter skate (11,831 kg) dominating the catches followed by barndoor skate (*Dipturus laevis*) (914.7 kg) and spiny dogfish (*Squalus acanthias*) (501.6 kg) (Table 2). Discards of regulated species (i.e. monkfish, winter skate, and spiny dogfish) were limited by market conditions and quotas. In the vast majority of incidents vessel trip quotas were filled before these species were discarded. Other captured species accounted for 827.2 kg of the landings.

In total 23 adult and juvenile Atlantic sturgeon were encountered during the course of the project although we were unable to partition between adults and juveniles (Van Eenennaam et al. 1996) since we were not permitted to handle/measure any protected resources that were encountered(Table 3; Figure 2). Catch rates (i.e. CPUE: # Atlantic sturgeon/1000m net/h) of Atlantic sturgeon did not vary significantly ($p=0.1158$) by gillnet type based on a non-parametric ANOVA (Wilcoxon Test) (Figure 3). The vast majority ($n=104$) of gillnet sets did not encounter any Atlantic sturgeon while encounter rates in the remaining sets ranged from 0.32 to 28.8 individuals per net day. Our results were likely influenced by the large range in encounter rates. A retrospective power analyses indicated that with $\alpha=0.05$ and sigma (σ) = 2.7522 (derived from current study) the power of the current study to detect a significant difference when one existed was .1708. To raise the power of the study to 0.50 it was estimated that a sample size of 453 hauls would be required as a result of the low encounter probability we experienced with Atlantic sturgeon.

From April 2 through May 13, 2011 an additional 50 hauls of a single 10 shot gillnet constructed to the same specifications as the nets used in the present study with the exception of alternating treatment/control panels was fished as part of a directed sampling effort for Atlantic sturgeon in Delaware's coastal waters by researchers at Delaware State University. Over the course of the entire sampling period a total of 67 Atlantic sturgeon were landed in this net configuration. The encounter rates of Atlantic sturgeon in control ($n=34$) and treatment ($n=33$) were almost identical between gear types. Although conducted outside the bounds of the current study, these findings strongly suggest that tie-downs may not have much of a role in mediating

Atlantic sturgeon bycatch. Also of interest in the companion study was the fact that the control gillnets captured Atlantic sturgeon at a significantly (p=0.0146) smaller size (mean = 146.2 cm) compared to treatment nets (mean = 158.9). The apparent difference in the size selectivity whereby control nets are selecting for smaller Atlantic sturgeon may play a role in the encounter rates noted in the current study and could change if the size range of sturgeon were different. Although we were not able to show a significant difference in the likelihood of encounter rates by gillnet type the ratio of sturgeon encounters suggested that the control gear had a greater probability of retaining sturgeon. A potential reason for this disparity may lie in the fact that fewer larger Atlantic sturgeon were in our sampling area and thus were not vulnerable to capture in the treatment nets during the period of sampling. Results based on passive acoustic telemetry suggest that adult and large juvenile Atlantic sturgeon begin to depart Delaware Bay (approximately 100km south of Statistical Area 612) in early/mid-September with the median departure date of early November with the last individual leaving on December 1st, 2010 presumptively on their way south (Erickson et al. 2010) (Fox and Breece 2010).

Though the sturgeon encounter rates were not statistically different, the majority (n=18) of Atlantic sturgeon encounters took place in control gillnets (net with tie-downs) with hauls 1, 18, and 102 each entangling three sturgeon to account for half of all encounters in the control gillnets. Of the Atlantic sturgeon encountered in the control gillnets, 10 were released alive while eight suffered mortality because of entanglement (Figure 4). The experimental gillnets encountered five Atlantic sturgeon of which two were alive and three were dead upon landing. Due to low encounter rates we pooled across gillnet treatment types to examine the influence of soak time on Atlantic sturgeon disposition (i.e. live/dead) upon landing. The results of a logistic regression analysis of pooled Atlantic sturgeon encounters by soak time indicated that deposition was not significantly impacted by soak time ($p=0.0832$) (Figure 5). The results of this retrospective analysis were likely influenced by the live encounter of an Atlantic sturgeon entangled in a gillnet soaked 74 hours. Although it is intuitive that longer soak times likely result in increased risk of mortality we are unable to assign the timing of entanglement for individual Atlantic sturgeon.

We recorded nine marine mammal encounters, all of which took place in the treatment gillnets (no tie-downs) (Table 4; Figure 6). The majority (6/9) of marine mammals encountered were short-beaked common dolphin (*Delphinus delphis*). The remaining four animals were identified as "unknown dolphin" due to state of decomposition ($N = 3$). The relatively high encounter rate of short-beaked common dolphins in the experimental gillnets was surprising since this species is not typically encountered in tie-down gillnetting operations based on interviews with participants in the monkfish fishery and a cursory review of the NEFOP data. In fact, interviews with the captains of the cooperating fishing vessels indicate that neither short-beaked, common, or Atlantic white sided dolphins have been caught in over two decades of fishing for monkfish, although short-beaked common dolphins are regularly observed foraging in heavily fished areas.

The tie-downs utilized in today's monkfish fishery were originally developed as a result of Atlantic sturgeon harvesters noticing "slime" (mucous) marks indicative of monkfish presence during the NJ coastal intercept Atlantic sturgeon fishery (Kevin Wark, F.V. Dana Christine, personal communication). In traditional Atlantic sturgeon gillnets, monkfish were not landed in large numbers due to escapement in the nets leaving a telltale mucous mark. After some experimentation, commercial harvesters were able to develop the tie-down methodology in addition to proper strategies for hauling and deployment, which helped contribute to the large-scale development of the monkfish fishery in the late 1980s and early 1990s.

Through our sampling efforts for this study a total of 11,044 kg of monkfish were landed (Table 2). The vast majority (66.2%) of monkfish were landed in control nets (with tie-downs) which represented a statistically significant difference ($p<0.0001$) in CPUE (# monkfish/1000m gillnet/h) based on the results of a paired t-test. In addition to catching monkfish at higher rates, the control gillnet configuration also landed significantly ($p<0.0001$) larger (mean= 69.6cm) monkfish when compared to monkfish landed in the experimental gillnets (mean= 67.7 cm) (Figure 7). Winter skate, the dominant species landed by weight (11,831kg) was heavily skewed with 84.9% landed in the control gillnets. Unlike monkfish, winter skate landed in the control gillnets (mean= 81.8cm) were significantly ($p<.0001$) smaller than those landed in the experimental net configuration (mean= 84.1cm) (Figure 8).

The results of this study suggest a complex problem surrounding the issue of tie-downs in the New Jersey monkfish fishery, which is somewhat reflective of the larger protected resource-commercial fishery interactions along the US east coast (Zollett 2009). The use of tie-downs clearly enhances the catch rates of both monkfish and winter skate while at the same time selecting for larger monkfish, which can translate into increased landings values for the targeted species. At the same time, the use of tie downs appears to have been successful in decreasing the take of harbor porpoise, which was a stated goal of the HPTRP. At the same time, our study shows equivocal results on the impact of tie-downs on the rate of Atlantic sturgeon bycatch. Although we found no significant difference in the rate of Atlantic sturgeon encounter, it should be noted that the overall power of our test statistic was low likely a result of the rarity of encounter events.

We did not find any significant difference in Atlantic sturgeon encounter rates by gillnet configuration, and the results of a companion study conducted in the spring of 2001 indicate that tie-downs play little, if any, role in mediating bycatch rates of sturgeon. At the same time our companion study may shed some light on the potential for tie-downs to select for smaller Atlantic sturgeon suggesting that future study efforts be conducted when a broad segment of Atlantic sturgeon are in the region and vulnerable to the fishing gear.

The modification of gillnet configuration as well as fishing practices (e.g. soak times) are areas that shows much promise for the reduction of Atlantic sturgeon bycatch. Gessner and Ardnt (2006) reconfigured gillnets through the creation of a gap between the lead line and the bottom meshes to allow Siberian sturgeon (*Acipenser baerii*) passage while still retaining most target species at levels similar to control gillnets. Our results suggest that removal of tie-downs will likely decrease the landings of targeted species, increased take of marine mammals, and may not decrease Atlantic sturgeon encounters to levels that are acceptable to resource managers. However, it is only through field trials under normal fishing conditions that we will be able to adequately assess the impacts of future gear modifications on the landings of targeted species as well as the bycatch of protected resources.

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Table 1: Sample locations (decimal degrees) and haul information for F.V. Dana Christine, F.V. Endeavor, and F.V. Eliza.

Haul Pairing	Haul Number	Vessel	Gear Type	Set Date	Set Latitude Start	Set Longitude Start	Haul Date	Soak Time (hours)	Depth (m)
1	1	Dana Christine	Control	11/14/2010	40.14278	-73.85389	11/14/2010	2.50	27.43
1	2	Dana Christine	Treatment	11/14/2010	40.14167	-73.86778	11/14/2010	3.00	23.77
2	3	Dana Christine	Control	11/14/2010	40.15139	-73.82444	11/14/2010	4.00	32.92
2	4	Dana Christine	Treatment	11/14/2010	40.14694	-73.83917	11/14/2010	4.75	27.43
3	5	Endeavor	Treatment	11/14/2010	40.00025	-73.10006	11/15/2010	23.50	45.72
3	6	Endeavor	Control	11/14/2010	40.01667	-73.11669	11/15/2010	24.25	46.63
4	7	Endeavor	Treatment	11/14/2010	40.01672	-73.11692	11/15/2010	25.50	46.27
4	8	Endeavor	Control	11/14/2010	40.01678	-73.13356	11/15/2010	26.00	47.18
5	9	Dana Christine	Treatment	11/14/2010	40.14778	-73.83000	11/14/2010	18.00	29.26
5	10	Dana Christine	Control	11/14/2010	40.15306	-73.82389	11/15/2010	19.00	32.92
6	11	Dana Christine	Treatment	11/14/2010	40.15000	-73.84250	11/15/2010	21.00	27.43
6	12	Dana Christine	Control	11/14/2010	40.15222	-73.85750	11/15/2010	22.50	27.43
7	13	Endeavor	Control	11/15/2010	40.01675	-73.11678	11/16/2010	22.75	46.27
7	14	Endeavor	Treatment	11/15/2010	40.01667	-73.10008	11/16/2010	23.00	44.81
8	15	Endeavor	Treatment	11/15/2010	40.01681	-73.13339	11/16/2010	22.25	46.63
8	16	Endeavor	Control	11/15/2010	40.01681	-73.15003	11/16/2010	22.75	46.63
9	17	Dana Christine	Treatment	11/15/2010	40.14778	-73.82778	11/16/2010	22.00	32.92
9	18	Dana Christine	Control	11/15/2010	40.15389	-73.81472	11/16/2010	23.20	32.92
10	19	Dana Christine	Treatment	11/16/2010	40.15750	-73.78667	11/16/2010	5.10	34.75
10	20	Dana Christine	Control	11/16/2010	40.15472	-73.80083	11/16/2010	5.90	34.75
11	21	Eliza	Control	11/16/2010	40.01678	-73.15000	11/19/2010	70.75	38.40
11	22	Eliza	Treatment	11/16/2010	40.01681	-73.13336	11/19/2010	71.25	47.18
12	23	Eliza	Control	11/16/2010	40.01667	-73.10017	11/19/2010	73.50	45.72
12	24	Eliza	Treatment	11/16/2010	40.01667	-73.08356	11/19/2010	75.50	45.35
13	25	Dana Christine	Control	11/21/2010	40.14833	-73.84306	11/21/2010	3.20	27.43
13	26	Dana Christine	Treatment	11/21/2010	40.15222	-73.85750	11/21/2010	3.70	27.43
14	27	Dana Christine	Control	11/21/2010	40.15139	-73.82444	11/21/2010	5.00	31.09
14	28	Dana Christine	Treatment	11/21/2010	40.14806	-73.82528	11/21/2010	5.20	29.26
15	29	Eliza	Treatment	11/19/2010	40.01681	-73.11675	11/22/2010	69.75	43.71
15	30	Eliza	Control	11/19/2010	40.01678	-73.13339	11/22/2010	70.25	47.73
16	31	Eliza	Treatment	11/19/2010	40.01678	-73.08353	11/22/2010	70.00	46.82
16	32	Eliza	Control	11/19/2010	40.00003	-73.10014	11/22/2010	70.50	46.45
17	33	Dana Christine	Control	11/21/2010	40.17250	-73.78639	11/22/2010	17.00	31.09
17	34	Dana Christine	Treatment	11/21/2010	40.16639	-73.79944	11/22/2010	21.03	25.60
18	35	Dana Christine	Control	11/21/2010	40.15139	-73.82444	11/22/2010	19.60	32.92
18	36	Dana Christine	Treatment	11/21/2010	40.14778	-73.82778	11/22/2010	21.30	27.43
19	37	Endeavor	Treatment	11/22/2010	40.01672	-73.10014	11/23/2010	20.75	47.55
19	38	Endeavor	Control	11/22/2010	40.01669	-73.11678	11/22/2010	21.50	47.00
20	39	Endeavor	Treatment	11/22/2010	40.01678	-73.13339	11/23/2010	24.25	48.10
20	40	Endeavor	Control	11/22/2010	40.01678	-73.15000	11/23/2010	24.00	47.55
21	41	Dana Christine	Control	11/22/2010	40.15139	-73.82667	11/23/2010	20.60	27.43
21	42	Dana Christine	Treatment	11/22/2010	40.14778	-73.82778	11/23/2010	21.20	27.43
22	43	Dana Christine	Control	11/22/2010	40.17361	-73.77278	11/23/2010	24.20	29.26
22	44	Dana Christine	Treatment	11/22/2010	40.16750	-73.78806	11/23/2010	24.30	31.09
23	45	Dana Christine	Treatment	11/23/2010	40.14778	-73.82778	11/25/2010	20.50	29.26
23	46	Dana Christine	Control	11/23/2010	40.15139	-73.82667	11/25/2010	20.90	29.26
24	47	Dana Christine	Treatment	11/23/2010	40.13861	-73.70611	11/25/2010	20.80	38.40
24	48	Dana Christine	Control	11/23/2010	40.12944	-73.69306	11/25/2010	20.30	38.40
25	49	Eliza	Treatment	11/23/2010	40.01678	-73.13339	11/28/2010	116.50	46.45
25	50	Eliza	Control	11/23/2010	40.01678	-73.15000	11/28/2010	117.50	46.63
26	51	Eliza	Control	11/23/2010	40.01672	-73.11675	11/28/2010	120.25	100.58
26	52	Eliza	Treatment	11/23/2010	40.01672	-73.10008	11/28/2010	121.25	46.63
27	53	Dana Christine	Treatment	11/25/2010	40.17083	-73.78472	11/28/2010	72.80	29.26
27	54	Dana Christine	Control	11/25/2010	40.16639	-73.79944	11/28/2010	73.50	31.09
28	55	Dana Christine	Treatment	11/25/2010	40.13083	-73.69722	11/28/2010	73.20	31.09
28	56	Dana Christine	Control	11/25/2010	40.12500	-73.68556	11/28/2010	74.10	29.26
29	57	Eliza	Control	11/28/2010	40.01672	-73.10014	11/29/2010	20.00	45.72
29	58	Eliza	Treatment	11/28/2010	40.01672	-73.08353	11/29/2010	20.50	45.90
30	59	Eliza	Treatment	11/28/2010	40.01678	-73.13339	11/29/2010	23.25	46.63
30	60	Eliza	Control	11/28/2010	40.01678	-73.15000	11/29/2010	24.00	46.45

31	61	Dana Christine	Treatment	11/28/2010	40.17083	-73.78472	11/29/2010	21.80	31.09
31	62	Dana Christine	Control	11/28/2010	40.16833	-73.79889	11/29/2010	22.90	31.09
32	63	Dana Christine	Control	11/28/2010	40.12778	-73.69361	11/29/2010	21.70	31.09
32	64	Dana Christine	Treatment	11/28/2010	40.13083	-73.69722	11/29/2010	22.10	40.23
33	65	Endeavor	Control	11/29/2010	40.01678	-73.15000	11/30/2010	22.00	46.09
33	66	Endeavor	Treatment	11/29/2010	40.01678	-73.13339	11/30/2010	22.50	47.18
34	67	Endeavor	Control	11/29/2010	40.01672	-73.10014	11/30/2010	25.00	44.81
34	68	Endeavor	Treatment	11/29/2010	40.01672	-73.08350	11/30/2010	25.75	45.72
35	69	Dana Christine	Control	11/29/2010	40.12361	-73.68167	11/30/2010	19.70	40.23
35	70	Dana Christine	Treatment	11/29/2010	40.13083	-73.69722	11/30/2010	21.00	40.23
36	71	Dana Christine	Control	11/29/2010	40.10000	-73.70778	11/30/2010	20.90	40.23
36	72	Dana Christine	Treatment	11/29/2010	40.15111	-73.71556	11/30/2010	21.70	40.23
37	73	Eliza	Control	11/30/2010	40.01678	-73.13336	12/3/2010	71.25	47.55
37	74	Eliza	Treatment	11/30/2010	40.01678	-73.11672	12/3/2010	24.25	47.73
38	75	Eliza	Treatment	11/30/2010	40.01672	-73.08344	12/3/2010	71.50	46.63
38	76	Eliza	Control	11/30/2010	40.01672	-73.10008	12/3/2010	72.00	46.63
39	77	Dana Christine	Control	11/30/2010	40.14167	-73.70722	12/3/2010	71.40	40.23
39	78	Dana Christine	Treatment	11/30/2010	40.15278	-73.71722	12/3/2010	71.60	40.23
40	79	Dana Christine	Control	11/30/2010	40.12361	-73.68167	12/3/2010	74.00	40.23
40	80	Dana Christine	Treatment	11/30/2010	40.13083	-73.69722	12/3/2010	75.97	40.23
41	81	Dana Christine	Control	12/8/2010	39.98361	-74.00222	12/8/2010	3.80	20.12
41	82	Dana Christine	Treatment	12/8/2010	39.98278	-74.01417	12/8/2010	4.50	20.12
42	83	Dana Christine	Treatment	12/8/2010	39.99333	-73.99889	12/8/2010	4.80	21.95
42	84	Dana Christine	Control	12/8/2010	39.99667	-73.99778	12/8/2010	5.20	21.95
43	85	Endeavor	Control	12/3/2010	40.01678	-73.13333	12/9/2010	142.75	46.09
43	86	Endeavor	Treatment	12/3/2010	40.01675	-73.11672	12/9/2010	134.75	46.63
44	87	Endeavor	Control	12/3/2010	40.01669	-73.11675	12/9/2010	143.00	46.27
44	88	Endeavor	Treatment	12/3/2010	40.01672	-73.10014	12/9/2010	143.75	46.63
45	89	Dana Christine	Treatment	12/8/2010	39.98278	-74.01417	12/9/2010	19.50	21.95
45	90	Dana Christine	Control	12/8/2010	39.98361	-74.00222	12/9/2010	19.50	21.95
46	91	Dana Christine	Treatment	12/8/2010	39.99333	-73.99889	12/9/2010	19.00	21.95
46	92	Dana Christine	Control	12/8/2010	39.99778	-74.00917	12/9/2010	19.90	21.95
47	93	Dana Christine	Treatment	12/9/2010	39.98083	-73.98917	12/10/2010	22.30	21.95
47	94	Dana Christine	Control	12/9/2010	39.98361	-74.00000	12/10/2010	22.90	21.95
48	95	Dana Christine	Control	12/9/2010	39.99778	-74.00917	12/10/2010	22.30	21.95
48	96	Dana Christine	Treatment	12/9/2010	39.99333	-73.99889	12/10/2010	22.70	21.95
49	97	Endeavor	Treatment	12/9/2010	40.01675	-73.11669	12/10/2010	22.00	51.76
49	98	Endeavor	Control	12/9/2010	40.01678	-73.11692	12/10/2010	22.25	47.18
50	99	Endeavor	Control	12/9/2010	40.01672	-73.10008	12/10/2010	21.00	46.63
50	100	Endeavor	Treatment	12/9/2010	40.01672	-73.08347	12/10/2010	21.75	47.18
51	101	Dana Christine	Treatment	12/10/2010	39.97944	-73.98750	12/11/2010	22.70	21.95
51	102	Dana Christine	Control	12/10/2010	39.98361	-74.00000	12/11/2010	23.80	21.95
52	103	Dana Christine	Treatment	12/10/2010	39.99222	-73.98778	12/11/2010	23.20	21.95
52	104	Dana Christine	Control	12/10/2010	39.99639	-74.00028	12/11/2010	23.50	21.95
53	105	Endeavor	Treatment	12/10/2010	40.01678	-73.13336	12/11/2010	23.25	47.18
53	106	Endeavor	Control	12/10/2010	40.01678	-73.13358	12/11/2010	23.50	47.18
54	107	Endeavor	Control	12/10/2010	40.01672	-73.10014	12/11/2010	23.00	46.63
54	108	Endeavor	Treatment	12/10/2010	40.01672	-73.08350	12/11/2010	23.75	47.18
55	109	Endeavor	Control	12/11/2010	40.01672	-73.10014	12/16/2010	121.50	46.63
55	110	Endeavor	Treatment	12/11/2010	40.01672	-73.08350	12/16/2010	122.50	46.09
56	111	Endeavor	Treatment	12/11/2010	40.01678	-73.13339	12/16/2010	124.50	47.18
56	112	Endeavor	Control	12/11/2010	40.01678	-73.15000	12/16/2010	125.00	47.55
57	113	Endeavor	Treatment	12/17/2010	40.00006	-73.91689	12/17/2010	5.00	22.86
57	114	Endeavor	Control	12/17/2010	40.00006	-73.93353	12/17/2010	5.50	22.49
58	115	Endeavor	Control	12/17/2010	40.00011	-73.90000	12/17/2010	5.75	22.49
58	116	Endeavor	Treatment	12/17/2010	40.00011	-73.88336	12/17/2010	6.25	22.49
59	117	Endeavor	Control	12/17/2010	40.00006	-73.93356	12/18/2010	18.50	21.21
59	118	Endeavor	Treatment	12/17/2010	40.00006	-73.91689	12/18/2010	20.00	21.95
60	119	Endeavor	Treatment	12/17/2010	40.00011	-73.88339	12/18/2010	12.50	22.31
60	120	Endeavor	Control	12/17/2010	40.00011	-73.90000	12/18/2010	19.00	22.68

Table 2: Summary of catch weight (kg) for identified and weighed species by both vessel and gear type. Note: table does not include prohibited species which were not accurately measured.

Vessel	Gear Type	Barndoor Skate (kg)	Bluefish (kg)	Clearnose Skate (kg)	Horseshoe Crab (kg)	Jonah Crab (kg)	Little Skate (kg)	Monkfish (kg)	Northern Stargazer (kg)	Sea Scallop (kg)	Spiny Dogfish (kg)	Summer Flounder (kg)	Tautog (kg)	Winter Skate (kg)	Total Weight (kg)
Dana Christine	Control	13.6	2.7	11.3	277.1	6.8	55.8	1623.8	5.0	0.7	101.6	1.6	3.6	8733.8	10837.4
Dana Christine	Treatment	0.0	130.6	2.3	70.3	0.0	9.1	684.4	0.0	0.0	198.6	0.0	0.0	1564.6	2659.9
Eliza	Control	258.5	0.0	7.3	4.5	0.0	72.1	3120.6	0.0	0.0	19.0	0.0	0.0	285.3	3767.3
Eliza	Treatment	83.0	0.0	0.0	0.0	0.0	3.2	1678.9	0.0	0.0	39.9	5.0	0.0	81.6	1891.6
Endeavor	Control	455.3	39.0	20.9	1.8	0.0	76.6	2561.9	0.0	0.0	58.0	4.5	0.0	1029.5	4247.6
Endeavor	Treatment	104.3	0.0	4.1	2.3	0.0	9.1	1374.6	0.0	0.0	84.4	0.0	0.0	136.1	1714.7
	Total Control	727.4	41.7	39.5	283.4	6.8	204.5	7306.3	5.0	0.7	178.7	6.1	3.6	10048.5	18852.4
	Total Treatment	187.3	130.6	6.3	72.6	0.0	21.3	3737.9	0.0	0.0	322.9	5.0	0.0	1782.3	6266.2
	Total Weights	914.7	172.3	45.8	356.0	6.8	225.9	11044.2	5.0	0.7	501.6	11.1	3.6	11830.8	25118.6

Table 3: Summary of Atlantic sturgeon encounters including haul information, gear type, individual status, and visually estimated weight.

Haul Number	Set Date	Haul Date	Soak Time	Gear Type	Sturgeon Status	Estimated Weight (kg)
1	11/14/2010	11/14/2010	2.50	Control	alive	41
1	11/14/2010	11/14/2010	2.50	Control	alive	36
1	11/14/2010	11/14/2010	2.50	Control	alive	34
2	11/14/2010	11/14/2010	3.00	Treatment	alive	32
9	11/14/2010	11/14/2010	18.00	Treatment	alive	32
11	11/14/2010	11/15/2010	21.00	Treatment	dead	36
12	11/14/2010	11/15/2010	22.50	Control	dead	34
12	11/14/2010	11/15/2010	22.50	Control	dead	36
18	11/15/2010	11/16/2010	23.20	Control	alive	18
18	11/15/2010	11/16/2010	23.20	Control	dead	18
18	11/15/2010	11/16/2010	23.20	Control	dead	23
48	11/23/2010	11/25/2010	20.30	Control	alive	36
54	11/25/2010	11/28/2010	73.50	Control	dead	36
62	11/28/2010	11/29/2010	22.90	Control	alive	43
77	11/30/2010	12/3/2010	71.40	Control	dead	27
78	11/30/2010	12/3/2010	71.60	Treatment	dead	45
79	11/30/2010	12/3/2010	74.00	Control	alive	27
93	12/9/2010	12/10/2010	22.30	Treatment	dead	23
95	12/9/2010	12/10/2010	22.30	Control	dead	14
102	12/10/2010	12/11/2010	23.80	Control	dead	23
102	12/10/2010	12/11/2010	23.80	Control	dead	29
102	12/10/2010	12/11/2010	23.80	Control	dead	45
104	12/10/2010	12/11/2010	23.50	Control	alive	34

Table 4: Marine mammal encounter information including haul number, gear type, soak time, estimated weight in kilograms if possible, and species if known. Unidentified (NK) dolphin in haul 61 is thought to be the same individual caught in haul 53.

Vessel Name	Set Date	Haul Date	Soak Time (Hour)	Estimated Weight	Gear Type	Species	Digital Images	Comments
Dana Christine	11/25/2010	11/28/2010	72.8	113	Treatment	Short Beaked Common Dolphin	042-043	
Dana Christine	11/28/2010	11/29/2010	21.8	18	Treatment	NK Dolphin		Potentially same individual caught in haul 53
Dana Christine	11/29/2010	11/30/2010	21.7	113	Treatment	Short Beaked Common Dolphin		
Eliza	11/30/2010	12/3/2010	24.25		Treatment	Short Beaked Common Dolphin	055-056	ID verified by NEFSC
Eliza	11/30/2010	12/3/2010	24.25		Treatment	NK Dolphin	056 only	
Dana Christine	11/30/2010	12/3/2010	71.6	68	Treatment	Short Beaked Common Dolphin	201030-201035	
Dana Christine	11/30/2010	12/3/2010	75.97	91	Treatment	Short Beaked Common Dolphin	201036-201039	
Endeavor	12/3/2010	12/9/2010	143.75		Treatment	NK Dolphin	201040-201044	
Dana Christine	12/8/2010	12/9/2010	19.5	91	Treatment	Short Beaked Common Dolphin	069-070	

Table 7: Catch information for monkfish (target species). Table includes kept fish only.

Haul Number	Vessel	Gear Type	Set Date	Haul Date	Soak Time (hour)	Weight (kg)	Mean Length (cm)
5	Endeavor	Treatment	11/14/2010	11/15/2010	23.50	104	67.61
6	Endeavor	Control	11/14/2010	11/15/2010	24.25	139	70.90
7	Endeavor	Treatment	11/14/2010	11/15/2010	25.50	22	71.20
8	Endeavor	Control	11/14/2010	11/15/2010	26.00	105	76.30
9	Dana Christine	Treatment	11/14/2010	11/14/2010	18.00	23	83.18
10	Dana Christine	Control	11/14/2010	11/15/2010	19.00	45	81.99
11	Dana Christine	Treatment	11/14/2010	11/15/2010	21.00	7	86.12
12	Dana Christine	Control	11/14/2010	11/15/2010	22.50	24	83.48
13	Endeavor	Control	11/15/2010	11/16/2010	22.75	109	68.30
14	Endeavor	Treatment	11/15/2010	11/16/2010	23.00	48	65.40
15	Endeavor	Treatment	11/15/2010	11/16/2010	22.25	47	65.27
16	Endeavor	Control	11/15/2010	11/16/2010	22.75	121	71.55
17	Dana Christine	Treatment	11/15/2010	11/16/2010	22.00	6	85.90
18	Dana Christine	Control	11/15/2010	11/16/2010	23.20	32	82.00
19	Dana Christine	Treatment	11/16/2010	11/16/2010	5.10	15	104.00
21	Eliza	Control	11/16/2010	11/19/2010	70.75	210	62.36
22	Eliza	Treatment	11/16/2010	11/19/2010	71.25	125	61.11
23	Eliza	Control	11/16/2010	11/19/2010	73.50	268	61.35
24	Eliza	Treatment	11/16/2010	11/19/2010	75.50	112	59.35
25	Dana Christine	Control	11/21/2010	11/21/2010	3.20	11	84.50
26	Dana Christine	Treatment	11/21/2010	11/21/2010	3.70	15	74.50
27	Dana Christine	Control	11/21/2010	11/21/2010	5.00	13	78.33
28	Dana Christine	Treatment	11/21/2010	11/21/2010	5.20	14	74.00
29	Eliza	Treatment	11/19/2010	11/22/2010	69.75	239	65.62
30	Eliza	Control	11/19/2010	11/22/2010	70.25	342	71.18
31	Eliza	Treatment	11/19/2010	11/22/2010	70.00	208	70.37
32	Eliza	Control	11/19/2010	11/22/2010	70.50	473	69.42
33	Dana Christine	Control	11/21/2010	11/22/2010	17.00	39	79.71
34	Dana Christine	Treatment	11/21/2010	11/22/2010	21.03	31	80.67
35	Dana Christine	Control	11/21/2010	11/22/2010	19.60	82	81.00
36	Dana Christine	Treatment	11/21/2010	11/22/2010	21.30	6	83.71
37	Endeavor	Treatment	11/22/2010	11/23/2010	20.75	184	69.09
38	Endeavor	Control	11/22/2010	11/22/2010	21.50	160	71.00
39	Endeavor	Treatment	11/22/2010	11/23/2010	24.25	101	66.77
40	Endeavor	Control	11/22/2010	11/23/2010	24.00	133	68.96
41	Dana Christine	Control	11/22/2010	11/23/2010	20.60	13	78.54
42	Dana Christine	Treatment	11/22/2010	11/23/2010	21.20	8	81.55
43	Dana Christine	Control	11/22/2010	11/23/2010	24.20	29	79.97
44	Dana Christine	Treatment	11/22/2010	11/23/2010	24.30	17	86.00
45	Dana Christine	Treatment	11/23/2010	11/25/2010	20.50	39	81.67
46	Dana Christine	Control	11/23/2010	11/25/2010	20.90	112	80.76
47	Dana Christine	Treatment	11/23/2010	11/25/2010	20.80	55	77.80
48	Dana Christine	Control	11/23/2010	11/25/2010	20.30	164	79.30
49	Eliza	Treatment	11/23/2010	11/28/2010	116.50	283	69.91
50	Eliza	Control	11/23/2010	11/28/2010	117.50	460	70.38
51	Eliza	Control	11/23/2010	11/28/2010	120.25	493	72.57
52	Eliza	Treatment	11/23/2010	11/28/2010	121.25	229	70.34
53	Dana Christine	Treatment	11/25/2010	11/28/2010	72.80	41	80.93
54	Dana Christine	Control	11/25/2010	11/28/2010	73.50	87	82.67
55	Dana Christine	Treatment	11/25/2010	11/28/2010	73.20	201	77.50
56	Dana Christine	Control	11/25/2010	11/28/2010	74.10	247	76.31
57	Eliza	Control	11/28/2010	11/29/2010	20.00	188	72.03

Table 7 (continued): Catch information for monkfish (target species). Table includes kept fish only.

Haul Number	Vessel	Gear Type	Set Date	Haul Date	Soak Time (hour)	Weight (kg)	Mean Length (cm)
58	Eliza	Treatment	11/28/2010	11/29/2010	20.50	136	71.88
59	Eliza	Treatment	11/28/2010	11/29/2010	23.25	125	67.29
60	Eliza	Control	11/28/2010	11/29/2010	24.00	181	68.42
61	Dana Christine	Treatment	11/28/2010	11/29/2010	21.80	7	84.86
62	Dana Christine	Control	11/28/2010	11/29/2010	22.90	21	80.87
63	Dana Christine	Control	11/28/2010	11/29/2010	21.70	61	79.13
64	Dana Christine	Treatment	11/28/2010	11/29/2010	22.10	10	71.40
65	Endeavor	Control	11/29/2010	11/30/2010	22.00	113	68.17
66	Endeavor	Treatment	11/29/2010	11/30/2010	22.50	117	64.33
67	Endeavor	Control	11/29/2010	11/30/2010	25.00	220	68.45
68	Endeavor	Treatment	11/29/2010	11/30/2010	25.75	123	68.36
69	Dana Christine	Control	11/29/2010	11/30/2010	19.70	25	81.36
70	Dana Christine	Treatment	11/29/2010	11/30/2010	21.00	10	64.00
71	Dana Christine	Control	11/29/2010	11/30/2010	20.90	57	79.00
72	Dana Christine	Treatment	11/29/2010	11/30/2010	21.70	28	74.86
73	Eliza	Control	11/30/2010	12/3/2010	71.25	186	71.38
74	Eliza	Treatment	11/30/2010	12/3/2010	24.25	94	70.60
75	Eliza	Treatment	11/30/2010	12/3/2010	71.50	110	72.05
76	Eliza	Control	11/30/2010	12/3/2010	72.00	287	69.80
77	Dana Christine	Control	11/30/2010	12/3/2010	71.40	201	80.07
78	Dana Christine	Treatment	11/30/2010	12/3/2010	71.60	38	84.27
79	Dana Christine	Control	11/30/2010	12/3/2010	74.00	142	81.91
80	Dana Christine	Treatment	11/30/2010	12/3/2010	75.97	35	84.46
85	Endeavor	Control	12/3/2010	12/9/2010	142.75	293	71.25
86	Endeavor	Treatment	12/3/2010	12/9/2010	134.75	120	69.89
87	Endeavor	Control	12/3/2010	12/9/2010	143.00	350	71.71
88	Endeavor	Treatment	12/3/2010	12/9/2010	143.75	100	74.88
89	Dana Christine	Treatment	12/8/2010	12/9/2010	19.50	18	83.11
91	Dana Christine	Treatment	12/8/2010	12/9/2010	19.00	5	83.40
92	Dana Christine	Control	12/8/2010	12/9/2010	19.90	70	81.83
93	Dana Christine	Treatment	12/9/2010	12/10/2010	22.30	7	79.89
95	Dana Christine	Control	12/9/2010	12/10/2010	22.30	60	82.43
96	Dana Christine	Treatment	12/9/2010	12/10/2010	22.70	31	82.23
97	Endeavor	Treatment	12/9/2010	12/10/2010	22.00	42	66.79
98	Endeavor	Control	12/9/2010	12/10/2010	22.25	98	72.74
99	Endeavor	Control	12/9/2010	12/10/2010	21.00	102	67.78
100	Endeavor	Treatment	12/9/2010	12/10/2010	21.75	29	65.67
101	Dana Christine	Treatment	12/10/2010	12/11/2010	22.70	17	83.44
102	Dana Christine	Control	12/10/2010	12/11/2010	23.80	16	83.20
104	Dana Christine	Control	12/10/2010	12/11/2010	23.50	73	79.36
105	Endeavor	Treatment	12/10/2010	12/11/2010	23.25	51	70.78
106	Endeavor	Control	12/10/2010	12/11/2010	23.50	143	69.52
107	Endeavor	Control	12/10/2010	12/11/2010	23.00	119	69.91
108	Endeavor	Treatment	12/10/2010	12/11/2010	23.75	95	67.95
109	Endeavor	Control	12/11/2010	12/16/2010	121.50	218	74.12
110	Endeavor	Treatment	12/11/2010	12/16/2010	122.50	87	72.39
111	Endeavor	Treatment	12/11/2010	12/16/2010	124.50	68	72.54
112	Endeavor	Control	12/11/2010	12/16/2010	125.00	98	77.02
116	Endeavor	Treatment	12/17/2010	12/17/2010	6.25	7	74.00
117	Endeavor	Control	12/17/2010	12/18/2010	18.50	9	79.10
118	Endeavor	Treatment	12/17/2010	12/18/2010	20.00	9	83.39
119	Endeavor	Treatment	12/17/2010	12/18/2010	12.50	5	81.33
120	Endeavor	Control	12/17/2010	12/18/2010	19.00	16	81.41

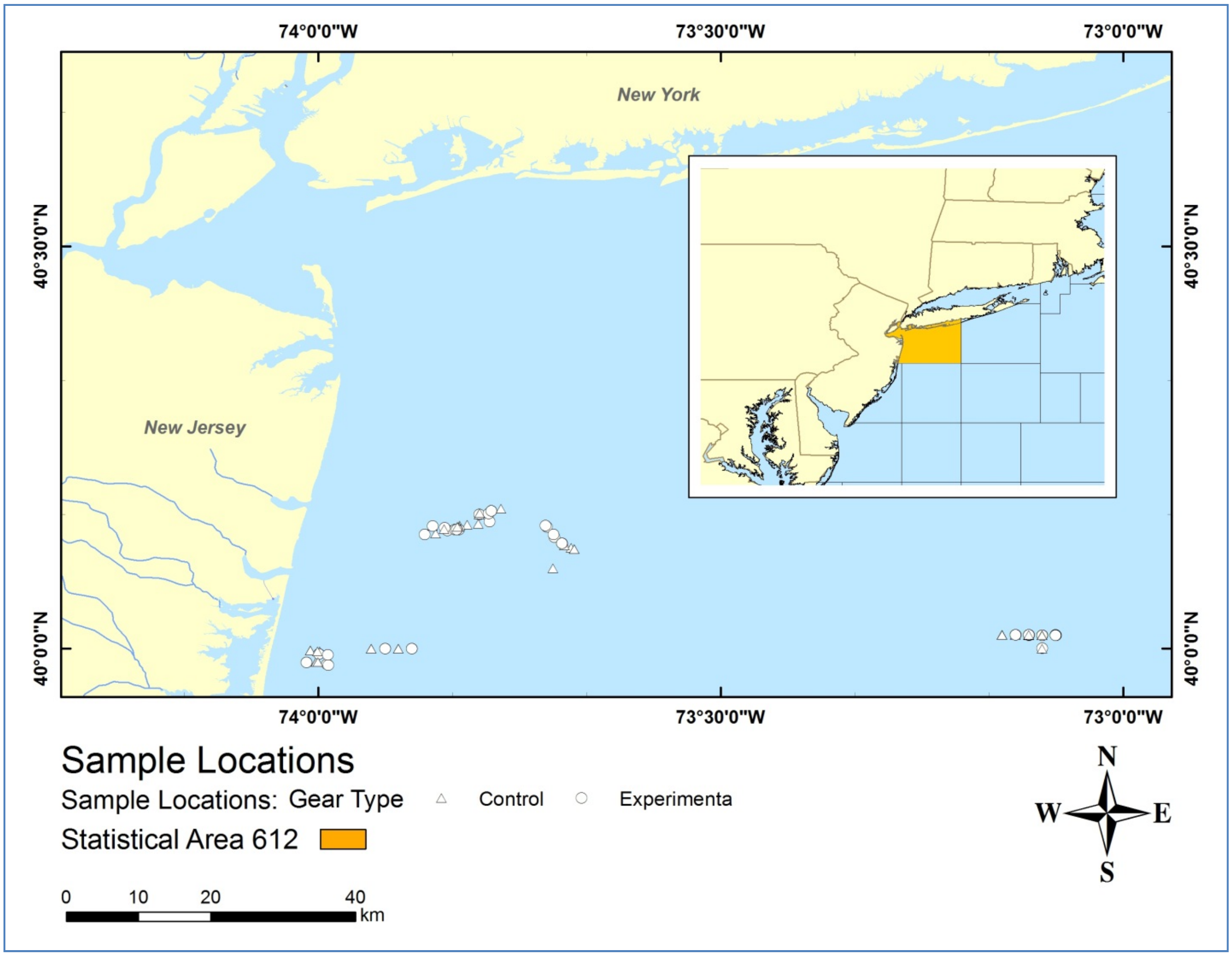

Figure 1: Location of gillnet sampling areas within NMFS Statistical Area 612 (inset) plotted by net type (triangle= control, open circles = experimental).

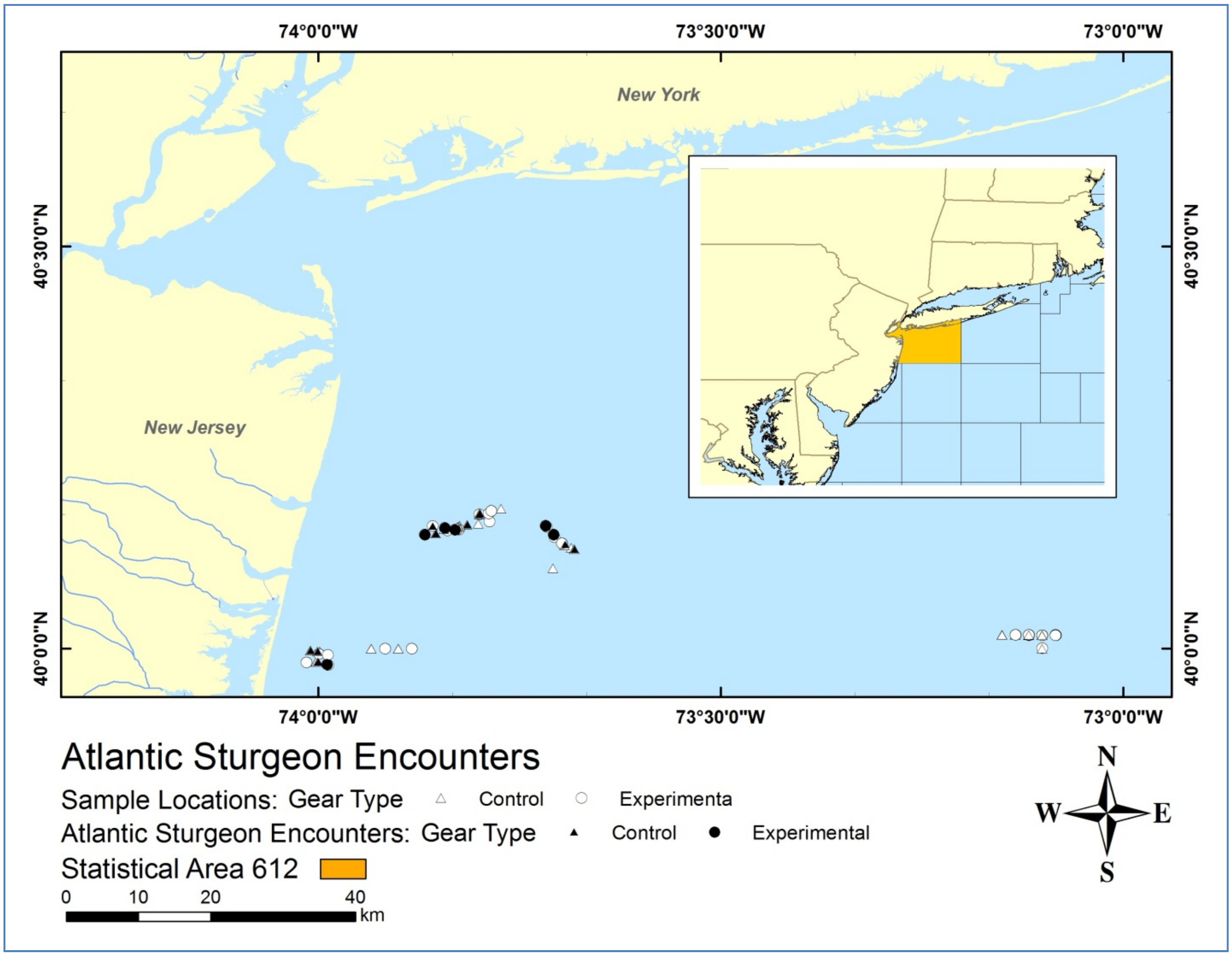

Figure 2: Location of gillnet activities by gear type (control = triangles; treatment= circles) within NMFS Statistical Area 612 with Atlantic sturgeon encounters (filled symbols). Figure is zoomed to represent the area that encompasses Atlantic sturgeon encounters. Gillnets fished further to the east are omitted from this figure due to the lack of encounter history.

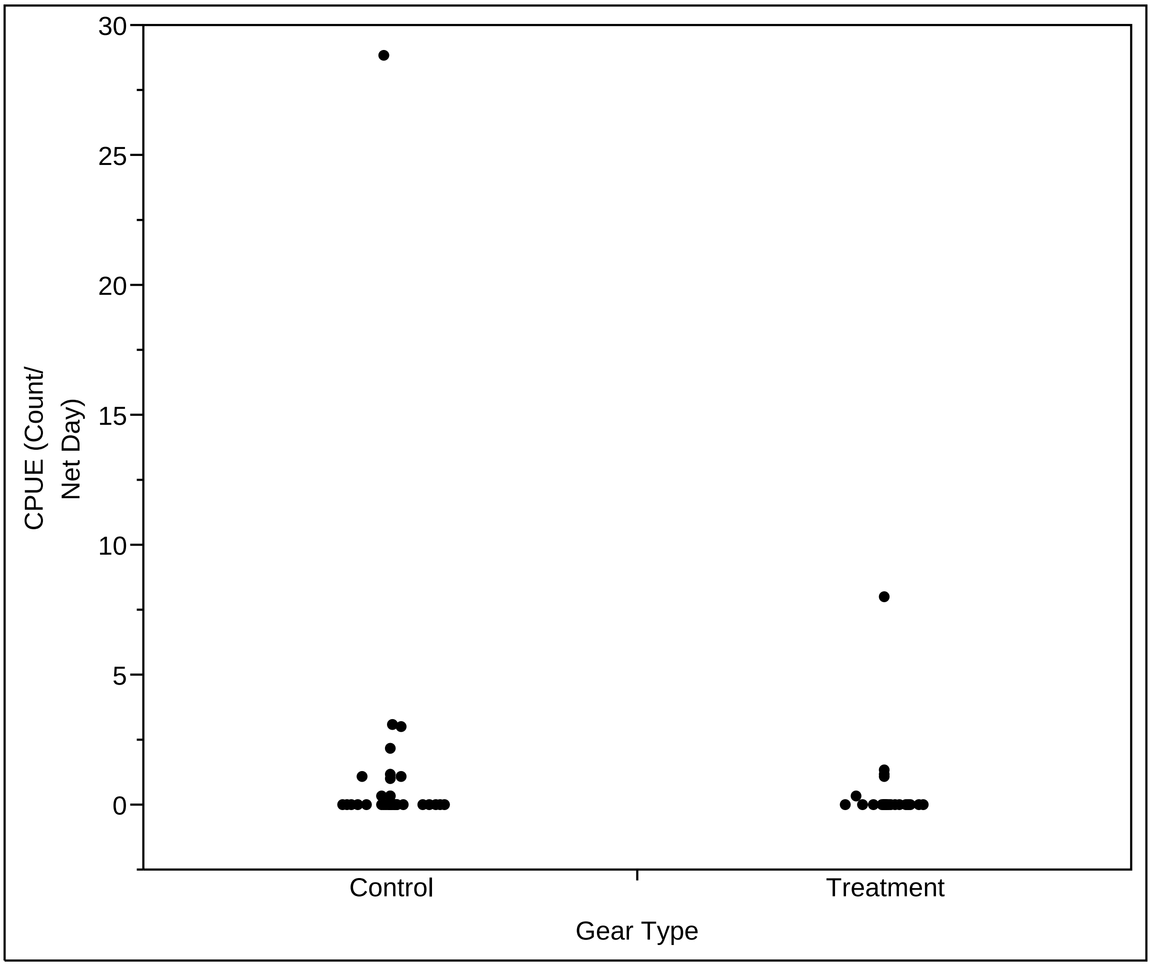

Figure 3: Atlantic sturgeon encounter rates by gear type for the 2010 sampling season.

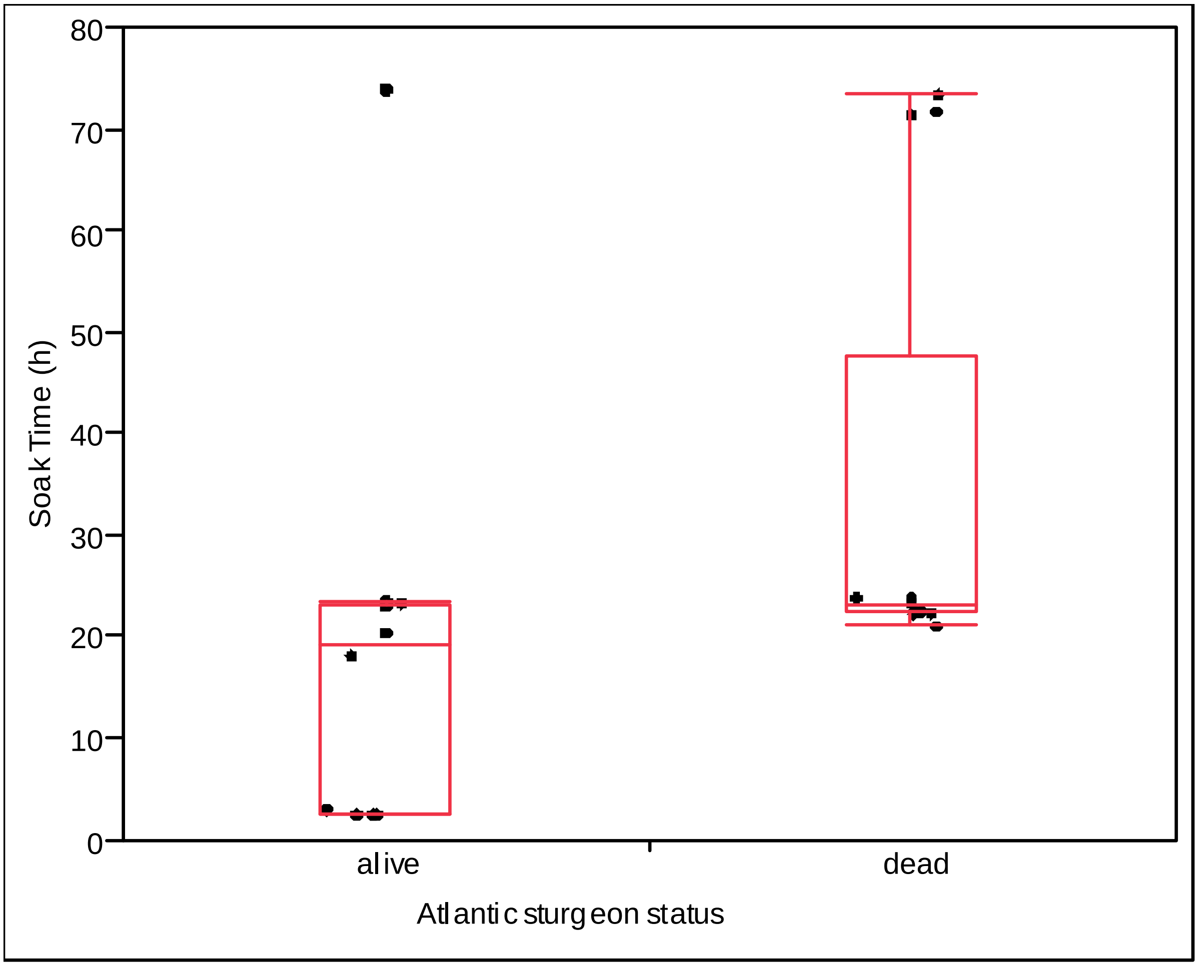

Figure 4: Atlantic sturgeon disposition at landing (alive vs. dead) plotted against gillnet soak time. Box plots represent median and 25-75th quartiles.

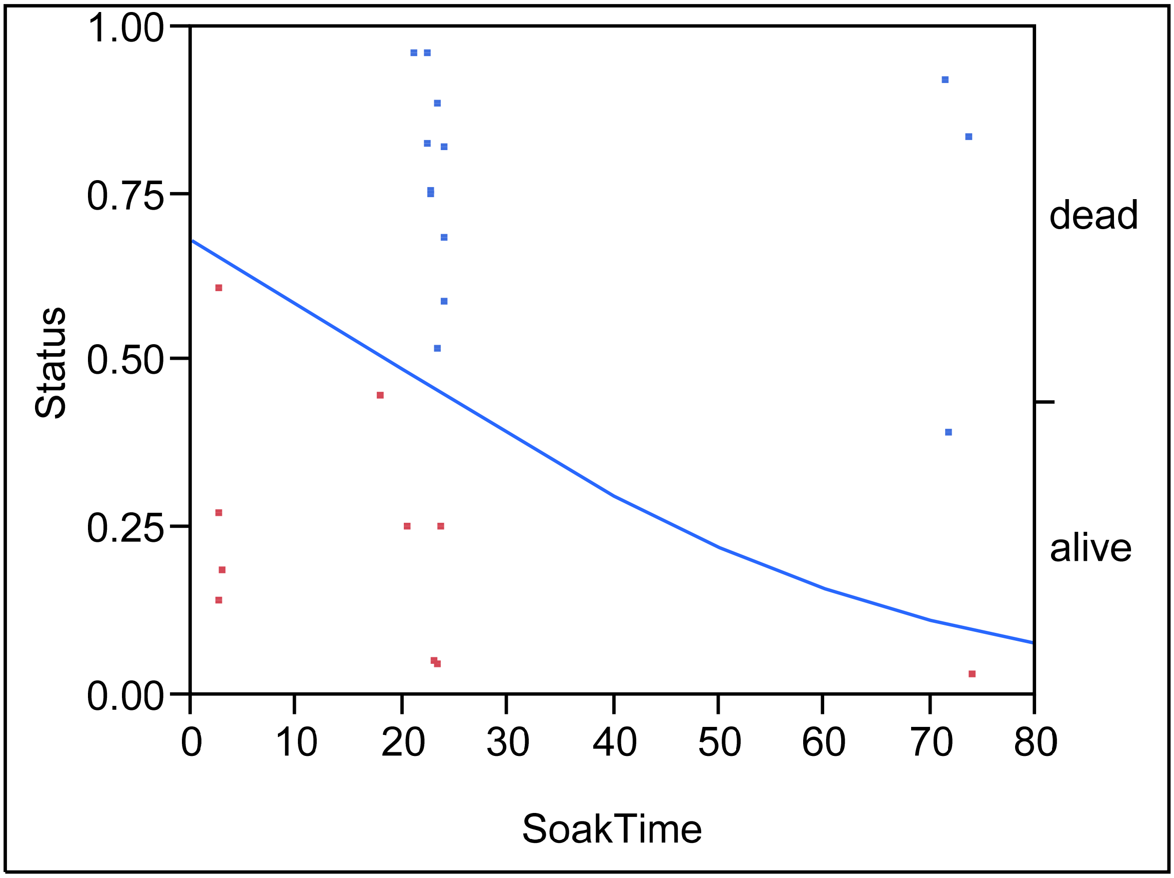

Figure 5: Results of logistic regression fit of Atlantic sturgeon status (alive vs. dead) by soak time for gillnet encounters. Points plotted above the line represent Atlantic sturgeon that were dead at the time of the encounter.

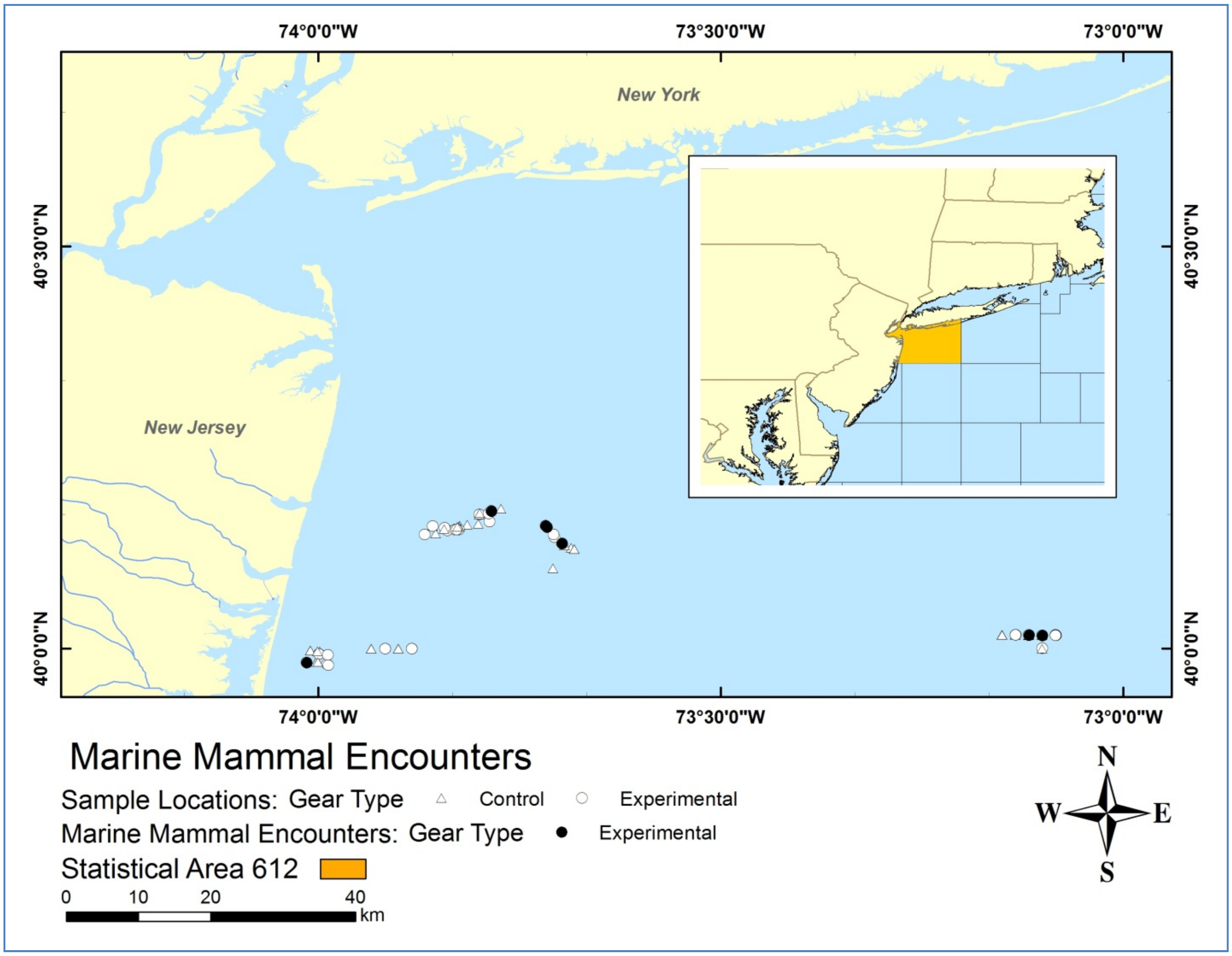

Figure 6: Location of gillnet activities by gear type (control = triangles; treatment= circles) within NMFS Statistical Area 612 with marine mammal encounters (filled symbols).

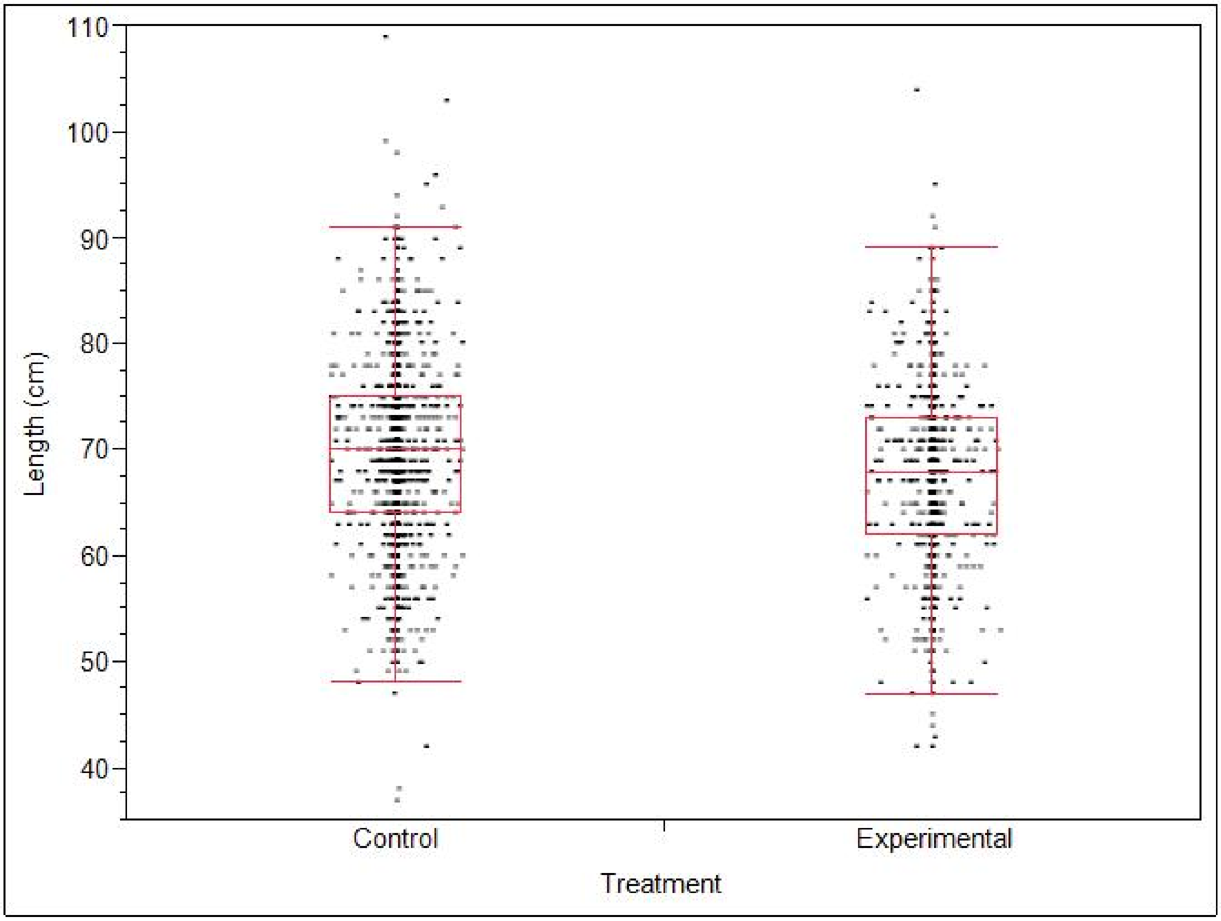

Figure 7: Length (cm) of monkfish landed by gillnet configuration. Box plots represent median and 25-75th quartiles.

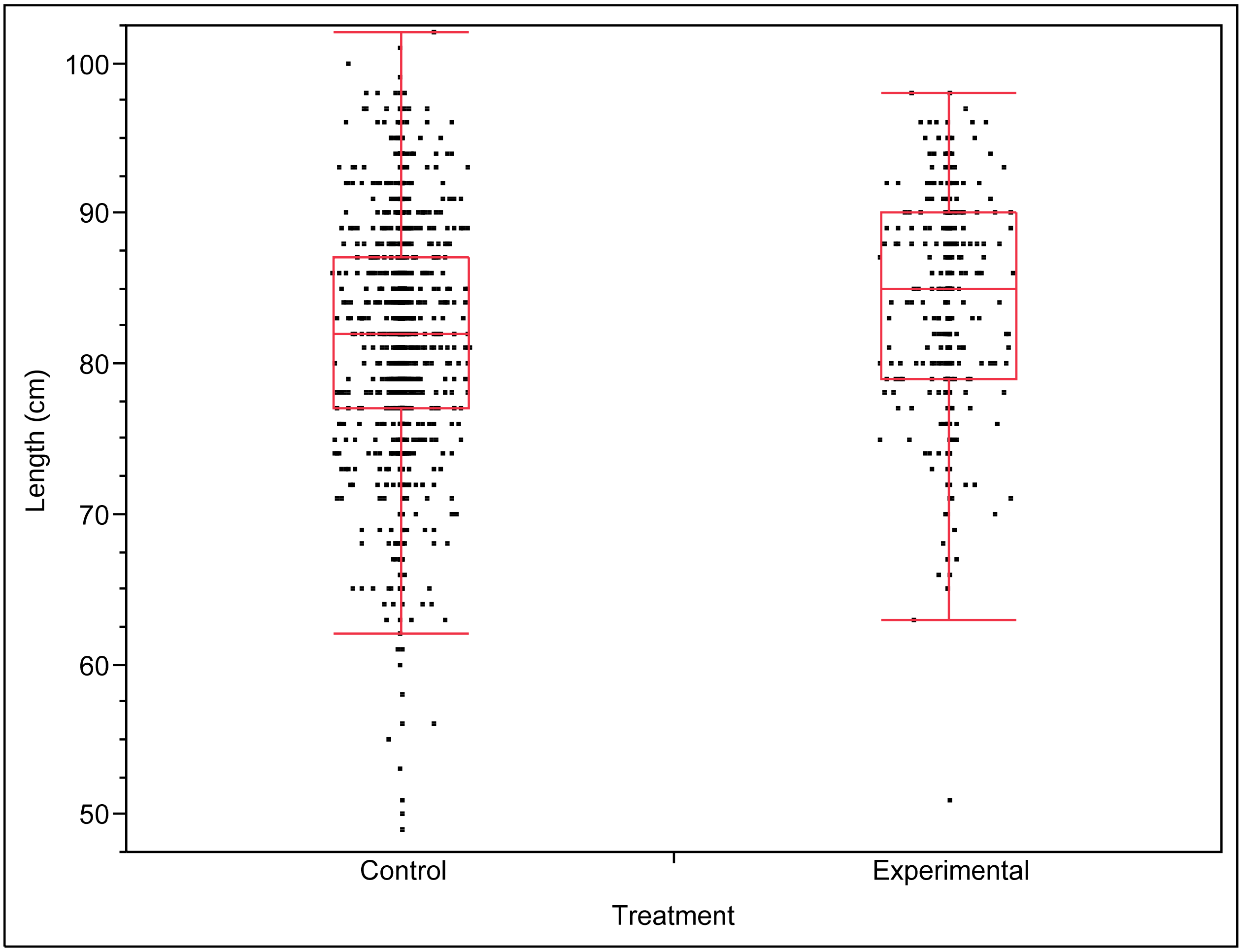

Figure 8: Length (cm) of winter skate landed by gillnet configuration. Box plots represent median and 25-75th quartiles.