The Design of a Turtle Excluder Dredge for the Sea Scallop Fishery

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February, 2008

Submitted to: National Marine Fisheries Service, Northeast Regional office

Sea Scallop Research TAC Set Aside Program

Grant Number: NA05NMF4541293

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Executive Summary

This project designed and tested a new concept for construction of a New Bedford style sea scallop dredge frame to a) keep turtles from snagging on top of the dredge frame and b) to prevent a turtle from getting trapped under the dredge bale. The project was performed in a number of phases. The first phase designed and fabricated a prototype dredge frame designed to act as a wedge and guide turtles over the top of the dredge. The frame underwent a trial off Panama City, Florida in 2005 using divers, fiberglass turtles and turtle carcasses. The prototype was then sea tested and filmed on commercial vessels operating out of Barnegat Light, New Jersey. The dredge design was modified and again tested in 2006 as in 2007. Additional modifications were made and extensive sea tests on commercial trips were conducted in 2007.

A total of 1,087 successful paired tows were conducting using the experimental turtle excluder dredge and standard New Bedford dredge as a control during the ten sea trial trips presented in this report. The catch of 520 tows (48% of total) were observed and sampled by a scientist onboard. A total of 11,184 scallop bushel baskets were landed by the experimental dredges and 11,213 were caught by the control dredges. This is a difference of 29 (-0.3%) less bushel baskets being caught by the experimental dredges than the control dredges. During tows that were observed, the difference was 1.6% more scallops being caught by the experimental dredge.

A significant bycatch reduction also occurred in the experimental dredges relative to the control dredges. Data compiled from all experimental dredge designs tested showed significantly ($p<0.05$) reduced total amounts of 9 of the 22 bycatch species captured during these sea trials. The species count reduced by the experimental dredges included: skate (-7%), barndoor skate (-18%), summer flounder (-31%), yellowtail flounder (-52%), winter flounder (-67%), fourspot (-25%), sand dab (-42%), longhorn sculpin (-46%), and silver hake (-52%). No bycatch totals were found to have significantly increased in the experimental dredge.

The final dredge frame design tested in this study held up to the rigors of commercial fishing, maintained commercially acceptable levels of scallop catch, had significantly lower bycatch of several species, while applying features that could reduce injury to sea turtles. In addition, this dredge design was found to be readily acceptable and applied by fishers with no increase in costs or labor.

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Introduction

The New Bedford dredge frame has changed little since its inception. This industry standard has evolved to it's current design because it met the criteria desired by fishers of being easy to handle at sea, structurally robust, economically made, quick to repair, and efficient in catching scallops. The reduction of bycatch or avoidance of injuring sea turtles was not a factor influencing how fishers developed the dredge.

Observer data and fishermen's reports suggest that a percentage of turtle takes involve the turtle getting trapped on the top of the dredge. A modification to the dredge frame can reduce the potential of this type of take. When a sea turtle encounters the dredge it either passes underneath the dredge or over the top of the dredge. We still do not know if these encounters take place while the dredge is on the sea floor or up in the water column (during setting and haul back). If the sea turtle passes under the dredge frame on a dredge that is not equipped with turtle chains it may have a good chance of being caught in the dredge bag. An examination of the 67 takes recorded by NMFS observers (Smolowitz et al, 2005) leads us to surmise that 5 turtles were definitely taken on top of the dredges and 21 were definitely inside the dredge bag. It is not clear how the remaining turtles were caught.

If the turtle passes over the top of the front part of the dredge frame, known as the bale, it can get caught in the space between the depressor plate and the cutting bar. Fishermen, and NMFS observers, have witnessed this form of entrapment. On many occasions, when the dredge is stopped during haul back alongside the vessel, turtles that apparently came up on top of the dredge can be seen to swim away unharmed. However, at times the turtle is lifted up aboard the vessel and falls on the deck and becomes injured.

Coonamessett Farm staff proposed testing a dredge frame modification that comes out of years of experience working with scallop dredges (Henriksen et al, 1997; Smolowitz et al, 2004). Frame alterations can have significant effects on catch and bycatch rates. In previous work, to reduce fish bycatch, Coonamessett Farm engineers altered the design of the bale so that it extends forward of the main frame eighteen inches before tapering toward the hauling point (bullring). This allowed testing of sweeps and blocking over the entire dredge width. Blocking is an approach used to prevent fish from entering the dredge from above the cutting bar and below the depressor plate. We have investigated blocking this space with rope, mesh, steel

scallop rings, and 1-inch bar stock but have found these materials do not hold up to the rigors of scallop fishing.

The preliminary investigations led to an initial turtle excluder dredge design that was a significant departure from the existing New Bedford style dredge. The cutting bar was moved forward of the depressor plate so that instead of confronting a vertical structure, a sea turtle would encounter a sloping structure. The first prototype design increased the width of the depressor plate and extended the struts, at twelve inch spacing, between the depressor plate and the forward positioned cutting bar. The theory was that a sea turtle could not get trapped in this space and would be smoothly guided over the dredge. In moving the cutting bar forward the shoe was lengthened by that distance; about 15 inches. The heel on the shoe was now 30 inches from the cutting bar. The overall dredge dimensions were held constant, for handling reasons, resulting in the distance from the gooseneck to the cutting bar being reduced.

The prototype dredge frame modifications did not result in any major change in fabrication costs. The redesigned frame used the same type of materials, had approximately the same weight of steel, and took about the same time to construct.

Initial testing led to the development of another modification; the removal of most of the bale stiffening bars in order to prevent a turtle that gets under the bale from being trapped by these bars. Ultimately it was decided to eliminate all the bale bars except for the center bar. This weakened the dredge considerably. To compensate the outer bale bar was doubled.

In early tests to reduce turtle takes in the Southeast US shrimp fishery, the forward excluder panel worked relatively well in reducing the capture of turtles (Seidel and McVea, 1995). This approach was abandoned in that fishery due to many complications with rigging and negative impacts on shrimp catch. The rigid scallop dredge frame is much more amenable to the excluder approach. Removing the bale bars would remove an obstruction thus allowing a turtle to rise up in front of the cutting bar to be “excluded”.

Field testing suggested that the longer shoe was not serving any purpose so the dredge design was modified again. The shoe was now designed to end at the dredge box frame; this placed the heel of the shoe in the same position relative to the cutting bar as in the standard dredge. Cutting the shoe short allowed the bale to be extended and that was accomplished by first coming out straight 15 inches and then bending towards the tow point. This widened the opening between bale and cutting bar considerably for potential turtle escapement. Strut spacing was reduced to nine inches to gain additional strength. Hardened steel round bar stock was used

to face the lower portion of the strut, overlapping the cutting bar, to allow for a smoother transition.

The modifications to the dredge frame does not require any changes to the handling and operation of the dredge as there was be no alteration to the frame length or width. However, the hydrodynamics of the dredge did change and field testing was needed to determine the impact on catch of these changes. In previous studies where the cutting bar was moved forward, similar to the change in the bale design discussed above, the repositioning was found to increase the dredge efficiency on scallops by 10-20% while reducing the weight and cost of the dredge (Smolowitz et al, 2002, 2001). The dredge was to be as lightweight as possible. This was be accomplished by eliminating many of the doublers and gusset plates as well as the bale bars.

The biggest unknown was how the new frame will fish and this required field trials and design adjustments. This report discusses these trials and the evolution of the turtle excluder dredge design.

Methodology

In designing the turtle excluder dredge to eliminate sea turtle capture by scallop dredges we adhered to the following key criteria; the materials used were common in the fishery and readily available, maintenance would not be a significant issue, the modifications were easily enforced, and costs were acceptable to the industry.

The modifications to the dredge frame were also designed to not require changes relative to the handling and operation of the dredge. This was accomplished by maintaining the dredge frame length and width. This is a very important criterion as the vessels are rigged to handle dredges of a particular length and width. As stated previously, we expected the hydrodynamics of the dredge to probably change and we needed to determine the impact on catch of these changes. The design optimization was expected to be an iterative process.

At Sea Operations

We received official notification to start the project on October 8, 2005. The scallop TAC set aside allowed under the award was as follows: 6,226 lbs from CAI, 11,971 lbs from CAII, and 71,803 lbs from Hudson Canyon. This posed two problems; NMFS would not allow the two Georges Bank trips to be combined and there were no economically available scallops in the Hudson Canyon. To accomplish the project objectives, we submitted changes to the Statement of Work on October 17, 2005. The F/V Neskone was issued an LOA and made two separate trips to collect the RSA landing those trips on January 11 and January 19, 2006.

Two prototypes were constructed; the first, a 13-foot dredge, was funded by NERO and tested in Panama City from June 18 through June 23, 2005. This was a joint project with Coonamessett Farm, NEFSC, NERO, VIMS, and the Harvesting Systems and Engineering Branch based in Pascagoula, Mississippi. The project was designed to assess standard and modified 13-foot commercial scallop dredges with regard to sea turtle interactions. The modified dredge evaluated was a 13-foot wide dredge with forward cutting bar, 32-inch shoes, and some of the bale bars removed.

This project was designed to simulate “the worst case scenario” of a dredge overtaking a turtle lying on the bottom. This scenario was achieved by placing two NOAA divers with video cameras on the towed dredge and two NOAA divers with either a dead turtle or model turtle in the path of the towed dredge. The divers ahead of the dredge deployed either the dead turtle or

model in the path of dredge, while the divers on the dredge video taped the interaction. The dead turtles used in the study appeared to have no carapace or plastron damage prior to deployment and all were recovered after interactions to document injuries sustained.

It is important to note that the use of dead turtles or replica turtles did not provide information about the behavior of sea turtles around scallop dredges, particularly on how and where (in the water column) they are interacting with the dredge and how they may be able to evade a dredge at or near the bottom. The replica turtles were of a similar size to those turtles documented to interact with scallop dredges, and included appendages (head, flippers) to mimic how a turtle may get caught on/in the gear. Because of the limitations of using replica turtles, and doing this work away from the area where the interactions are occurring, the goal was not to learn how turtles are interacting with the dredge, but rather to provide insight into how a gear modification may work in minimizing the impact to those turtles that may be interacting with the gear while it is on the bottom.

The project was conducted in the Gulf of Mexico near the base of operations at the NMFS Southeast Fisheries Science Center, Panama City, Florida Laboratory. The *F/V Captain Wick*, a 70-ft fish/shrimp trawler, was used as the platform with the *R/V Caretta*, a 65-ft NOAA vessel providing diver and video support.

Upon completion of the Panama City work the dredge was shipped to Barnegat Light, New Jersey, and limited comparison fishing was conducted in conjunction with a turtle video project in August and September, 2005 using the F/V Kathy Ann. We added a steel angle iron to the cutting bar to eliminate the flat forward facing surface. We also added round bar to the struts to come down and wrap around the bottom of the cutting bar. All but the center bale bars were removed to facilitate escapement of any turtle or large fish entrapped under the bale during a tow. The NEFSC funded the construction of a 15-foot version of this dredge and that was constructed by Dockside Repair, Inc in New Bedford.

In June, 2006 the Panama City testing was continued with the modified dredge with the same participants and vessel as in the 2005 project. Due to time and cost constraints, turtles were not randomly placed in the path of the dredge. Divers were instructed to place turtles in specific predetermined orientations and locations along the face of the dredge in an effort to identify design flaws.

Based on preliminary tows to determine optimum scope and towing speed, all tows were conducted using a 3:1 ratio of tow wire to depth and a towing speed at 3.0 knots. This was a

compromise to achieve a dredge towing angle that closely matched that of commercial dredges while allowing divers to safely ride the dredge. This speed was slower than typical commercial towing speeds of 4-5 knots.

Five separate turtle carcasses were used in 14 field trails (Milliken et al, 2007). The carcasses were found dead on beaches (stranded) and varied in freshness, size, and levels of emaciation. All of the carcasses were inspected thoroughly prior to deployment to document existing external damage. Placement of turtle carcasses in the path of the dredge was not random. Placement for most trials was predetermined to assess the effectiveness of the design in various areas of the dredge. After each interaction, the carcasses were recovered and damage assessments were performed by trained NMFS staff.

In twelve trials, the carcasses went over the dredge (n=7) or were deflected to the side (n=1; tow 3). In one of the remaining four trials (tow 14), the turtle carcass was outfitted with weights because it was buoyant, started to go over the dredge but was constrained from passing completely over by the dredge by the weights which caught the frame of the dredge.

In the remaining three trials, the bale held the carcass from going over the dredge. There were no instances of any carcass going under the dredge frame. Carcass damage from the dredge interaction for each in the five trials was slight or none. The performance of the experimental dredge design was a substantial improvement over both the traditional New Bedford style dredge and the 2005 modified dredge.

Although the Panama City gear trials indicate that the 2006 dredge design directed more turtles over the dredge than under the cutting bar, there are a few additional gear modifications which could further reduce possible injuries to sea turtles on the seafloor. The dredge design might be improved to reduce the likelihood of turtles getting blocked either under the center bale bar or under the side bale bars. Although live turtles trapped in these areas might be able to escape to either side of the obstructing bar, the encounter might increase the likelihood of an injury. The utility of the round bar strut extensions on the front of the cutting bar appeared to be equivocal to the movement of the carcass over the dredge frame and may warrant future examination of alternate designs or elimination of this modification.

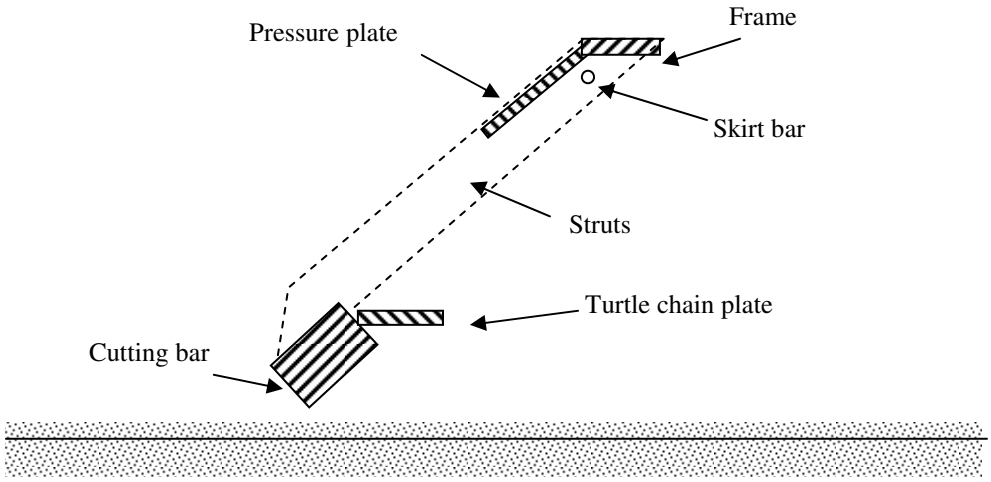
Experimental Dredge Frame Design Characteristics

All experimental dredge designs tested during this study were variations of a basic design concept that differed from the standard New Bedford dredge by four major characters. All experimental and control dredges were 15' wide. The basic design tested throughout all trials was a dredge design frame employing the following characteristics that were different from the New Bedford dredge used as the control.

- cutting bar placed in front of the pressure plate rather than behind
- cutting bar placed at a 45 degree angle rather than a 90 degree angle
- struts placed at a 45 degree angle rather than 90 degree angle
- 3 bale bars (to outside and one center), as compared to 9 on the New Bedford dredge

Figure 1 below illustrates a cross section of experimental dredge frame design concept tested during this study. More detailed characteristics describing materials used in the construction of all experimental dredges can be found in appendix 113.

Figure 1. Cross-section of experimental dredge frame concept design used during at sea trials.



This basic design is referred to as the experimental dredge frame design. Modifications to this basic dredge design are named and described as follows.

Experimental Dredge Frame Design 1

Figure 2. Photograph of experimental dredge frame design 1

Experimental Dredge Frame Design1 was tested on trips: Celtic-2006-1, Celti-2006-2, and Westport-2006-1. Frame Design 1 had the following characteristics that differed from standard New Bedford dredges used as the control:

1. Cutting bar set in front of depressor plate instead of underneath and aft of the depressor plate as on the New Bedford dredge (shown in Figure 3)

Figure 3. Photograph showing the position of the cutting bar relative to the pressure plate on experimental dredge frame design 1 (left) and the New Bedford dredge (right)

2. Cutting bar set at 45 degree angle instead of 90 degree angle (shown in Figure 4)

Figure 4. Photograph of the cutting bar used on experimental dredge frame design 1 (left) and a view of cutting bar used on a New Bedford dredge (right)

3. Frame shoes 30 inches long instead of 15 inches (shown in Figure 5)

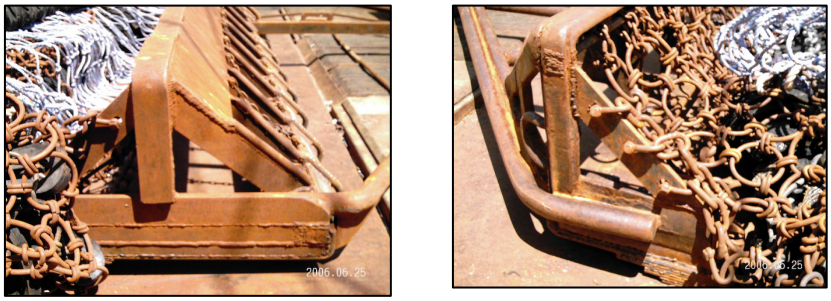


Figure 5. Photograph of the shoe used on experimental dredge frame design 1 (left) and a the shoe used on a New Bedford dredge (right)

4. 3 bale bars (one center and 2 outside) instead of 9 (shown in Figure 6)

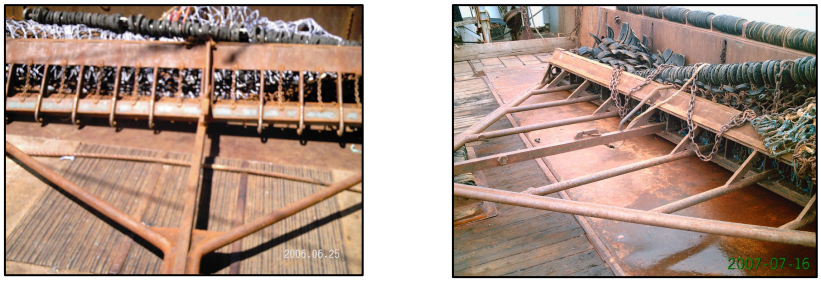


Figure 6. Photograph of the bale used on experimental dredge frame design 1 (left) and a the bale bars used on a New Bedford dredge (right)

5. No wheels used; wheels are often used on New Bedford dredges (Celtic trips had wheels on control dredge, Westport trips had no wheels on control dredge) (shown in Figure 7)

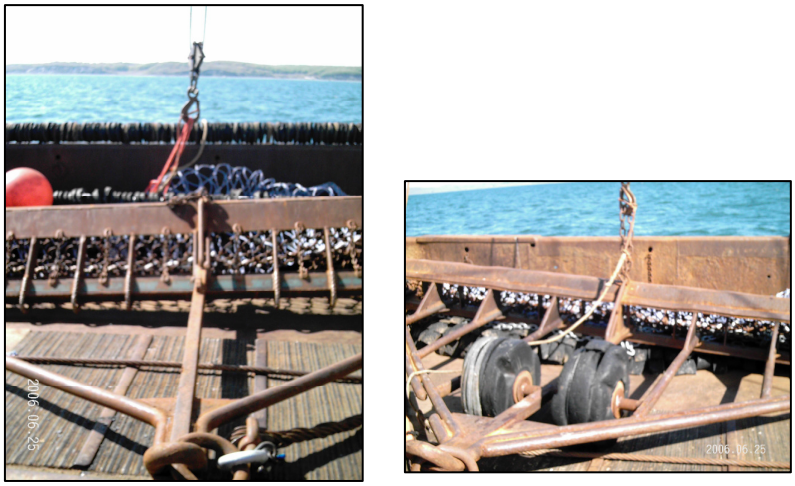


Figure 7. Photograph of the goose neck used on experimental dredge frame design 1 (left) and a the wheels used on the New Bedford dredge used as control on F/V Celtic (right)

6. Rebar loops (turtle guards) on cutting bar space 12" apart at the spacing of the struts (not installed on New Bedford dredges) (shown in Figure 8)

Figure 8. Photograph of the rebar loops used a turtle guards on experimental dredge design 1

7. Chains connected to the cutting bar and depressor placed six inches between struts (not installed on New Bedford dredges) (shown in Figure 9)

Figure 9. Photograph of the frame chains on experimental dredge design 1

Experimental Dredge Frame Design 2

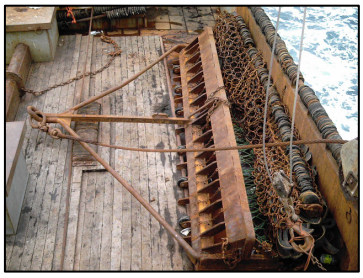


Figure 10. Photograph of experimental dredge design 2

Experimental Dredge Frame Design 2 was tested on trips: Celtic-2006-3, and Westport-2006-2. A summary of each trip and their results follows in the next section. Frame Design 2 was set up with the same characteristics described for Frame Design 1 except for the turtle guards (Figure 10). Small wheels were placed on the cutting bar, instead of the rebar loops that were used on Design 1. The wheels were 6" in diameter and place on the cutting bar at approximately every other strut (Figure 11). In the spaces between wheels, at every other strut spacing, a ½" x 4" metal plate was welded on the cutting bar.

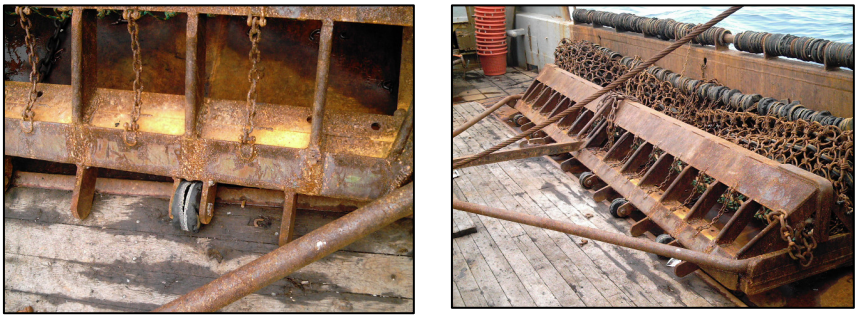


Figure 11. Photographs of cookie wheels used on experimental dredge design 2

Experimental Dredge Frame Design 3

Experimental Dredge Frame Design 3, as seen in Figure 12, was tested on trips: Friendship-2-2007, Friendship-3-2007, Friendship-4-2007, and Friendship-5-2007. A summary of each trip and their results follows in the next section. Differences between dredge design 3 and the previous two experimental dredges are as follows:

Figure 12. Photograph of experimental dredge design 3

1. 2 molded 5"x 16" wheels with the axis positions 30" from top of the gooseneck. (note: wheels not used during all tows) (Figure 13)

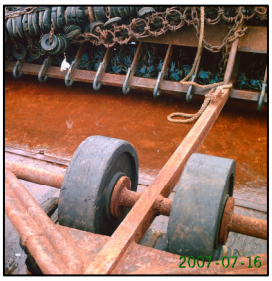


Figure 13. Photograph of wheels used on experimental dredge design 3

2. The shoe was ½" x 3" spring steel cut 17 1/2" long and attached to 1 1/2" x 3 ½" x 15" long bar stock (Figure 14)

Figure 14. Photograph of shoe used on experimental dredge design 3

3. 2" round bar was mounted outside of main bale bar (Figure 12)

4. Space between struts measured 8 ½"; the spacing between the 8" depressor plate and cutting bar measure 10" (Figure 12)

5. No chains connected to the cutting bar and depressor placed 4.5” between struts (not installed on New Bedford dredges) (Figure 15)

6. The turtle guards were made of 1” hardened steel round stock and placed every 9” along struts (Figure 15)

Figure 15. Photograph of turtle guards used on experimental dredge design 3

7. A 9” straight extension connected the bale to the frame (Figure 16)

Figure 16. Photograph of bale extension used on experimental dredge design 3

8. Bale was 9’ long from gooseneck to the extension as seen in Figure 17

Figure 17. Photograph of experimental dredge design 3

9. A ½” x 4” metal plate was attached to the bale extension next to the shoe (Figure 18)

Figure 18. Photograph of bottom side of experimental dredge design 3

Experimental Dredge Frame Design 3a

Experimental Dredge Frame Design 3a was tested on trip Friendship-1-2007. A summary of this trip follows in the next section. The only difference between turtle dredge design 3 and 3a were that the turtle guards consisted of 6” wheels instead of metal loops. (Figure 19)

Figure 19. Photograph of experimental dredge design 3a

Results: Summaries of At Sea Trials

During 2006-2007 the testing of the performance of 3 different experimental scallop dredge designs was performed over the course of 10 commercial trips in 4 different fishing grounds on 3 different fishing vessels. The testing trips were spread over spring, fall, and summer seasons on Georges Bank and the mid Atlantic. The dredge designs were test on a variety of bottom types including "hard bottom", "soft bottom", starfish, sand dollar, and shell.

All experimental dredges were towed simultaneously next to the fishing vessels standard New Bedford dredge, which served as the control gear. A total of 1,087 successful tows were completed. A scientist onboard sampled 520 (48%) of the successful tows. A list summarizing all experimental trips included in this report is given in Table 1 below. A brief description of each trip follows.

Trip ID	Vessel	Observer	Date Sailed	Date Landed	Area	Trip Type	Total Good Tows	Total Observed Tows	Experimental Dredge Design Tested	Control Dredge	Turtle Chains Used?
CELTIC-2006-1	Celtic	Matt	5/19/2007	5/21/2006	Mud Hole	Declared out of fishery	11	11	Dredge Frame 1	Standard New Bedford w/ wheels	No
CELTIC-2006-2	Celtic	Matt	5/25/2006	6/11/2006	Southeast Parts	Open Area	218	92	Dredge Frame 1	Standard New Bedford w/ wheels	No
WESTPORT-2006-1	Westport	Matt	7/31/2006	8/6/2006	CAII	CAII trip	27	9	Dredge Frame 1	Standard New Bedford, no wheels	No
CELTIC-2006-3	Celtic	Matt, Eric	10/6/2006	10/18/2006	CAII	RSA Collection	114	76	Dredge Frame 2	Standard New Bedford w/ wheels	No
WESTPORT-2006-2	Westport	Matt	9/14/2006	9/26/2006	CAII	RSA Collection	162	75	Dredge Frame 2	Standard New Bedford, no wheels	No
FRIENDSHIP-2007-1	Friendship	Karen	5/15/2007	5/29/2007	Hudson Canyon	RSA Collection	NK	53	Dredge Frame 3a	Standard New Bedford, no wheels	Yes
FRIENDSHIP-2007-2	Friendship	Matt	6/5/2007	6/20/2007	Hudson Canyon	RSA Collection	184	89	Dredge Frame 3	Standard New Bedford, no wheels	Yes
FRIENDSHIP-2007-3	Friendship	Karen	6/27/2007	7/10/2007	Hudson Canyon	RSA Collection	161	43	Dredge Frame 3	Standard New Bedford, no wheels	Yes
FRIENDSHIP-2007-4	Friendship	Matt	6/5/2007	6/20/2007	Hudson Canyon	RSA Collection	116	55	Dredge Frame 3	Standard New Bedford, no wheels	No
FRIENDSHIP-2007-5	Friendship	Karen	8/22/2007	8/29/2007	Elephant Trunk	RSA Collection	42	19	Dredge Frame 3	Standard New Bedford, no wheels	No

Table 1. Summary of all at sea trial trips observed for this report

Celtic-2006-1

The trip Celtic-2006-1 was the 1st preliminary field test of experimental dredge frame design 1. The F/V Celtic left New Bedford on 5/19/2006 for the Mud Hole area off of New York. The vessel declared out of fishery for this shake down cruise. Matt Weeks was the scientist onboard. Charlie Quinn was captain with Paul as mate. The crew included Charlie Jr, Scott, and Anthony. The entire crew was very cooperative with the scientist onboard. Twelve paired tows were conducted, eleven of which were considered successful. All tows were observed and the catch quantified. The trip ended in New Bedford on 5/21/2006 for a total of one day at sea. At total of 400 lbs. of sucked scallop meats were landed and sold to Eastern Fisheries.

The purpose was to test the experimental dredge frame design 1 during a short commercial fishing trip. The captain and scientist wanted to see if the dredge would catch enough scallops to make a commercially viable trip. The captain/owner, Charlie Quinn, had experience fishing experimental dredge designs and wanted to show the mate how best to fish

the dredge. Paul would be captaining the following longer experimental dredge test trip on Georges Bank.

One of the vessel's New Bedford style dredges was fished simultaneously next to the experimental dredge and served as a control for the trial. The crew deployed, fished, and retrieved both dredges identically and simultaneously for the entire trip. To limit the effects of catch differences resulting from the chain bag, the vessel's chain bag was used on the experimental dredge frame. The control dredge had the same chain bag characteristics. New twine tops were installed on both bags prior to sailing. 3 rock chains and 3 tickler chains were used on each dredge the Celtic's bag characteristics are listed in appendix 112.

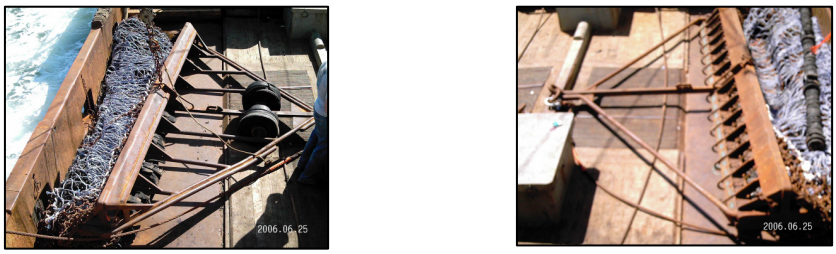


Figure 20. Photograph F/V Celtic's New Bedford dredge used as control (left) and experimental dredge frame design 1 (right)

The crew experimented with different fishing variables (i.e. speed, scope, heading, tow duration, vessel side) and setting techniques to gain an understanding as to how the dredge fished best. The control dredge and experimental dredge were consistently deployed simultaneously using identical fishing parameters.

Counts of all fish and scallops caught during good tows were quantified. Scallops were counted by the number of orange bushel baskets filled and fish were tallied by species. A total of seven different species of fish were caught during the trip. Due to time constraints, some species were collected into bushel baskets and a total count was estimated by a count/volumetric conversion. Total length measurements were taken of each species as time permitted between tows. If all specimens of a species were not able to be measured from a tow, then a representative random sample was taken for that species. Most tows had complete sampling of all species caught. Bridge data was recorded by the captain throughout the trip. All data was entered into an Excel spreadsheet upon returning to land. The NEFSC's electronic logbook was used during the trip to record a GPS log and effort data. Data were also collected for the Standardized Scallop Bag project, during this trip.

Twelve tows were made during this trial trip. One tow was unsuccessful because of the experimental dredge's twine top being hung on the turtle guards. As a result the dredge did

not fish properly on that tow and the catch was not quantified to be used as a comparison. The tow times ranged from 34 minutes to 1 hour 20 minutes, with an average of one hour tow duration for the entire trip. Tow speed ranged from 4.5 to 4.8 knots, with an average of 4.6 knots for the trip. No gear modifications were made at anytime during the trip. The experimental dredge was switched from port to starboard after tow 7. Fishing depth ranged from 23 to 32 fathoms, averaging 28 fathoms for the entire trip. Catch sizes ranged from 2.5 to 9 bushels. The experimental dredge averaged 5.6 bushels and the control dredge average 4.8. All fish were discarded immediately after being sampled. Trash and bottom type consisted of sand dollars, starfish, and shells.

Tow by tow bridge log data recorded during this trip is provided in Appendix Table 1. Catch count data collected for each sampled tow is show in Appendix Table 11. Length data for each species is shown in Appendix Tables 21 thru 26. Descriptive statistics summarizing all catch by species for each dredge is shown in Table 2 below.

Due to the small sample size of this preliminary test, statistically significant catch results were not achieved for this trip. However, it was agreed by the captain and scientist that the experimental dredge frame was capable of fishing comparable to, if not better than, the vessel's standard New Bedford dredge. The experimental dredge appeared to catch significantly less trash compared to the control dredge, although this was not confirmed quantitatively. Weather throughout this trip was fair with calm seas. It was also noted that the experimental dredge potentially captures skate at a lower rate than the New Bedford dredge. Because of the success of the experimental dredge in catching scallops, the captain agreed to take the dredge out on his next open area trip for more extensive testing.

Table 2. Summary of data collected during trip Celtic-2006-1

Celtic 2006-1																
Descriptive Statistics and t-Test: Paired Two Sample for Means																
Experimental Dredge Design 1																
Species	**Scallops**		**Skate**		**Monk**		**Summer Flounder**		**Grey Sole**		**Yellowtail Flounder**		**Winter Fld.**		**Four Spot Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	62	53	1563	1463	113	118	8	1	5	4	14	12	0	1	35	27
% Difference in Count	**18%**		**7%**		**-4%**		**700%**		**25%**		**17%**		**-100%**		**30%**	
Fish Count/Scallop Bushel Catch Ratio			25.3	27.9	1.8	2.2	0.1	0.0	0.1	0.1	0.2	0.2	0.0	0.0	0.6	0.5
% Difference in Catch Ratio			**-9%**		**-19%**		**580%**		**6%**		**-1%**		**-100%**		**10%**	
Max	9.0		250.0		17.0		6.0		4.0		5.0		0.0		11.0	
Min	2	2	50	75	4	3	0	0	0	0	0	0	0	0	0	0
Median	6	4	125	125	9	12	0	0	0	0	1	1	0	0	1	0
Mode	#N/A	4	100	75	9	12	0	0	0	0	0	0	0	0	0	0
σ	2	2	69	61	4	6	2	0	1	1	2	1	0	0	4	4
Mean	5.6	4.8	142.1	133.0	10.3	10.7	0.7	0.1	0.5	0.4	1.3	1.1	0.0	0.1	3.2	2.5
Variance	4.0	2.6	4763.1	3754.0	17.4	31.2	3.2	0.1	1.5	0.9	3.0	1.3	0.0	0.1	14.4	12.5
Observations	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Pearson Correlation	0.31		0.82		0.64		-0.13		-0.16		-0.37		#DIV/0!		0.28	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	10		10		10		10		10		10		10		10	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	1.25		0.76		-0.35		1.14		0.18		0.25		-1.00		0.55	
P(T<=t) one-tail	0.12		0.23		0.37		0.14		0.43		0.40		0.17		0.30	
t Critical one-tail	1.81		1.81		1.81		1.81		1.81		1.81		1.81		1.81	
P(T<=t) two-tail	**0.240**		**0.463**		**0.736**		**0.283**		**0.858**		**0.807**		**0.341**		**0.594**	
t Critical two-tail	**2.23**		**2.23**		**2.23**		**2.23**		**2.23**		**2.23**		**2.23**		**2.23**	

Celtic-2006-2

The trip Celtic-2006-2 was the 2nd field test of experimental dredge frame 1. The F/V Celtic sailed New Bedford on 5/25/2006 for an open area trip fishing in the Southeast part of Georges Bank. The scientist onboard was Matt Weeks. Paul was captain of this trip and Billy was mate. The crew included: Timmy as engineer/cook and deckhands Joe, Anthony, John, and Jason. All crew members were helpful in the collection of data during the trip. The weather was also cooperative during the majority of the trip, with calm seas and fair conditions.

A total of 238 tows were conducted during the trip. Of those tows, 218 were considered successful tows and were included in the data analysis. Ninety-two tows (42% of good tows) were observed and sampled by the scientist. The Celtic stopped fishing on 6/8/2006 and arrived in New Bedford on 6/11/2006 for a total of 17 days at sea. There was engine trouble on the last day and the vessel had to be towed in from Georges Bank to New Bedford. The vessel sold approximately 32,000 lbs. of scallop meats landed during the trip to Eastern Fisheries.

The scientific purpose of this trip was to further test experimental dredge design 1 and to compare its catch with a standard New Bedford dredge fished alongside during regular commercial fishing operations. The crew deployed, fished, and retrieved both dredges identically and simultaneously for the entire trip. The gear (chain bag and dredge frame) from trip Cetlic-2006-1 was again used during this trip. Three rock chains and 3 tickler chains were used on each dredge. Further details of the Celtic's bag specifications are listed in appendix 112. Photos of both dredges used during this trip are shown in Figure 20.

The scientist conducted fish counts and scallop bushel counts on all observed tows. Length data was collected from bycatch species as time permitted. All retained scallops were collected into bushel baskets by the crew and the number for each dredge recorded by the captain or mate. Bushel counts were conducted for every tow, even when the scientist was off watch. The scientist observed the captain's watch for the first half of the trip and the mate's watch for the second half. Bridge data were recorded by the captain and mate for each tow throughout the trip. All data were edited and entered by the scientist into an Excel spreadsheet once ashore. Two other research

projects were also being conducted simultaneously during this trip. Scallop bag data was being recorded and logbook/tag printer trials were also being done by the scientist throughout the trip. A GPS data log (position, heading, speed, effort, time) was collected by the logbook every 2 seconds throughout the trip. Temperature loggers were also attached to both dredges. The additional data are available upon request.

Of the 238 tows made during this trip, 218 (92%) were deemed successful and thus included in the data set for analysis. Of the 20 tows not included, 17 (7% of total) were excluded because the tow was considered bad (hang up, holes in bag, flipped dredge, etc.) and 3 were purged due to either illegible or incomplete bushel count data. Of the bad tows, 5 (2% of total) were due to the twine on the experimental dredge hanging up on the turtle guard. No significant gear modifications were made at anytime during the trip. After tow 169, the crew did routine gear maintenance (put on new shoe stock, fixed any minor holes, etc.) to both dredges. The experimental dredge was switched from the port to the starboard side after tow 114 to ensure that this variable was accounted for in the data.

The tow times ranged from 23 minutes to 1 hour 40 minutes, with an average of 1 hour tow duration for the entire trip. Tow speed ranged from 4.3 to 4.9 knots, with an average of 4.7 knots for the trip. The experimental dredge was switched from port to starboard after tow 114 to minimize any possible side bias. Fishing depth ranged from 32 to 42 fathoms, averaging 36 fathoms for the entire trip. Scallop catch sizes ranged from 3 to 16 bushels. The experimental dredge averaged 9.2 bushels per tow while the control dredge averaged 8.3 bushels. Detailed tow by tow bridge log data recorded during this trip is provided in Appendix Table 2.

A total of 21 bycatch species were observed during the trip. Catch count data collected for each sampled tow is show in Appendix Table 12. Length data for each species are provided in Appendix Tables 27-31. Descriptive statistics summarizing species caught at a significantly different amount relative to the two dredges are in Table 3 below. A statistical summary for all species caught during the trip is located in Appendix Table 66. A larger sample size and higher bycatch rates during this trip showed statistically significant (alpha = 0.05) differences in catch rates between the experimental and control dredges for several bycatch species. The catch rate of 4 bycatch species

were observed to be significantly reduce in the experimental dredge while the scallop catch rate was increased. Of the total 218 successful tows conducted, the experimental dredge caught 11% more scallops compared to the control dredge. During the 92 tows observed by the scientist onboard, the experimental dredge had an increased scallop catch of 13% relative to the control dredge. The bycatch count was significantly reduced in the following species: little skates (-17%), yellowtail flounder (-21%), winter flounder (-72%), and sand dab (-38%). The bycatch counts of all other species caught in the experimental dredge were not statistically different from the counts observed in the control dredge. Since the experimental dredge was more efficient in catching scallops while equally or less efficient in catching fish, the bycatch ratio of 19 of the 21 species caught was reduce in the experimental dredge. The crew anecdotally noted that they witnessed significantly and consistently less bycatch in the experimental dredge during tows when the scientist was off watch, suggesting that the reduction was consistent throughout the trip. Based on the length frequency data collected, there was no evidence that size selectivity occurred for any species. It had been hypothesized that the smaller spaces on the experimental dredge would exclude larger animals. Instead, the experimental dredge had basically the same length frequency distribution as catch in the control dredge for all species encountered. Although the scallop length frequency data collected was limited, there was no readily observable scallop size selection occurring in the experimental dredge's catch.

A small pilot whale was brought up dead in the experimental dredge during tow 164. The whale was fresh dead and was returned to the sea after photos, notes, and measurements had been taken by the scientist. Those data were later evaluated by a marine mammal expert in Woods Hole who suggested that the animal was possibly an aborted fetus or perhaps a still birth calf. There was no evidence to indicate that the animal's death was caused by commercial fishing activity. It is assumed that the animal was on the bottom and got into the bag under the dredge frame, since there are no spaces large enough to allow entry through the dredge frame. A broken rock chain was noted on the experimental dredge immediately after tow 164, which would have provided a larger opening. The animal was noted as being "soft and flimsy" thus it is possible that it was forced through a smaller than expect space.

Table 3. Species caught during trip Celtic-2006-2 whose total count was significantly ($p<0.05$) different in experimental dredge design 1 relative to the control dredge

Celtic 2006-2														
Descriptive Statistics and t-Test: Paired Two Sample for Means														
Experimental Dredge Design 1														
Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Yellowtail Fld.**		**Winter Fld.**		**Sand Dab**		**Silver Hake**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1998	1808	840	744	3954	4775	180	229	5	18	91	147	4	15
% Difference in Count	**11%**		**13%**		**-17%**		**-21%**		**-72%**		**-38%**		**-73%**	
Fish Count/Scallop Bushel Catch Ratio					4.71	6.4	0.21	0.3	0.01	0.0	0.11	0.2	0.00	0.0
% Difference in Catch Ratio					**-27%**		**-30%**		**-75%**		**-45%**		**-76%**	
Mean	9.2	8.3	9.1	8.1	43.0	51.9	2.0	2.5	0.1	0.2	1.0	1.6	0.0	0.2
Standard Error	0	0	0	0	3	3	0	0	0	0	0	0	0	0
Median	9	8	9	8	38	45	1	2	0	0	0	0	0	0
Mode	8	8	8	8	30	34	0	0	0	0	0	0	0	0
Standard Deviation	2	2	2	2	27	30	2	3	0	1	3	4	0	0
Sample Variance	4	3	4	3	722	875	5	8	0	0	7	16	0	0
Kurtosis	0	1	2	2	1	2	1	1	33	6	14	8	19	8
Skewness	0	0	0	-1	1	1	1	1	6	3	4	3	5	3
Range	13	10	13	11	133	144	10	11	2	2	16	20	1	2
Minimum	3	3	2	2	6	12	0	0	0	0	0	0	0	0
Maximum	16	13	14	13	139	156	10	11	2	2	16	20	1	2
Confidence Level(95.0%)	0.26	0.22	0.42	0.34	5.56	6.13	0.48	0.60	0.06	0.11	0.53	0.82	0.04	0.09
Observations	218	218	92	92	92	92	92	92	92	92	92	92	92	92
Pearson Correlation	0.67		0.58		0.87		0.56		0.24		0.84		0.16	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	217.00		91.00		91.00		91.00		91.00		91.00		91.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	8.69		5.90		-5.78		-2.05		-2.58		-2.54		-2.47	
P(T<=t) one-tail	0.00		0.00		0.00		0.02		0.01		0.01		0.01	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.000		0.000		0.000		0.044		0.012		0.013		0.016	
t Critical two-tail	1.97		1.99		1.99		1.99		1.99		1.99		1.99	

Westport-2006-1

The trip Westport-2006-1 was the 3rd and final field test of experimental dredge frame 1. The F/V Westport left New Bedford on 7/31/2006 for to fish for scallops in Closed Area II on Georges Bank. This was a regular closed area trip, in which the vessel was allowed to land 18,000 lbs. of shucked scallop meats. The scientist onboard was Matt Weeks. Eddy Welch was captain of this trip and Nate was mate. The crew included: Shane as engineer and deckhands Foggy, Shane, Cham, and Tim. All crew members were helpful in the collection of data during the trip. The weather was also cooperative during the majority of the trip, with clam seas and fair conditions. The Westport stopped fishing on 8/5/2006 and arrived in New Bedford on 8/6/2006 for a total of 7 days at sea. The trip ended early (before the entire 18,000 lbs limit was reached) because of a broken winch. The shucked scallop meats and monkfish tails that had been landed were sold at the New Bedford Seafood Auction. The vessel finished this broken trip at a later date without the dredge or scientist onboard.

A total of 36 tows were conducted during the trip. Of those tows, 27 were considered tows that were of a quality to be included in the data analysis. 9 tows were excluded from the data set because of either gear complications, deck loading of catch, or incomplete records in the bridge log. Eleven tows (41% of total good tows) were observed and sampled by the scientist.

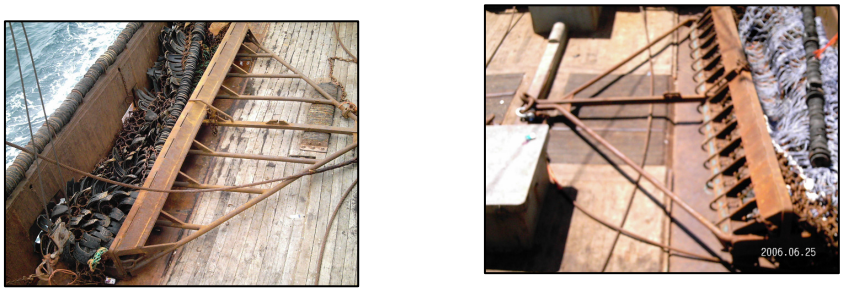


Figure 21. Photograph F/V Westport's New Bedford dredge used as control (left) and experimental dredge frame design 1 (right)

The scientific purpose of this trip was to further test experimental dredge design 1 on a different fishing vessel and with a different crew. The experimental dredge was again fished simultaneously alongside a standard New Bedford dredge that served as the control. The chain bags used regularly by the Westport were attached to the

experimental dredge frame and one of the vessel's New Bedford dredge frame. Further details of the Westport's bag specifications are listed in appendix 113. Photos of both dredges used during this trip are shown in Figure 21.

The scientist conducted total species and scallop bushel counts on all observed tows. Length data was collected from bycatch species as time permitted. All retained scallops were collected into bushel baskets by the crew and the number for each dredge recorded by the captain or mate. Bushel counts were conducted for every tow, even when the scientist was off watch. The scientist observed the captain's watch for the entire trip. During the scientist's watch the crew intentionally fished in areas known to have a higher abundance of bycatch species so that increased bycatch levels could be observed. Many of the tows made during the trip Celtic-2006-2 were repeated. Bridge data was recorded by the captain and mate for each tow throughout the trip. All data were edited and entered by the scientist into an Excel spreadsheet once ashore.

Two other research projects were also being conducted simultaneously during this trip. Scallop bag data was being recorded and logbook/tag printer trials were also being done by the scientist throughout the trip. A GPS data log (position, heading, speed, effort, time) was collected by the logbook every 2 seconds throughout the trip. Temperature loggers were also attached to both dredges during the trip. All additional data are available upon request.

The tow times ranged from 40 minutes to 1 hour 28 minutes, with an average of 1 hour 12 minutes tow duration for the entire trip. Tow speed ranged from 4.0 to 4.6 knots, with an average of 4.3 knots for the trip. The experimental dredge was on the port side for the entire trip. Fishing depth ranged from 39 to 53 fathoms, averaging 40 fathoms for the entire trip. Scallop catch sizes ranged from 11 to 55 bushels, per side, averaging approximately 35 bushels per tow. A complete tow by tow bridge log is provided in Appendix Table 3.

Nine tows were excluded from the data set for a variety of reasons. Of those nine bad tows: four were due to part of the experimental dredge's bag hanging up on the turtle guards, one was due to large boulders being caught in the control dredge, two were due to control dredge's bag hanging up the frame, one had a busted sweep on the control dredge, and one was due to deck loading.

The crew also had some trouble setting the gear during the beginning of the trip. This was due to the crew being accustomed to setting the dredges using an older technique referred to as "knocking off the rail", rather than flaring the dredges. Due to the design of the experimental dredge, specifically the turtle guards, knocking the dredges off was not an option. Therefore, the control dredge was set with the knock off method and the experimental was set by flaring off the gallows. Difficulty in the setting of the gear may have been the cause for the bag hanging up on the dredge frame. However, the learning curve was overcome after the first few tows and this was not a reoccurring issue later in the trip. No significant gear modifications were made to either the experimental or the control dredges at anytime during the trip. Since the trip was cut short, no major wearing of the gear was observed. A total of 13 different bycatch species were observed during the trip. Bycatch included: little skate, barndoor skate, winter skate, monkfish, grey sole, yellowtail flounder, winter flounder, four spot flounder, American plaice, sea raven, longhorn sculpin, red hake, and silver hake. Catch count data collected for each sampled tow is show in Appendix Table 13. Length data for each species are shown in Appendix Tables 32 thru 41. Descriptive statistics summarizing all of the species caught in each dredge is shown in Appendix Table 67.

Due to the limited number of observed tows resulting from the broken trip, significance testing for catch quantity differences between dredges was not relevant for most species. However, yellowtail flounder was found to have a significance level of $p<0.05$. A summary of catch data for scallops and yellowtail flounder on this trip is listed below in Table 4. The total count of yellowtail flounder was found to be 55% less in the experimental dredge. This significant reduction the yellowtail is consistent with similar results from the previous two test trips. No size selection of yellowtail flounder or any other species caught was observed.

Table 4. Species caught during trip Westport-2006-1 whose total count was significantly ($p<0.05$) in experimental dredge design 1 relative to the control dredge

Westport 2006-1						
Descriptive Statistics and t-Test: Paired Two Sample for Means						
Experimental Dredge Design 1						
Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Yellowtail Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	930	975	428	406	37	82
% Difference in Count	**-5%**		**5%**		**-55%**	
Fish Count/Scallop Bushel Catch Ratio					0.09	0.2
% Difference in Catch Ratio					**-57%**	
Mean	34.5	36.1	38.9	36.9	3.4	7.5
Standard Error	2	2	2	4	1	2
Median	37	39	40	40	2	8
Mode	38	48	47	48	1	16
Standard Deviation	10	12	7	12	4	6
Sample Variance	106	148	42	137	16	38
Kurtosis	0	1	1	0	3	-2
Skewness	0	-1	-1	-1	2	0
Range	44	50	22	34	12	16
Minimum	11	2	25	14	1	0
Maximum	55	51	47	48	13	16
Confidence Level(95.0%)	930.25	974.50	4.37	7.87	2.67	4.16
Observations	27.00	27.00	11.00	11.00	11.00	11.00
Pearson Correlation	4.07	4.82	0.52		0.60	
Hypothesized Mean Difference	0		0		0	
df	26.00		10.00		10.00	
α	0.05		0.05		0.05	
t Stat	-0.86		0.66		-2.73	
P(T<=t) one-tail	0.20		0.26		0.01	
t Critical one-tail	1.71		1.81		1.81	
P(T<=t) two-tail	0.396		0.523		0.021	
t Critical two-tail	2.06		2.23		2.23	

Although the data were limited by the sample size, results from what was collected suggest that a dramatic reduction in bycatch numbers of most species was occurring in the experimental dredge. The number of bushels of kept scallops was too variable to deduce any conclusions regarding catch ratios or scallop catch efficiency. However, these data were included in the analysis of data compiled from all three trips using dredge design 1. Those results are discussed later in this report.

Celtic-2006-3

The trip Celtic-2006-3 was the 1st field test of experimental dredge frame 2. The F/V Celtic sailed New Bedford on 10/6/2006 for a RSA collection trip fishing in Closed Area II of Georges Bank. The scientists onboard were Matt Weeks and Eric Matzen. Paul D. was captain of this trip and Timmy Quinn was mate. All crew members were very helpful in the collection of data during the trip. The weather was also cooperative during the majority of the trip, with calm seas and fair conditions. The Celtic stopped fishing on 10/17/2006 and arrived in New Bedford on 10/18/2006 for a total of 12 days at

sea. The crew sold all of their landed scallop meats to Eastern Fisheries.

The scientific goal of this trip was to test a modification to experimental dredge design 1. This modified experimental dredge design was named dredge frame design 2. The same gear configuration and standard New Bedford dredge from previous trips on the Celtic were used during this trip. Photos of both dredges used during this trip are shown in Figure 22.

Figure 22. Photograph F/V Celtic's New Bedford dredge used as control (left) and experimental dredge frame design 2 (right)

A total of 151 tows were conducted during the trip. Of those tows, 114 were considered successful tows and thus were included in the data analysis. Seventy-six tows (67% of good tows) were observed and sampled by the scientists. The crew deployed, fished, and retrieved both dredges identically and simultaneously for the entire trip. A scope of approximately 3:1 (wire out: seafloor depth) was applied to both dredges while fishing. Several times during the trip, the vessel intentionally fished in areas of higher fish abundance in order to observe higher bycatch levels. Many of the tows made during the trip Westport-2006-1 were repeated.

The scientist conducted fish counts and scallop bushel counts on all observed tows. Length data was collected from bycatch species as time permitted. All retained scallops were collected into bushel baskets by the crew and the number for each dredge recorded by the captain or mate. Bushel counts were conducted for all tows. Matt observed the captain's watch and Eric observed the mate's watch for the entire trip. Bridge data was recorded by the captain and mate for each tow throughout the trip. All data were edited and entered by the Matt into an Excel spreadsheet once ashore**.**

Three other research projects were also being conducted simultaneously during this trip. Scallop bag data was recorded and logbook/tag printer trials were also being done by the scientist throughout the trip. A GPS data log (position, heading, speed,

effort, time) was collected by the NEFSC's electronic logbook every 2 seconds throughout the trip. Temperature loggers were also attached to both dredges during the trip. On behalf of the NEFSC Observer Program, both scientists conducted testing of catch estimation methods used by observers. All these additional data are available upon request.

Of the 151 tows made during this trip, 114 (75%) were deemed scientifically relevant and used in the data analysis. Due to the high density of scallop in the area, deck loading occurred on 25 tows. Sampling of bycatch and counting of bushel baskets could not be completed during these tows. Instead, validation tests of observer program catch estimation protocols were done when deck loading occurred.

Of the remaining 12 tows not included, 6 (4% of total) were excluded because the experimental dredge's twine top was hung up on the turtle guards. During 2 tows, the control dredge's twine top hung up on its frame. Tows that had a problem with the twine top hanging on the frame, tended to happen in succession. A likely explanation for this problem would be the setting of gear at the wrong angle to the tide. The remaining 4 excluded tows were purged from the data set because of hangs on the seafloor or a dredge not fishing correctly for an unknown reason (possibly flipped or crossed).

No significant gear modifications were made at anytime during the trip. After tow 114, the crew did routine gear maintenance (put on new shoe stock, fixed any minor holes, chains, etc.) to both dredges. The experimental dredge was switched from the port to the starboard side after tow 140 to ensure that this variable was accounted for in the data.

The tow times ranged from 22 minutes to 1 hour 50 minutes, with an average of 1 hour 20 minutes tow duration for the entire trip. Tow speed ranged from 4 to 5.1 knots, with an average of 4.5 knots for the trip. Fishing depth ranged from 32 to 47 fathoms, averaging 40 fathoms for the entire trip. Scallop catch sizes ranged from 6 to 39 bushels per side, averaging approximately 17 bushels per tow. Detailed tow by tow bridge log data recorded during this trip are provided in Appendix Table 5.

A total of 20 different bycatch species were observed during the trip. The majority of the bycatch consisted of little skate, monkfish, yellowtail flounder, and red hake.

Catch count data collected for each sampled tow is show in Appendix Table 15. Length data collected during the trip is given in Appendix Tables 42 thru 45. A statistical summary for all species is located in Appendix Table 68 Statistics summarizing the scallop catch and bycatch species whose count was significantly different from that observed in the control dredge ($p<0.05$) are provided in Table 5 below.

During this trip, there were no significant differences between the two dredge's scallop catch. Both dredges averaged 17 bushels per tow for the whole trip. Seventeen out of 20 bycatch species were caught at a lower catch ratio relative to the control dredge. Of those 19 reduce catch ratios, 9 had a statistically significant different total count ($p<0.05$). The catch of red hake in the two dredges appears to have been similar. The experimental dredge had a higher catch ratio for 2 species, monkfish and American plaice**.** However, the catch difference for those two species did not meet the criteria of being statistically significant at alpha=0.05.

Celtic 2006-3												
Descriptive Statistics and t-Test: Paired Two Sample for Means												
Experimental Dredge Design 2												
Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Grey Sole**		**Yellowtail Fld.**		**Winter Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1904	1939	1223	1248	4756	5539	14	26	1899	2857	7	27
% Difference in Count	**-2%**		**-2%**		**-14%**		**-46%**		**-34%**		**-74%**	
Fish Count/Scallop Bushel Catch Ratio					3.89	4.5	0.01	0.0	1.55	2.3	0.01	0.0
% Difference in Catch Ratio					**-13%**		**-45%**		**-32%**		**-74%**	
Mean	17	17	16	16	62	73	0	0	25	38	0	0
Standard Error	1	1	1	1	4	4	0	0	3	5	0	0
Median	16	16	15	15	60	74	0	0	11	25	0	0
Mode	16	12	12	12	18	96	0	0	2	1	0	0
Standard Deviation	6	6	6	6	34	37	1	1	30	43	0	1
Sample Variance	39	35	31	32	1156	1351	1	1	902	1835	0	1
Kurtosis	2	0	1	0	0	0	27	9	2	3	36	7
Skewness	1	1	1	1	0	0	5	3	2	2	6	3
Range	32	30	27	23	163	169	5	4	133	207	3	4
Minimum	7	6	7	8	6	10	0	0	0	0	0	0
Maximum	39	36	34	31	169	179	5	4	133	207	3	4
Confidence Level(95.0%)	1	1	1	1	8	8	0	0	7	10	0	0
Observations	114	114	76	76	76	76	76	76	76	76	76	76
Pearson Correlation	0.78		0.77		0.73		0.70		0.87		-0.02	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	113		75		75		75		75		75	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-0.81		-0.74		-3.64		-2.17		-4.97		-2.69	
P(T<=t) one-tail	0.21		0.23		0.00		0.02		0.00		0.00	
t Critical one-tail	1.66		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	**0.42**		**0.46**		**0.00**		**0.03**		**0.00**		**0.01**	
t Critical two-tail	**1.98**		**1.99**		**1.99**		**1.99**		**1.99**		**1.99**	

Species	**Sand Dab**		**Longhorn Sculpin**		**Silver Hake**		**Lobster**		**Four Spot Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	321	450	38	61	31	67	24	45	487	664
% Difference in Count	**-29%**		**-38%**		**-54%**		**-47%**		**-27%**	
Fish Count/Scallop Bushel Catch Ratio	0.26	0.4	0.03	0.0	0.03	0.1	0.02	0.0	0.40	0.5
% Difference in Catch Ratio	**-27%**		**-36%**		**-54%**		**-46%**		**-26%**	
Mean	4	6	1	1	0	1	0	1	6	9
Standard Error	1	1	0	0	0	0	0	0	1	1
Median	0	0	0	0	0	0	0	0	6	8
Mode	0	0	0	0	0	0	0	0	6	8
Standard Deviation	8	12	1	1	1	2	1	1	6	6
Sample Variance	62	139	1	1	1	4	1	1	35	32
Kurtosis	8	10	8	2	13	21	5	6	11	2
Skewness	3	3	3	2	3	4	2	2	3	1
Range	42	63	5	5	5	13	3	6	38	30
Minimum	0	0	0	0	0	0	0	0	0	0
Maximum	42	63	5	5	5	13	3	6	38	30
Confidence Level(95.0%)	2	3	0	0	0	0	0	0	1	1
Observations	76	76	76	76	76	76	76	76	76	76
Pearson Correlation	0.83		0.35		0.43		0.58		0.05	
Hypothesized Mean Difference	0		0		0		0		0	
df	75		75		75		75		75	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-2.15		-2.18		-2.55		-2.58		-2.63	
P(T<=t) one-tail	0.02		0.02		0.01		0.01		0.01	
t Critical one-tail	1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	**0.04**		**0.03**		**0.01**		**0.01**		**0.01**	
t Critical two-tail	**1.99**		**1.99**		**1.99**		**1.99**		**1.99**	

Table 5. Species caught during trip Celtic-2006-3 whose total count was significantly ($p<0.05$) in experimental dredge design 2 relative to the control dredge

Westport-2006-2

The trip Westport-2006-2 was the 2nd and final field test of experimental dredge frame 2. The F/V Westport departed New Bedford on 9/14/2006 for an RSA collection trip to Closed Area II on Georges Bank. The scientist onboard was Matt Weeks. Eddy Welch was captain of this trip and Nate was mate. The crew included: Shane as engineer/cook and deckhands Foggy, Shane, Cham, and Jimmy. All crew members were very helpful in the collection of data during the trip.

A total of 171 tows were conducted during the trip. The Westport stopped fishing on 9/25/2006 and arrived in New Bedford on 9/26/2006 for a total of 12 days at sea. The vessel sold all of its catch at the New Bedford Seafood Auction.

The scientific purpose of this trip was to continue testing experimental dredge design 2 on a different vessel in order to compare its catch with a standard New Bedford dredge fishing alongside during regular commercial fishing operations. The gear (chain bag configuration and dredge frame) from trip Westport-2006-1 was again used during this trip. Further details of the Westport's bag specifications are listed in appendix #. Photos of both dredges used during this trip are shown below in Figure 23. It was noted at the beginning of this trip that the right bale bar on the experimental dredge had been bent slightly during a previous trip (not included in this report) (see Figure 28.)

Figure 23. Photograph F/V Westport's New Bedford dredge used as control (left) and experimental dredge frame design 2 (right)

The scientist conducted fish counts and scallop bushel counts on all observed tows. Length data was collected from bycatch species as time permitted. All retained scallops were collected into bushel baskets by the crew and the number for each dredge recorded by the captain or mate. Bushel counts were conducted for every tow, even when the scientist was off watch. The scientist observed the captain's watch for the

entire trip, per the captain's request. Bridge data were recorded by the captain and mate for each tow throughout the trip. All data were edited and entered by the scientist into an Excel spreadsheet once ashore.

Two other research projects were also being conducted simultaneously during this trip. Scallop bag data was being recorded and logbook/tag printer trials were also being done by the scientist throughout the trip. A GPS data log (position, heading, speed, effort, time) was collected by the NEFSC's electronic logbook every 2 seconds throughout the trip. Temperature loggers were also attached to both dredges during the trip. These additional data are available upon request.

Of the 171 tows, 162 (95%) were considered successful and thus were included in the final data set. 75 tows (46% of good tows) were observed and sampled by the scientist. No unusual gear problems or trends occurred on this trip. While the scientist was on watch, the crew fished off of the denser scallop beds and in areas known to have larger populations of fish. This was done so that a better understanding of bycatch levels in the experimental dredge could be achieved.

No significant gear modifications were made at anytime during the trip. The crew did routine gear work to both dredges between tow 45 and 46.

The tow times ranged from 7 minutes to 1 hour 33 minutes, with an average of 1 hour and 11 minute tow duration for the entire trip. Tow speed ranged from 3.7 to 5.1 knots, with an average of 4.2 knots for the trip. Bottom depth ranged from 30 to 52 fathoms, averaging 38 fathoms for the entire trip. The captain tried varying the scope of the experimental dredge to see how it affected catch. Scallop catch sizes ranged from 3 to 30 bushels per side. The experimental dredge averaged 14 bushels of scallops per tow and the control dredge averaged 16 bushels. Detailed tow by tow bridge log data recorded during this trip are provided in Appendix Table 4.

A total of 18 different bycatch species were observed during the trip. The majority of the bycatch species included: little skates, winter skate, monkfish, yellowtail flounder, and four-spot flounder. Catch count data collected for each sampled tow is show in Appendix Table 14. Length data for each species is provided in Appendix Tables 37 thru 41. Descriptive statistics summarizing species that were caught at a level of statistically significant differences ($p<0.05$) between the two dredges are listed below in

Table 5. A statistical summary for all species caught during the trip is located in Appendix Table 69.

The experimental dredge caught significantly less scallops during this trip. This could have resulted from a side bias (the dredges were not switched during this trip) or slight difference in the vessel's chain bag gear (both had been used all season). The captain mentioned that the experimental dredge consistently caught less trash (starfish, sand dollars) on large tows as compared to the control dredge, which could also affect scallop catch. The captain experimented with different levels of wire to depth ratio used while fishing the experimental dredge. The ratio was kept approximately 3:1, with 5-15 fathoms difference of wire given to one side. The captain found that the dredge seemed to like shorter wire (15 fathoms less than the control dredge at 3:1). However, due to the limited sample size at each tow configuration and possible influence of other fishing variables, no conclusive catch difference relative to the scope could be quantified.

Even with the decreased scallop catch, the experimental dredge caught 15 out of 18 species at a lower fish count/scallop bushel count ratio. Ten of those species were caught at a statistically significantly lower level. No shift in the length frequency distribution was observed for any of the species caught.

Westport 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Barndoor Skate**		**Winter Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	2191	2506	959	1116	3090	6108	140	285	116	238
% Difference in Count	**-13%**		**-14%**		**-49%**		**-51%**		**-51%**	
Fish Count/Scallop Bushel Catch Ratio					3.22	5.5	0.15	0.3	0.12	0.2
% Difference in Catch Ratio					**-41%**		**-43%**		**-43%**	
Mean	13.6	15.6	12.8	14.9	41.8	82.5	1.9	3.8	1.5	3.2
Standard Error	0	0	0	0	3	5	0	0	0	0
Median	14	16	13	15	39	77	1	3	1	3
Mode	13	16	11	15	30	67	0	1	0	0
Standard Deviation	4	4	4	4	23	46	2	4	2	4
Kurtosis	1	1	2	-1	1	0	10	14	3	14
Skewness	0	0	1	0	1	1	3	3	2	3
Range	26	27	26	16	120	224	13	25	9	24
Minimum	3	4	4	8	1	3	0	0	0	0
Maximum	29	30	29	23	121	227	13	25	9	24
Confidence Level(95.0%)	1	1	1	1	5	11	1	1	0	1
Variance	16.99	14.37	18.25	13.58	513.94	2089.32	6.04	18.57	4.25	13.85
Observations	162	162	75	75	74	74	75	75	75	75
Pearson Correlation	0.68		0.64		0.72		0.70		0.41	
Hypothesized Mean Difference	0		0		0		0		0	
df	161.00		74.00		73.00		74.00		74.00	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-7.90		-5.32		-10.51		-5.33		-4.10	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00	
t Critical one-tail	1.65		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.000		0.000		0.000		0.000		0.000	
t Critical two-tail	1.97		1.99		1.99		1.99		1.99	

Table 5.1. Scallop catch and skate species caught during trip Westport-2006-2 whose total count was significantly ($p<0.05$) different in experimental dredge design 2 relative to the control dredge

Westport 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Summer Fld.**		**Grey Sole**		**Yellowtail Fld.**		**Winter Fld.**		**Four Spot Fld.**		**Sand Dab**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	30	51	1	7	650	2637	6	19	114	388	143	375
% Difference in Count	**-41%**		**-86%**		**-75%**		**-68%**		**-71%**		**-62%**	
Fish Count/Scallop Bushel Catch Ratio	0.03	0.0	0.00	0.0	0.68	2.4	0.01	0.0	0.12	0.3	0.15	0.3
% Difference in Catch Ratio	**-32%**		**-83%**		**-71%**		**-63%**		**-66%**		**-56%**	
Mean	0.4	0.7	0.0	0.1	8.7	35.2	0.1	0.3	1.5	5.2	1.9	5.0
Standard Error	0	0	0	0	1	5	0	0	0	0	0	1
Median	0	0	0	0	4	22	0	0	1	4	0	1
Mode	0	0	0	0	1	4	0	0	0	1	0	0
Standard Deviation	1	1	0	0	10	39	0	1	2	4	3	7
Kurtosis	1	1	75	18	4	7	8	7	7	0	2	2
Skewness	1	1	9	4	2	2	3	3	2	1	2	2
Range	2	4	1	2	49	210	1	3	11	16	12	30
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	2	4	1	2	49	210	1	3	11	16	12	30
Confidence Level(95.0%)	0	0	0	0	2	9	0	0	0	1	1	2
Variance	0.43	0.95	0.01	0.14	94.09	1527.24	0.07	0.38	3.63	16.06	9.38	54.19
Observations	75	75	75	75	75	75	75	75	75	75	75	75
Pearson Correlation	0.20		-0.03		0.80		0.28		0.45		0.75	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	74.00		74.00		74.00		74.00		74.00		74.00	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-2.29		-1.76		-7.20		-2.50		-8.82		-4.90	
P(T<=t) one-tail	0.01		0.04		0.00		0.01		0.00		0.00	
t Critical one-tail	1.67		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.025		0.083		0.000		0.015		0.000		0.000	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99	

Table 5.2. Species caught during trip Westport-2006-2 whose total count was significantly ($p<0.05$) different in experimental dredge design 2 relative to the control dredge

Westport 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Red Hake**		**Silver Hake**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	37	158	54	112
% Difference in Count	**-77%**		**-52%**	
Fish Count/Scallop Bushel Catch Ratio	0.04	0.1	0.06	0.1
% Difference in Catch Ratio	**-73%**		**-44%**	
Mean	0.5	2.1	0.7	1.5
Standard Error	0	0	1	1
Median	0	1	0	0
Mode	0	0	0	0
Standard Deviation	1	3	5	5
Kurtosis	20	6	74	52
Skewness	4	2	9	7
Range	9	14	41	39
Minimum	0	0	0	0
Maximum	9	14	41	39
Confidence Level(95.0%)	0	1	1	1
Variance	2.01	8.80	22.42	22.96
Observations	75	75	75	75
Pearson Correlation	-0.01		0.93	
Hypothesized Mean Difference	0		0	
df	74.00		74.00	
α	0.05		0.05	
t Stat	-4.24		-3.69	
P(T<=t) one-tail	0.00		0.00	
t Critical one-tail	1.67		1.67	
P(T<=t) two-tail	0.000		0.000	
t Critical two-tail	1.99		1.99	

Table 5.3. Species caught during trip Westport-2006-2 whose total count was significantly ($p<0.05$) different in experimental dredge design 2 relative to the control dredge

Friendship 2007-1

The F/V Friendship (Trip ID F/V Friendship 2007-1) left New Bedford for a RSA collection trip to the Hudson Canyon Assess Area on 5/15/2007 and returned on 5/29/2007, making it a 15 day trip. The scientist onboard was Karen Bolles. Tom Wilson was the captain with Mark Sanders as Mate. The crew was cooperative most of the time with the scientist.

One experimental and one control dredge were fished. The experimental dredge was designated dredge design 3a. The control dredge was a standard New Bedford dredge without wheels. Photos of both dredges used during this trip are shown below in Figure 24.

The purpose of this trip was to experiment with major changes to the experimental dredge as described in the previous section. This was a preliminary testing trip with several characteristics changing throughout the trip and a new crew that was inexperienced in scientifically testing new gear. The data collected during this trip were not included into the analysis for dredge 3a. The total number of tows for the entire trip was not recorded due to the difficulty the bridge had with fishing the experimental dredge correctly.

Figure 24. Photograph F/V Friendship's New Bedford dredge used as control (left) and experimental dredge frame design 3a (right)

Turtle chains were used on both dredges to comply with the current regulations. The crew had some trouble initially with flaring the experimental dredge during the setting process. This issue was solved by using a piece of line attached to the rail and wrapped around the bale bar. This held the dredge down and alongside the vessel until it was flared, upon which the line was let go and the dredge deployed. New shoes were put on the experimental dredge after tow 15. At the captain's request, the 18" wheels were taken off the experimental dredge after tow number 13. The turtle guards were removed from the dredge after tow 18. After tow 23, a ticker chain was placed on the dredge in front of the cutting bar. After tow 26, the extra ticker chain was removed for the dredge. After tow 48, a chain was added to the experimental dredge to raise the cutting bar higher off the bottom. Twine top meshes were measured halfway through the trip and found to have shrunk approximately ¼" by the end of the trip. The experimental dredge was fished on the starboard side for the entire trip and thus there were no groupings to examine regarding switching sides.

Species observed most often included little skate, monkfish, and fourspot flounder. Other species observed included sea robin, grey sole, fluke, black sea bass, red hake, squid, spiny dogfish, and winter skate.

Friendship-2007-2

The trip Friendship-2007-2 was the 1st field trial of experimental dredge frame 3. The F/V Friendship sailed on 6/5/2007 from New Bedford for a RSA collection trip in the Hudson Canyon Access Area and returned to New Bedford on 6/20/2007 for a total of 15 days at sea. The scientist onboard was Matt Weeks. Tom Wilson was the captain with Mark Sanders as Mate. The crew was cooperative most of the time with the scientist. The crew sold their entire catch of scallop meats landed during the trip to Eastern Fisheries.

The scientific purpose of this trip was to test experimental dredge design 3 and compare its catch with a standard New Bedford dredge fished alongside during regular commercial fishing operations. The control dredge was a standard New Bedford dredge frame without wheels. Photos of both dredges used during this trip are shown below in Figure 25. The characteristics of

both chain bags used were identical except for the experimental dredge's bag having 15 diamonds and the control dredge having 14 diamonds. The gear (chain bag and control dredge frame) from trip Friendship-2006-1 was again used during this trip. Turtle chains were used on both the experimental and standard dredge throughout the trip (this trip was prior to the turtle chain exemption permit).

Figure 25. Photograph F/V Friendship's New Bedford dredge used as control (left) and experimental dredge frame design 3 (right)

The scientist conducted bycatch counts and scallop bushel counts on all observed tows. Length data was collected from bycatch species as time permitted. When deck loading did not occur, retained scallops were collected into bushel baskets by the crew and the number for each dredge recorded by the captain or mate. When deck loading did occur, sampling and bushel counts were not able to be completed. Bushel counts were conducted for most tows, even when the scientist was off watch. The scientist observed most tows on a watch that lasted from 05:30 to 18:30. The scientist's watch overlapped both mate and captain's watch. Most bridge data were recorded by the captain and mate. All data were edited and entered by the scientist into an Excel spreadsheet. A GPS data log (position, heading, speed, effort, time) was collected by the NEFSC's electronic logbook every 2 seconds throughout the trip.

A total of 246 tows were conducted during the trip. Of those tows, 184 (75%) were considered scientifically successful tows with compete data and thus were included in the data analysis. Eighty-nine tows (48% of good tows) were observed and sampled by the scientist. During rougher weather the crew fished in areas with high sand dollar density to help retain smaller scallops. The crew used a scope ratio of 3:1 + 10 fathoms for most of the trip; however some tows did have uneven amounts of wire set out. The captain seemed to think that shorter wire worked better for both dredges.

One significant gear modifications was made during the trip. At the captain's request, the 18" wheels on the experimental dredge were cut off between tow 23 and 24. The wheels remained off for the rest of the trip. After tow 169, the crew did routine gear maintenance (put on new shoe stock, fixed any minor holes, etc.) to both dredges after tow 73. The experimental dredge remained on the starboard side for the entire trip. No unusual gear problems were

encountered during the trip.

The tow times ranged from 7 minutes to 2 hour 6 minutes, with an average of 1 hour 8 minutes tow duration for the entire trip. Short tows were made in areas of high scallop density. Tow speed ranged from 3.0 to 5.7 knots, with an average of 4.5 knots for the trip. Fishing depth ranged from 24 to 39 fathoms, averaging 34 fathoms for the entire trip. Scallop catch sizes ranged from 0.5 to 30 bushels per side. The experimental dredge averaged 4.3 and the control dredge 4.1 bushels of scallops per tow. Complete tow by tow bridge log data were recorded during this trip and are provided in Appendix Table 6.

A total of 12 bycatch species were observed in the dredges during the trip. The majority of species caught were little skate and monkfish. Catch count data collected for each sampled tow is show in Appendix Table 16. Length data for each species is provided in Appendix Tables 52-54. A statistical summary for all species observed during this trip is located in Appendix Table 70. Below in Table 6 is a statistical summary of scallop and skate catch.

Friendship 2007-2						
Descriptive Statistics and t-Test: Paired Two Sample for Means						
Experimental Dredge Design 3						
Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	787	750	374	336	5674	4441
% Difference in Count	**5%**		**11%**		**28%**	
Fish Count/Scallop Bushel Catch Ratio					15.18	13.2
% Difference in Catch Ratio					**15%**	
Mean	4.3	4.1	4.2	3.8	63.8	49.9
Standard Error	0	0	0	0	3	2
Median	4	4	4	4	61	47
Mode	4	5	4	5	72	48
Standard Deviation	3	3	3	2	32	23
Sample Variance	11	8	7	3	1052	548
Kurtosis	31	30	40	15	0	2
Skewness	5	4	5	3	1	1
Range	30	27	25	14	149	130
Minimum	1	1	1	1	12	8
Maximum	30	27	25	15	161	138
Confidence Level(95.0%)	0.48	0.41	0.57	0.38	6.83	4.93
Observations	184	184	89	89	89	89
Pearson Correlation	0.89		0.85		0.75	
Hypothesized Mean Difference	0		0		0	
df	183		88		88	
α	0.05		0.05		0.05	
t Stat	1.84		2.66		6.09	
P(T<=t) one-tail	0.03		0.00		0.00	
t Critical one-tail	1.65		1.66		1.66	
P(T<=t) two-tail	0.07		0.01		0.00	
t Critical two-tail	1.97		1.99		1.99	

Table 6. Summary of scallop and skate catch observed during trip Friendship-2007-2

The experimental dredge caught a total of 787 bushels of scallops while the control dredge caught 750 for the entire trip. This was a 5% increase over the control dredge; however this difference was not statistically significant. One species, little skate, was found caught by a significantly higher amount in the experimental dredge. The experimental dredge caught 5,674 little skate, while the control caught 28% less with 4,441 total little skates. Also, the skate count per a bushel of scallops was 15% higher in the control dredge. All other species observed

in the two dredges were not found to be caught in significantly different amounts.

One turtle interaction with the control dredge was observed on 6/12/2007 at 10:06. The begin tow position was 3850.13 N 7329.05 E at 08:25. The end tow position was at 3850.46 73332.17. The tow duration was 1 hour and 41 minutes at an average speed of 4.3 knots. The bottom depth averaged 30 fathoms during the tow. Additional data collected on the animal are available upon request.

Friendship 2007-3

The trip ID F/V Friendship 2007-3 left New Bedford for a RSA collection trip in the Hudson Canyon Access Area on 6/27/2007 and returned on 7/10/2007, making it a 14 day trip. The scientist onboard was Karen Bolles. Tom Wilson was the captain with Mark Sanders as Mate. The crew was cooperative most of the time with the scientist. The crew sold their entire catch of scallop meats landed during the trip to Eastern Fisheries. Photos of both dredges used during this trip are shown in Figure 25.

One experimental dredge and one control dredge was fished. The experimental dredge consisted of small wheels and teeth. There were no tickle or turtle chains used during this trip. The experimental dredge was on the starboard side until tow 89. The experimental dredge was on the port side from tow number 90 to 200. Only the number of baskets of scallops caught by each dredge was recorded for tow numbers 123 to 200. Several catches were estimated visually first and then verified by actually counting the number of baskets caught on each side. Based on this assessment, tows were accurately estimated when fishing the bed of smaller-sized scallops.

One significant gear modifications was made during this trip. At the captain's request, the bag configuration on both dredges was changed from 15 to 14 diamonds after tow 163. No unusual gear problems were encountered during the trip.

A total of 200 tows were conducted during this trip. Of those, 161 were included in the final data set. Forty-three tows (23% of the total) were observed by the scientist. The tow times ranged from 7 minutes to 2 hour 6 minutes, with an average of 1 hour 8 minutes tow duration for the entire trip. Short tows were made in areas of high scallop density. Tow speed ranged from 3.0 to 5.7 knots, with an average of 4.5 knots for the trip. Fishing depth ranged from 24 to 39 fathoms, averaging 34 fathoms for the entire trip. Scallop catch sizes ranged from 0.5 to 30 bushels per side. The experimental dredge averaged 4.3 and the control dredge 4.1 bushels of scallops per a tow. Complete tow by tow bridge log data recorded during this trip are provided in Appendix Table 18.

The species caught in the greatest numbers were little skate, monkfish and, to a lesser

extent, four-spot flounder. Other species caught were yellowtail flounder, fluke, grey sole, sea robin, silver hake, winter skate, winter flounder, and windowpane flounder. However, these species were caught in such small numbers. Catch count data collected for each sampled tow is shown in Appendix Table 18. Length data for each species is provided in Appendix Tables 55 thru 58. A statistical summary for all species observed during this is located in Appendix Table 71. Below is a statistical summary of scallop and skate catch (Table 7).

Friendship 2007-3
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels(obs tows)**		**Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	869	865	127	124	2956	2505
% Difference in Count	**0%**		**2%**		**18%**	
Fish Count/Scallop Bushel Catch Ratio					23.23	20.2
% Difference in Catch Ratio					**15%**	
Mean	5.4	5.4	3.0	2.9	68.7	58.3
Standard Error	1	1	0	0	5	5
Median	3	3	3	3	65	54
Mode	3	3	3	3	65	45
Standard Deviation	7	7	1	1	33	32
Sample Variance	56	46	2	1	1065	993
Kurtosis	20	9	1	0	0	2
Skewness	4	3	1	0	0	1
Range	60	40	7	5	137	156
Minimum	1	1	1	1	5	9
Maximum	60	40	7	6	142	165
Sum	869	865	127	124	2956	2505
Count	161	161	43	43	43	43
Confidence Level(95.0%)	1.17	1.05	0.41	0.37	10.05	9.70
Mean	5.40	5.37	2.96	2.89	68.74	58.26
Variance	56.08	45.91	1.77	1.41	1065.48	992.58
Observations	161	161	43	43	43	43
Pearson Correlation	0.96		0.90		0.87	
Hypothesized Mean Difference	0		0		0	
df	160		42		42	
t Stat	0.14		0.81		4.22	
P(T<=t) one-tail	0.44		0.21		0.00	
t Critical one-tail	1.65		1.68		1.68	
P(T<=t) two-tail	**0.89**		**0.42**		**0.00**	
t Critical two-tail	1.97		2.02		2.02	

Table 7. Summary of scallop and skate catch observed during trip Friendship-2007-3

The experimental dredge caught a total of 869 bushels of scallops while the control dredge caught 865 for the entire trip, therefore both dredges had the same catch efficiency for scallops during this trip. One species, little skate, was caught by a significantly different amount by the experimental dredge. The experimental dredge caught 2956 little skate, while the control caught 18% less with 2505 total little skates. All other species observed in the two dredges were not caught in significantly different amounts.

Friendship 2007-4

The trip Friendship-2007-4 was the 3rd sea trial of experimental dredge frame 3. The F/V Friendship sailed on 7/16/2007 from New Bedford for the Hudson Canyon Access Area for an RSA collection trip and returned on 7/25/2007 for a total of 15 days at sea. The scientist onboard was Matt Weeks. Tom Wilson was the captain with Mark Sanders as Mate. The crew

included: Mike, Jed, Mike, Joe, and Teddy. The crew was cooperative most of the time with the scientist. The crew sold their entire catch of scallop meats landed during the trip to Eastern Fisheries.

The scientific purpose of this trip was to continue the sea testing of experimental dredge design 3 and compare its catch with a standard New Bedford dredge fished alongside during regular commercial fishing operations. The control dredge was a standard New Bedford dredge frame without wheels. Photos of both dredges used during this trip are shown in Figure 25. The characteristics of both chain bags used were identical. The gear (chain bag and control dredge frame) from trip Friendship-2006-3 was used again on this trip. Since a permit was obtained to allow the vessel not to use turtle chains, a configuration of two tickler and one rock chain was used on both dredges throughout the trip. The experimental dredge had 2 wheels 18" in diameter attached directly behind the gooseneck. The wheels remained on the dredge throughout the trip. No significant changes were made to either dredge during this trip.

The scientist conducted actual fish counts and scallop bushel counts on all observed tows. Length data was collected from bycatch species as time permitted. When deck loading did not occur, retained scallops were collected into bushel baskets by the crew and the number for each dredge recorded by the captain or mate. When deck loading did occur, sampling and bushel counts were not able to be completed. Bushel counts were conducted for most tows, even when the scientist was off watch. The scientist observed most tows on a watch that lasted from 05:30 to 18:30. The scientist's watch overlapped both mate and captain's watch. Most bridge data was recorded by the captain and mate. All data were edited and entered by the scientist into an Excel spreadsheet. A GPS data log (position, heading, speed, effort, time) was collected by the NEFSC's electronic logbook every 2 seconds throughout the trip. In addition, a Vemco temperature/depth logger was attached to the control dredge. The logger collected temperature at depth data every 10 seconds throughout the trip. These data are available upon request.

A total of 165 tows were conducted during the trip. Of those tows, 116 (70%) were considered scientifically successful tows with compete data and thus were included in the data analysis. Most of the data not included were incomplete due to not being recorded by the crew. Several bad tows occurred, but none due to dredge design. Fifty-five tows (47% of good tows) were observed and sampled by the scientist. During rougher weather the crew fished in areas with high sand dollar density to help retain smaller scallops. The crew varied the amount of wire used on each dredge. On this trip, the captain thought the experimental dredge worked best when set with slightly longer wire than the control dredge.

The tow times ranged from 25 minutes to 1 hour 27 minutes, with an average of 48

minutes tow duration for the entire trip. Short tows were made in areas of high scallop density. Tow speed ranged from 3.3 to 5.7 knots, with an average of 5 knots for the trip. Fishing depth ranged from 29 to 37 fathoms, averaging 31 fathoms for the entire trip. Scallop catch sizes ranged from 1 to 8 bushels per side. The experimental dredge averaged 3.8 and the control dredge 3.2 bushels of scallops per a tow. Complete tow by tow bridge log data recorded during this trip are provided in Appendix Table 9.

A total of 10 bycatch species were observed in the dredges during the trip. Catch count data collected for each sampled tow is show in Appendix Table 19. Length data for each species is provided in Appendix Tables 59-60. A statistical summary for all species observed during this trip is located in Appendix Table 72. Below in Table 8 is a statistical summary of scallop, skate, and monkfish catch. The only species caught in any appreciable amount was little skate.

The experimental dredge caught a total of 442 bushels of scallops while the control dredge caught 376 for the entire trip. This was a statistically significant 18% increase of scallop catch over the control dredge. None of the bycatch species observed in the two dredges were found to be captured in significantly different amounts.

Descriptive Statistics and t-Test: Paired Two Sample for Means								
Experimental Dredge Design 3								
Species	**Scallop Bushels (entire trip)**		**Scallop Bushels(obs tows)**		**Skate**		**Monk**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	442	376	197	178	2191	2048	60	68
% Difference in Count	**18%**		**11%**		**7%**		**-12%**	
Fish Count/Scallop Bushel Catch Ratio					11.15	11.5	0.31	0.4
% Difference in Catch Ratio					**-3%**		**-20%**	
Mean	3.8	3.2	3.6	3.2	39.8	37.2	1.1	1.2
Standard Error	0	0	0	0	5	5	0	0
Median	4	3	3	3	29	28	1	1
Mode	3	3	3	3	17	33	0	1
Standard Deviation	1	1	2	1	37	36	2	1
Sample Variance	2	2	2	2	1336	1330	2	1
Kurtosis	1	1	2	1	5	5	3	2
Skewness	1	1	1	1	2	2	2	1
Range	7	7	7	6	164	172	6	5
Minimum	1	1	1	1	4	1	0	0
Maximum	8	8	8	7	168	173	6	5
Sum	442	376	197	178	2191	2048	60	68
Count	116	116	55	55	55	55	55	55
Confidence Level(95.0%)	0.27	0.26	0.42	0.37	9.88	9.86	0.41	0.30
Mean	3.81	3.24	3.57	3.23	39.84	37.24	1.09	1.24
Variance	2.17	2.04	2.40	1.84	1336.21	1330.00	2.34	1.22
Observations	116	116	55	55	55	55	55	55
Pearson Correlation	0.74		0.89		0.95		0.22	
Hypothesized Mean Difference	0		0		0		0	
df	115		54		54		54	
α	0.05		0.05		0.05		0.05	
t Stat	5.86		3.57		1.62		-0.64	
P(T<=t) one-tail	0.00		0.00		0.06		0.26	
t Critical one-tail	1.66		1.67		1.67		1.67	
P(T<=t) two-tail	0.00		0.00		0.11		0.52	
t Critical two-tail	1.98		2.00		2.00		2.00	

Table 8. Summary of scallop, skate, and monkfish catch observed during trip Friendship-2007-4

Friendship-2007-5

The trip Friendship-2007-5 was the 4th and final sea trial of experimental dredge frame 3. The F/V Friendship sailed on 8/22/07 from New Bedford for the Elephant Trunk Closed Area for an RSA collection trip and returned on 8/29/2007 for a total of 9 days at sea. A total of 21,689 lbs of scallops were permitted to be taken. The scientist onboard was Karen Bolles. Tom

Wilson was the captain with Mark Sanders as Mate. The crew was not cooperative with the scientist at times during the trip. The crew sold their entire catch of scallop meats landed during the trip to Eastern Fisheries.

The scientific purpose of this trip was to continue the sea testing of experimental dredge design 3 and compare its catch with a standard New Bedford dredge fished alongside during regular commercial fishing operations. The control dredge was a standard New Bedford dredge frame without wheels. Photos of both dredges used during this trip are shown in Figure 25. The characteristics of both chain bags used were identical. The gear (chain bag and control dredge frame) from trip Friendship-2006-3 was used again on this trip. Since a permit was obtained to allow the vessel not to use turtle chains, a configuration of two tickler and one rock chain was used on both dredges throughout the trip. The experimental dredge had 2 wheels 18" in diameter attached directly behind the gooseneck. The wheels remained on the dredge throughout the trip. No significant changes were made to either dredge during this trip. The dredge remained on the starboard side for the entire trip.

Forty-two tows were used from this trip in the data analysis. Nineteen tows were observed and sampled by the scientist. The tow times ranged from 5 minutes to 1 hour, with an average of 29 minutes tow duration for the entire trip. Tow speed ranged from 3.8 to 4.6 knots, with an averaging 4.1 knots for the trip. Fishing depth ranged from 26 to 30 fathoms, averaging 28 fathoms for the entire trip. Scallop catch sizes ranged from 6 to 100 bushels per side. The experimental dredge averaged 38.2 and the control dredge 39.5 bushels of scallops per tow. Complete tow by tow bridge log data recorded during this trip are provided in Appendix Table 10.

A total of 5 different bycatch species were observed in the dredges during the trip. Bycatch levels for all species were low relative to past trips. Catch count data collected for each sampled tow is show in Appendix Table 20. Length data for each species is provided in Appendix Table 61-64. A statistical summary for all species observed during this trip is located in Appendix Table 73. Below in Table 9 is a statistical summary of scallop, skate, and monkfish catch.

Friendship 2007-5
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Monk**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1605	1661	653	570	835	680	33	17
% Difference in Count	**-3%**		**15%**		**23%**		**94%**	
Fish Count/Scallop Bushel Catch Ratio					1.28	1.2	0.05	0.0
% Difference in Catch Ratio					**7%**		**69%**	
Mean	38.2	39.5	34.3	30.0	43.9	35.8	1.7	0.9
Standard Error	4	4	5	5	6	5	0	0
Median	36	34	25	22	36	30	1	1
Mode	15	25	25	15	#N/A	#N/A	1	1
Standard Deviation	25	24	23	21	25	23	2	1
Sample Variance	642	597	529	449	617	512	3	1
Kurtosis	-1	-1	-1	-1	1	0	5	1
Skewness	0	1	1	1	1	1	2	1
Range	94	93	74	69	101	87	7	3
Minimum	6	7	12	6	0	0	0	0
Maximum	100	100	85	75	101	87	7	3
Confidence Level(95.0%)	7.90	7.61	11.08	10.21	11.98	10.90	0.80	0.45
Observations	42	42	19	19	19	19	19	19
Pearson Correlation	0.93		0.96		0.94		0.55	
Hypothesized Mean Difference	0		0		0		0	
df	41		18		18		18	
α	0.05		1.05		2.05		3.05	
t Stat	-0.95		3.02		4.11		2.65	
P(T<=t) one-tail	0.17		0.00		0.00		0.01	
t Critical one-tail	1.68		1.73		1.73		1.73	
P(T<=t) two-tail	0.35		0.01		0.00		0.02	
t Critical two-tail	2.02		2.10		2.10		2.10	

Table 9. Summary of scallop, skate, and monkfish catch observed during trip Friendship-2007-5

Combined Results

Data for each dredge type were compiled and summarized by experimental dredge number as well as by species caught. These summaries can be found in Appendix Tables 74 thru 105. A brief discussion of quantitative and qualitative results of each dredge follows. A breakdown of length frequency data collected for bycatch species by dredge and trip is provided in Appendix Tables 77 thru 85.

Experimental Dredge Frame Design 1

Statistics for species caught by experimental dredge 1 at mean counts found to be significantly different ($p<0.05$) from the control are listed the Table 10 below. A statistical summary for all species caught are available in Appendix Table 74. Length frequency data for little skate, yellowtail flounder, barndoor skate, summer flounder, and monkfish are found in Appendix Tables 77 – 85.

Experimental dredge frame design 1 completed a total of 256 successful paired tows with a standard New Bedford dredge. The catches of 114 tows were sampled by a scientist onboard. The experimental dredge caught 2,949 bushels of kept scallops as compared to 2,806 bushels by the control dredges. Relative to the control dredge, experimental dredge design 1 was found to catch 5- 10% more scallops while substantially reducing the number of little skate, monk, summer flounder, grey sole, yellowtail flounder, winter flounder, and four spot. No size selection was found to occur in dredge 1 nor was a significant increase in any bycatch species

Experimental Dredge Frame Design 1
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Scallop Bushels (all good tows)**		**Scallop Bushels(obs tows)**		**Skate**		**Yellowtail Fld.**		**Winter Fld.**		**Sand Dab**		**American Plaice**		**Silver Hake**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***xperiment***	***Control***	***xperiment***	***Control***	***xperiment***	***Control***	***Experimental***	***Control***
Total Count	2949	2806	1330	1202	5577	6321	231	323	8	22	91	147	64	88	5	19
% Difference in Count	**5%**		**11%**		**-12%**		**-28%**		**-64%**				**-27%**		**-74%**	
Fish Count/Scallop Bushel Catch Ratio					4.19	5.3	0.17	0.3	0.01	0.0	0.07	0.1	0.05	0.1	0.00	0.0
% Difference in Catch Ratio					**-20%**		**-35%**		**-67%**		**-44%**		**-34%**		**-76%**	
Mean	11.5	11.0	11.7	10.5	48.9	55.4	2.0	2.8	0.1	0.2	0.8	1.3	0.6	0.8	0.0	0.2
Standard Error	1	1	1	1	4	4	0	0	0	0	0	0	0	0	0	0
Median	9	8	9	8	38	45	1	2	0	0	0	0	0	0	0	0
Mode	8	8	9	8	30	34	0	0	0	0	0	0	0	0	0	0
Standard Deviation	9	9	9	10	45	43	3	4	0	1	2	4	2	2	0	0
Sample Variance	75	87	88	90	2062	1858	6	13	0	0	6	13	2	3	0	0
Kurtosis	8	8	6	8	6	4	3	3	42	6	18	11	11	4	19	7
Skewness	3	3	3	3	2	2	2	2	6	3	4	3	3	2	5	3
Range	53	49	46	46	249	223	13	16	3	2	16	20	8	7	1	2
Minimum	2	2	2	2	1	2	0	0	0	0	0	0	0	0	0	0
Maximum	55	51	47	48	250	225	13	16	3	2	16	20	8	7	1	2
Confidence Level(95.0%)	1.07	1.15	1.74	1.76	8.43	8.00	0.47	0.66	0.07	0.10	0.44	0.67	0.28	0.31	0.04	0.08
Observations	256	256	114	114	114	114	114	114	114	114	114	114	114	114	114	114
Pearson Correlation	0.94		0.93		0.91		0.56		0.39		0.84		0.76		0.21	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	255		113		113		113		113		113		113		113	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	2.84		3.50		-3.74		-2.89		-2.62		-2.53		-2.03		-2.95	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00		0.01		0.02		0.00	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.005		0.001		0.000		0.005		0.010		0.013		0.045		0.004	
t Critical two-tail	1.97		1.98		1.98		1.98		1.98		1.98		1.98		1.98	

Table 10. Species caught during all trips using experimental dredge design 1 whose total count was significantly ($p<0.05$) different from the control dredges

One issue presented by this dredge design was the occasional entanglement of a part of the chain bag on the turtle guards. A photo illustrating this entanglement is shown below in Figure 26. When this occurred, the dredge had little or no catch. This problem occurred more frequently during the beginning of the trip, when the captain and mate were figuring out how to set and fish the experimental dredge in various environmental conditions (i.e. tide and sea state). As the trip went on, and the crew became more experienced with the experimental dredge, the hang up problem occurred less often. A total of two bad tows occurred during Westport-2006-1, one occurrence during Celtic-2006-1, and four times on Celtic-2006-2. This represents a total of 7 out of 286 tows for a (2%) occurrence. It should be recognized that events similar to these gear entanglements of the bag on the dredge frame also occur when fishing a standard New Bedford dredge. Tows when this occurred were noted by the scientist but not sampled nor included in the data set.

Figure 26. Photograph showing the twine top being hung up on the turtle guards

Another design issue noted during the testing of dredge design 1 was the wearing down of the turtle guards. Around tow 110 of Celtic-2006-2, the scientist noted that turtle guards were wearing thin. A photograph showing one of the worn turtle guard is provided below in Figure 27. Towards the end of the trip the guards were breaking off entirely as show in Figure 27. This resulted in some of the fish bycatch being sliced and mutilated as well as a few gear hang ups. The turtle guards eventually began breaking off and were not replaced. This problem of the rebar becoming worn down was over come in later trips by using hardened steel or rubber cookies in place of the rebar. One question that this observation may shed light on is how the fish are entering the scallop bag, through the dredge frame or under the frame. Several species of fish were observed with unique cut marks that were most likely resulting from being run over by turtle guards (fig 27). Therefore, it could be inferred that a large portion are making it under the cutting bar, even where the frame is in frequent contact with the ground. This problem was addressed in dredge design 3, by using hardened steel instead of rebar for the turtle guards.

Figure 27. Photograph showing the wearing down of rebar loops used for the turtle guards (right and left) and fish cut by the turtle guards (center)

Another other issue observed during use of the experimental dredge was the increased amount of scallops being crushed by the dredge frame. Crushing, and thus waste of scallops routinely occurs at some level by all dredge frames when the bag is being dumped on deck. As the bag is lifted and the catch shaken loose, the dredge frame come up off the deck and back down onto the catch already on deck. Most of the crushing occurs on the forward and aft sections of the catch pile. This is the section of the pile that comes in contact with the dredge frame's shoe. Scallops crush in other areas of the pile could have been caused by the turtle guards during the empting of the catch. The scallops crushed by the dredge are usually considered ruined and discarded. The extent to which this happens depends upon a number of variables, including: sea state, crew experience, catch size, and the dredge's position on deck upon retrieval. During this trip, approximately ½ of a bushel of scallops were being routinely crushed by the experimental dredge as compared to 0 – ¼ by the control dredge. The precise amount crushed was not quantified due to the mixed of trash and crushed scallops being picked over and immediately discarded by the crew. This estimate was based on comments by the crew and observations made by the scientist. For the experimental dredge, which averaged 9.2 bushels for the entire trip, the loss of scallops due to crushing could have been 5% of its total catch. The reason for this loss in by the experimental dredge was largely due to the longer shoe on the experimental dredge. The turtle guards and wider frame bottom may have also contributed to this loss of catch. Even with the loss of ~½ of a bushel, the experimental dredge averaged more retainable scallops than the control dredge. This problem was addressed in dredge design 3, by shortening the length of the shoe.

Deploying the experimental dredge also presented a challenge to each crew at the beginning of the trip. This was due to a different response the dredge had to flaring during the setting process, but was quickly overcome after a few tows. Flaring the experimental dredge was different from the New Bedford dredge because of the different hydrodynamics caused by the longer shoe and cutting bar position.

The experimental dredge was also observed to consistently catch less bottom trash (sand dollars, starfish, shells, sponge, rocks, etc.) than the control dredge. A quantitative difference was difficult to estimate, but the crew members agreed that the experimental dredge's trash was dramatic less throughout the trip. Although it is possible that the experimental dredge frame tends to exclude this catch, there are additional variables that could have accounted for this difference (i.e., weather, dredge recovery technique, the order that the dredges were recovered, differences in how the chain bag was fishing). There did not appear to be a correlation between the amount of trash landed and the number of bushels of scallops landed. Although, the experimental dredge's catch ratio of bushels of trash to bushels of kept scallops would likely have been significantly lower than the control dredge since the experimental dredge was more efficient in catching scallops.

Experimental Dredge Frame Design 2

Statistics for species caught by experimental dredge 2 at levels found to be significantly different ($p<0.05$) from the control are listed the Table 11 below. A statistical summary for all species caught are available in Appendix Table 76. Length frequency data for bycatch by both the experimental and control dredge are provided in the Appendix Tables 77-85.

Experimental dredge frame design 2 completed a total of 276 successful paired tows with a standard New Bedford dredge. The catches of 150 tows were sampled by a scientist onboard. The experimental dredge caught 4,109 bushels of kept scallops as compared to 4,462 bushels by the control dredges. Experimental dredge 2 was found to catch 8% less scallops than the control dredge while substantially reducing the number of little skate, barndoor skate, winter skate, summer flounder, grey sole, yellowtail flounder, winter flounder, four spot flounder, sand dab, silver hake, and lobster. No size selection for any species was found to occur nor was a significant increase in any bycatch species. No size selection was found to occur in dredge 2 nor was a significant increase in any bycatch species. .

During a trip not included in this report, damage occurred to one of the outside bale bars. A slight bend in the bar occurred during a hang up while towing. This was due to the weakening of the dredge frame by removing the inside bale bars. The damage was not catastrophic, and the dredge continued to fish as it had previously. This was addressed in dredge design 3, by the doubling up of the bale bars.

Figure 28. Photograph of experimental dredge 2 with bale bar bent from hang up

Experimental Dredge Frame Design 2
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	Scallop Bushels (all good tows)		Scallop Bushels(obs tows)		Skate		Barndoor Skate		Winter Skate		Summer Fld.	
Dredge	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*
Total Count	4109	4462	2162	2344	7796	11647	274	434	450	607	47	75
% Difference in Count	**-8%**		**-8%**		**-33%**		**-37%**		**-26%**		**-37%**	
Fish Count/Scallop Bushel Catch Ratio					3.61	5.0	0.13	0.2	0.21	0.3	0.02	0.0
% Difference in Catch Ratio					**-27%**		**-32%**		**-20%**		**-32%**	
Mean	14.9	16.2	14.4	15.6	52.0	77.6	1.8	2.9	3.0	4.0	0.3	0.5
Standard Error	0	0	0	0	2	3	0	0	0	0	0	0
Median	14	16	14	15	46	76	1	2	2	3	0	0
Mode	16	12	12	12	31	96	0	1	0	3	0	0
Standard Deviation	5	5	5	5	31	42	2	3	4	5	1	1
Sample Variance	28	23	27	23	936	1727	5	12	16	20	0	1
Kurtosis	3	2	1	0	1	0	7	21	10	12	6	6
Skewness	1	1	1	1	1	1	2	4	3	3	2	2
Range	36	33	31	24	168	224	13	25	23	30	4	5
Minimum	3	4	4	8	1	3	0	0	0	0	0	0
Maximum	39	36	34	31	169	227	13	25	23	30	4	5
Confidence Level(95.0%)	0.63	0.57	0.84	0.78	4.94	6.70	0.38	0.56	0.65	0.73	0.11	0.15
Observations	276	276	150	150	150	150	150	150	150	150	150	150
Pearson Correlation	0.75		0.72		0.61		0.54		0.44		0.27	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	275		149		149		149		149		149	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-5.82		-3.97		-9.41		-4.45		-2.83		-2.30	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00		0.01	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.000		0.000		0.000		0.000		0.005		0.023	
t Critical two-tail	1.97		1.98		1.98		1.98		1.98		1.98	

Table 11.1. Species caught during all trips using experimental dredge design 2 whose total count was significantly ($p<0.05$) different from the control dredges

Experimental Dredge Frame Design 2
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	Yellowtail Fld.		Winter Fld.		Four Spot Fld.		Sand Dab		Silver Hake		Lobster	
Dredge	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*
Total Count	2546	5478	13	45	596	1047	464	825	82	178	29	48
% Difference in Count	**-54%**		**-71%**		**-43%**		**-44%**		**-54%**		**-40%**	
Fish Count/Scallop Bushel Catch Ratio	1.18	2.3	0.01	0.0	0.28	0.4	0.21	0.4	0.04	0.1	0.01	0.0
% Difference in Catch Ratio	**-50%**		**-69%**		**-38%**		**-39%**		**-50%**		**-34%**	
Mean	17.0	36.5	0.1	0.3	4.0	7.0	3.1	5.5	0.5	1.2	0.2	0.3
Standard Error	2	3	0	0	0	0	0	1	0	0	0	0
Median	7	23	0	0	3	6	0	1	0	0	0	0
Mode	2	4	0	0	0	8	0	0	0	0	0	0
Standard Deviation	24	41	0	1	5	5	6	10	3	4	1	1
Sample Variance	567	1681	0	0	25	27	37	97	12	13	0	1
Kurtosis	6	4	35	8	15	2	14	11	135	78	10	14
Skewness	2	2	5	3	3	1	3	3	11	8	3	3
Range	133	210	3	4	38	30	42	63	41	39	3	6
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	133	210	3	4	38	30	42	63	41	39	3	6
Confidence Level(95.0%)	3.84	6.61	0.06	0.11	0.81	0.84	0.99	1.59	0.55	0.59	0.09	0.14
Observations	150	150	150	150	150	150	150	150	150	150	150	150
Pearson Correlation	0.74		0.09		0.26		0.79		0.87		0.56	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	149		149		149		149		149		149	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-8.47		-3.54		-5.94		-4.71		-4.38		-2.14	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00		0.02	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.000		0.001		0.000		0.000		0.000		0.034	
t Critical two-tail	1.98		1.98		1.98		1.98		1.98		1.98	

Table 11.2. Species caught during all trips using experimental dredge design 2 whose total count was significantly ($p<0.05$) different from the control dredges

Experimental Dredge Frame Design 3

Statistics for species caught by experimental dredge 3 at levels found to be significantly different ($p<0.05$) from the control are listed the Table 12 below. A statistical summary for all species caught are available in Appendix Table 77. Length frequency data for bycatch by both the experimental and control dredges are provided in the Appendix Tables 77-85.

Experimental Dredge Frame Design 3
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels(obs tows)**		**Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	3680	3514	1347	1211	11205	10125
% Difference in Count	**5%**		**11%**		**11%**	
Fish Count/Scallop Bushel Catch Ratio					8.32	8.4
% Difference in Catch Ratio					**-1%**	
Mean	7.7	7.3	6.5	5.9	54.4	49.2
Standard Error	1	1	1	1	2	2
Median	4	4	4	4	48	44
Mode	3	3	3	3	45	48
Standard Deviation	13	13	11	10	34	31
Sample Variance	172	166	130	101	1169	984
Kurtosis	17	17	22	24	1	2
Skewness	4	4	5	5	1	1
Range	100	100	85	75	168	173
Minimum	1	1	1	1	0	0
Maximum	100	100	85	75	168	173
Confidence Level(95.0%)	1.18	1.15	1.56	1.38	4.70	4.31
Observations	481	481	206	206	206	206
Pearson Correlation	0.97		0.98		0.83	
Hypothesized Mean Difference	0		0		0	
df	480		205		205	
α	0.05		0.05		0.05	
t Stat	2.43		3.85		3.85	
P(T<=t) one-tail	0.01		0.00		0.00	
t Critical one-tail	1.65		1.65		1.65	
P(T<=t) two-tail	0.016		0.000		0.000	
t Critical two-tail	1.96		1.97		1.97	

Table 12. Species caught during all trips using experimental dredge design 3 whose total count was significantly ($p<0.05$) different from the control dredges

Experimental dredge frame design 3 completed a total of 481 successful paired tows with a standard New Bedford dredge. The catches of 206 tows were sampled by a scientist onboard. The experimental dredge caught 3,680 bushels of kept scallops as compared to 3,514 bushels by the control dredge. Experimental dredge 3 was found to catch 5 – 11% more scallops.

It also increased the number of little skate caught by 11%. The area fished by dredge 3 has both a lower diversity and abundance of fish species, so the number of fish caught during trial trips is not comparable to the results found with dredge 1 and 2. No size selection for any species was found to occur nor was a significant increase in any bycatch species. Significantly more little skate were found to be captured by the experimental dredge 3. Although when the catch ratio is considered (skate:scallop bushel kept), the capture rate of little skate in both dredges were equal.

Results of All Experimental Dredges

Statistics of all data combined by experimental dredges and control dredges can be found in Appendix Table # . A summary of all experimental dredge scallop catch and specific bycatch species are provided below in Table 13. Length frequency data for bycatch by both the experimental and control dredges are provided in the Appendix Tables 77-85.

A total of 1,087 successful paired tows were conducting using an experimental and standard New Bedford dredge during the 10 sea trial trips presented in this report. The catch of 520 tows (48% of total) were observed and sampled by a scientist onboard. A total of 11,184 scallop bushel baskets were landed by the experimental dredges and 11,213 were caught by the control dredges. This is a difference of 29 (-0.3%) less bushel baskets being caught by the experimental dredges than the control dredges. During tows that were observed, the difference was 1.6% more scallops being caught by the experimental dredge.

A significant bycatch reduction also occurred in the experimental dredges relative to the control dredges. The experimental dredge was found to have significantly reduced the amount of 10 of the 22 bycatch species captured during these sea trials. The species count reduced by the experimental dredges included: skate (-7.1%), barndoor skate (-18%), summer flounder (-31%), yellowtail flounder (-52%), winter flounder (-67%), four-spot (-25%), sand dab (-42%), longhorn sculpin (-46%), silver hake (-52%), and lobster (-36%). No bycatch totals were found to have significantly increased in the experimental dredge.

All Dredges - Scallop Catch and Bycatch Species with p<0.05								
Descriptive Statistics and t-Test: Paired Two Sample for Means								
Species	**Scallop Bushels (all good tows)**		**Scallop Bushels(obs tows)**		**Skates**		**Barndoor Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	11184	11213	5150	5067	27513	29601	777	948
% Difference in Count	**-0.3%**		**1.6%**		**-7.1%**		**-18.0%**	
Fish Count/Scallop Bushel Catch Ratio					5.34	5.84	0.15	0.19
% Difference in Catch Ratio					**-9%**		**-19%**	
Mean	10.3	10.3	9.9	9.7	52.9	56.9	1.5	1.8
Standard Error	0	0	0	0	2	2	0	0
Median	8	7	8	8	45	48	0	0
Mode	3	3	3	3	31	33	0	0
Standard Deviation	11	11	10	9	36	39	3	3
Sample Variance	112	116	91	84	1318	1500	9	11
Kurtosis	16	14	16	12	3	2	9	11
Skewness	3	3	3	3	1	1	3	3
Range	100	100	85	75	250	227	19	25
Minimum	1	1	1	1	0	0	0	0
Maximum	100	100	85	75	250	227	19	25
Confidence Level(95.0%)	0.63	0.64	0.82	0.79	3.13	3.34	0.26	0.28
Observations	1087	1087	520	520	520	520	520	520
Pearson Correlation	0.95		0.94		0.72		0.75	
Hypothesized Mean Difference	0		0		0		0	
df	1086		519		519		519	
α	0.05		0.05		0.05		0.05	
t Stat	-0.26		1.14		-3.27		-3.39	
P(T<=t) one-tail	0.40		0.13		0.00		0.00	
t Critical one-tail	1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.791		0.254		0.001		0.001	
t Critical two-tail	1.96		1.96		1.96		1.96	

Table 13.1. Species caught during all experimental dredge trips whose total count was significantly ($p<0.05$) different from the control dredges

All Dredges - Scallop Catch and Bycatch Species with p<0.05								
Descriptive Statistics and t-Test: Paired Two Sample for Means								
Species	**Summer Fld.**		**Yellowtail Fld.**		**Winter Fld.**		**Fourspot Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	111	161	2792	5811	22	67	1264	1690
% Difference in Count	**-31.1%**		**-52.0%**		**-67.2%**		**-25.2%**	
Fish Count/Scallop Bushel Catch Ratio	0.02	0.03	0.54	1.15	0.00	0.01	0.25	0.33
% Difference in Catch Ratio	**-32%**		**-53%**		**-68%**		**-26%**	
Mean	0.2	0.3	5.4	11.2	0.0	0.1	2.4	3.3
Standard Error	0	0	1	1	0	0	0	0
Median	0	0	0	0	0	0	1	1
Mode	0	0	0	0	0	0	0	0
Standard Deviation	1	1	15	27	0	0	4	4
Sample Variance	0	1	220	747	0	0	13	19
Kurtosis	26	11	26	17	74	20	21	5
Skewness	4	3	5	4	8	4	3	2
Range	6	5	133	210	3	4	38	30
Minimum	0	0	0	0	0	0	0	0
Maximum	6	5	133	210	3	4	38	30
Confidence Level(95.0%)	0.06	0.07	1.28	2.36	0.02	0.04	0.32	0.37
Observations	520	520	520	520	520	520	520	520
Pearson Correlation	0.35		0.81		0.23		0.47	
Hypothesized Mean Difference	0		0		0		0	
df	519		519		519		519	
α	0.05		0.05		0.05		0.05	
t Stat	-2.62		-7.54		-4.19		-4.51	
P(T<=t) one-tail	0.00		0.00		0.00		0.00	
t Critical one-tail	1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.009		0.000		0.000		0.000	
t Critical two-tail	1.96		1.96		1.96		1.96	

Table 13.2. Species caught during all experimental dredge trips whose total count was significantly ($p<0.05$)

different from the control dredges

All Dredges - Scallop Catch and Bycatch Species with p<0.05								
Descriptive Statistics and t-Test: Paired Two Sample for Means								
Species	**Sand Dab**		**Longhorn Sculpin**		**Silver Hake**		**American Lobster**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	567	984	93	173	101	209	32	50
% Difference in Count	**-42.4%**		**-46.2%**		**-51.7%**		**-36.0%**	
Fish Count/Scallop Bushel Catch Ratio	0.11	0.19	0.02	0.03	0.02	0.04	0.01	0.01
% Difference in Catch Ratio	**-43%**		**-47%**		**-52%**		**-37%**	
Mean	1.1	1.9	0.2	0.3	0.2	0.4	0.1	0.1
Standard Error	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0
Standard Deviation	4	6	1	3	2	2	0	0
Sample Variance	14	36	1	6	3	4	0	0
Kurtosis	43	37	212	409	455	252	41	55
Skewness	6	5	13	19	21	14	6	7
Range	42	63	19	54	41	39	3	6
Minimum	0	0	0	0	0	0	0	0
Maximum	42	63	19	54	41	39	3	6
Confidence Level(95.0%)	0.32	0.52	0.09	0.22	0.16	0.18	0.03	0.04
Observations	520	520	520	520	520	520	520	520
Pearson Correlation	0.82		0.86		0.86		0.58	
Hypothesized Mean Difference	0		0		0		0	
df	519		519		519		519	
α	0.05		0.05		0.05			
t Stat	-5.02		-2.09		-4.55		-1.97	
P(T<=t) one-tail	0.00		0.02		0.00		0.02	
t Critical one-tail	1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.000		0.037		0.000		0.049	
t Critical two-tail	1.96		1.96		1.96		1.96	

Table 13.3. Species caught during all experimental dredge trips whose total count was significantly (p<0.05) different from the control dredges

Discussion

The goal of this study was to work cooperatively with the scallop industry in developing a new dredge that would minimize the impact of possible sea turtle interactions with the dredge frame. During this study, significant design and structural modifications were made to the standard New Bedford scallop dredge. In order for an alteration of this long standing industry standard tool to be successful, it must bring some benefits to fishers. If not, it is unlikely to be endorsed by fishers and may negatively impact the fishery in a variety of ways.

With the successful testing of the turtle chain equipped dredges most of the concerns related to injuries turtle may receive entering the dredge bag were addressed. The two remaining concerns were for turtles that might get caught on top of the dredge frame and for turtles that might get run over by a dredge on the sea floor.

Observers and fishermen have reported and documented turtles coming up on top of the dredge. In most cases these turtles, when observed while the dredge is still in the water alongside the vessel, swim off the dredge. The implication is that these turtles are being held on the dredge by sea water pressure during haul back and can swim away when the dredge is stopped alongside the vessel. In other cases the turtles are observed wedged in the space between the depressor plate and the cutting bar on top of the dredge frame. In this position the turtle is at risk of injury if the dredge frame comes in contact with the vessel side during the lifting operation or if the turtle falls from the dredge while the dredge is up in the air over the vessel's deck.

The second issue is that of turtles that might get run over by the dredge while the dredge is being towed on the sea floor. Our work with turtle carcasses off Panama City indicated that if a turtle managed to get under the bale of a standard dredge being towed on the sea floor, the bale bars could prevent the turtle from escaping upward before encountering the cutting bar. Once encountering the cutting bar of a standard scallop dredge, it is most likely too late for a turtle to escape by swimming upwards, as the cutting bar is under and behind the depressor plate.

Given these two potential problem areas, this project focused on dredge frame design changes that might mitigate these concerns. The basic changes, described in the introduction section, consisted of moving the cutting bar forward and removing all the interior bale bars except the center strut. These modifications brought with them their own set of problems which needed to be addressed.

When we initially moved the cutting bar forward we chose 15 inches as this maintained the same depressor plate angle. We also decided on two other design parameters; keeping the distance between the bull ring (tow point) and the heel of the shoe the same and keeping the same bag design (not changing the frame's bag attachment points). This lead to the shoe of the

experimental dredge to be 30 inches long between the cutting bar at the front and the heel at the rear of the shoe. These changes created a number of issues as follows: a) the longer shoes crushed more scallops on deck, b) the space between the bale and the cutting bar was reduced possibly impacting the chances of a turtle to escape, and c) the cutting bar rode higher off the sea floor possibly allowing more of a chance for a turtle to get run over by the dredge. The experimental dredge also had a single bar forming the bale which did not seem to be strong enough without the supporting bale bars.

We attempted to address the raised cutting bar height by adding strut extensions that wrapped around the cutting bar; at 12 inch spacing. The thought was that this would keep a turtle from being forced under the cutting bar. We also angled the cutting bar to reduce the vertical flat surface that our research showed skates were being held on by water pressure.

To further reduce the risk of turtles getting caught on the frame, and to strengthen the frame, we reduced the strut spacing to 9 inches. To strengthen the dredge we doubled the bale bar.

The smaller spaces, more streamline profile, and increased ground contact points of the experimental dredge design lead us to initially expect that larger species (ie barndoor skate, summer flounder, monkfish, winter skate, and winter flounder) would be excluded at a higher rate relative to the control dredge. The idea was that mechanical shorting of large species would be done by the dredge frame. This hypothesis was not proven to be true. Although total numbers were reduced for most of these species, the size distributions were not noticeably different from control dredge. For example, large barndoor skate of lengths ranging from 101 -125 cm were caught in a higher number (23 total) relative to the control dredge (20 total). During trip Celtic-2006-2, it was noted that skates, monkfish, and some flounders were being damaged by the worn turtle guards. This implies that these animals were being overtaken by the dredge frame and captured underneath the cutting bar rather than in the spaces between struts.

Of the bycatch species counts that were reduced in the experimental dredge, most importantly is the very significant decrease in yellowtail flounder. Dredge 1 and 2 had a significant reduction ($p<0.05$) of scallop bushel to yellowtail flounder catch ratios of 35% and 50% respectively. Dredge 3 also had a reduction, but since most tows occurred in Hudson Canyon, catch numbers were not high enough for valid statistical analysis. Overall, when the data from all trips are combined, the yellowtail catch ratio was 53% less in the experimental dredges than in the control dredges. The total number of yellowtail caught by the experimental dredges during observed tows was 2,792 fish compared to at total of 5,811 counted in the control

dredges. The majority of the yellowtail flounder were caught during the test trips Celtic-2006-2, Westport-2006-1, Celtic-2006-3, and Westport-2006-2.

Why yellowtail should be excluded at a higher rate relative to other bycatch species of similar size and body type is not at present understood. A viable theory could be that yellowtail behavior when encountering the new dredge leads to exclusion more than mechanical sorting by the dredge. This theory could also hold for other species as well. The fact that monkfish were not reduced while yellowtail was, could be a result of their behavioral reaction to the dredge. The yellowtail length data collected during these trials suggest the possibility that larger yellowtail, within the size range of 51-65 cm, are more likely to be excluded by the experimental dredge. A total of 31 yellowtail of this size range were found in the control dredge, while none were observed in the experimental dredge. However the number of lengths collected during this study do not allow for this conclusion to be verified statistically.

Those tests found that the new dredge design had comparable catch efficiency for scallops relative to the standard New Bedford dredge design while significantly reducing bycatch of several non-targeted species.

The crews of all vessels used during this study were very receptive of the new dredge design. In fact, several vessels wanted to continue fishing the dredge voluntarily, one has built their own version that is in current use, and one vessel in Barnegat Light continues to use an earlier prototype. The cooperative effort supporting this study has lead to the success and valuable results achieved thus far. Word of the new dredge design has moved throughout the scallop fleet. Ideas stemming from this work have starting growing into proactive and voluntary innovation on part of the fishing industry.

Input from fishermen was crucial in making key modifications to the dredge design. Several crew members mentioned that by removing the center bale bars, deck handling was made both easier and safer. The open bale of the new dredge also eliminated the occurrence of boulders becoming snagged in the dredge frame, which reduces catch and is a hassle to deal with on deck. Another benefit mentioned by fishermen was that the main wire is less likely to get snagged on the experimental dredge frame during the dumping process. It was fishermen who recommended shortening the shoe to reduce the amount of crush scallops that had to be discarded.

All first time users of the new dredge had frustration initially with deployment of the gear. This problem was quickly overcome in every case within a few tows by experimenting around with how the new dredge reacts to different deployment techniques unique to each vessel.

One other issue faced by the crew was trouble dumping of the catch. The chain bags

used during this study were designed to be attached to a standard New Bedford dredge frame. The significant modifications made to develop the new dredge changed how the bag fit on the dredge frame. The way the bag fit on the dredge caused pinching in on the corners during the dumping process. This caused approximately 2 bushels of scallops to be caught in the front corners during the dumping process. To release the scallops out of the bag, crew members had to shake the bag manually or by lifting the dredge up and down repetitively. This was not only a hassle, but damaged scallops and put a strain on the vessel's rigging. (Given that the experimental dredge usually fished better than their dredge, the crew members were usually forgiving.) This problem can be rectified by designing a bag specifically for the new dredge frame.

Future Studies

Additional tests were completed in 2007 and results will be analyzed in 2008. These data may help illuminate some of the questions brought up in this report and further verify results. Plans have been made to observe 133 sea days with dredge design 3 and a control dredge both equipped without turtle chains. This will allow analysis to be done regarding the ability of the new dredge design to reduce the number of incidental takes of sea turtles. During these tests, the priority will be observing the haul back of each tow for possible sea turtle interactions. Unfortunately the areas of higher sea turtle density, the Mid Atlantic Bight, do not overlap with large fish populations of interest. To continue testing for fish bycatch reduction, specific trips will have to be made to areas on Georges Bank.

Several aspect of this study could be expanded to further improve the design. Earlier models (dredge design 1& 2) were successful in capturing more scallops than the control dredges. Characteristics unique to those dredges could be revisited to see if they should be incorporated into dredge design 3. Examples of characteristics to explore would include: longer shoe, different bale angles, frame chain tightness, pressure plate size, cutting bar position relative to the shoes, wheel placement, and bale length. In addition, a list of fishing variables could be studied to see how the new dredge is best fished. A sensitivity analysis will be performed to quantify the effect of wire scope, speed, tow duration, heading with regard to tide, towing angle, and effects of catch size.

More video studies shall be done to understand fish behavior and how the dredge captures specific species. Using the data collected thus far as a guide, sampling during future sea trials should focus on getting a targeted number of length measurements for specific species of concern. More focus could be placed on collecting yellowtail flounder lengths and scallop shell heights. A directed effort should be made to quantify trash amounts during each observed

tow to see if it is indeed different. Longer and more extensive testing should occur on hard bottom to see what the long term effects are on the new dredge frame.

There is much supplement work to be done supporting the new dredge frame design. A new chain bag needs to be designed specifically for the new dredge frame. While designing this new bag, innovative bycatch reduction methods within the bag could be explored. Ideas that could be explore while designing the chain bag include: twine top configuration, escapement windows, sorting chains, fish eyes, "w" shaped sweeps, or TED like devices). Different bag configurations could be tested during paired tows with both dredges being based on the experimental design presented in this report. Finally, in order to promote voluntary application by the scallop feet, vessels out of a variety of ports should be actively involved with future gear design research.

Literature Cited:

Dupaul, William D., David B. Rudders, and Ronald J. Smolowitz. 2004. Industry Trials of a Modified Sea Scallop Dredge to Minimize the Catch of Sea Turtles. VIMS Marine Resource Report No. 2004-12. 31pp.

Henriksen, S., E. Welch, S. Therrien, R.J. Smolowitz, P.J. Struhsaker, C.A.Goudy, and H. Kite-Powell. 1997. Results of Gear Modification Tests to Reduce Bycatches of Commercial Finfish in Sea Scallop Dredges. August, 1997. Final Report, NOAA Award No. NA66FD0026, NMFS, NE Region Office, Gloucester, MA

Milliken, H. O., L. Belskis, W.DuPaul, J. Gearhart, H. Haas, J. Mitchell, R. Smolowitz, and W. Teas. April 2007. Evaluation of a Modified Scallop Dredge's Ability to Reduce the Likelihood of Damage to Loggerhead Sea Turtle Carcasses. Northeast Fisheries Science Center Reference Document 07-07, Woods Hole, MA.

Seidel, Wilber R. and Charles McVea, Jr. 1995. Development of a Sea Turtle Excluder Shrimp Trawl for the Southeast U.S. Penaeid Shrimp Fishery. In Biology and Conservation of Sea Turtles Revised Ed. Ed. Karen A. Bjorndal. Pp 497-502.

Smolowitz, R. J., C. Harnish, and D. Rudders. 2005. Turtle-Scallop Dredge Interaction Study. Project Report. Coonamessett Farm, Falmouth, MA 83 pp.

Smolowitz, R. J., D. Rutecki, P.J. Struhsaker, and W. Dupaul. 2004. Comparison of Ten Inch vs Six Inch Twine Tops to Reduce Discard of Bycatch In The Sea Scallop Fishery. 2003 Final Report. Coonamessett Farm, Falmouth, MA.

Smolowtz, R.J., P.J. Struhsaker, and W.D. Dupaul. 2002. An Experimental Fishery to test fishing gear for bycatch reduction in the Sea Scallop fishery of Georges Bank. Coonamessett Farm, Inc. East Falmouth, MA 02536.

Smolowitz, R.J., P.J. Struhsaker, and W.D. Dupaul. 2001. Dredge modifications to reduce incidental groundfish catches in the Northwest Atlantic Sea Scallop fishery. NOAA Award No. NA16FM1032. Coonamessett Farm, East Falmouth, MA 0253

Appendices

Appendix Table 2. Bridge Data Log F/V Celtic 2006-1

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
5/20/2006	1	7:18	1:05	4030.944	07232.071	4026.591	7234.362	4.5	23	75	PORT	4.25	2.5	
5/20/2006	2	8:50	1:00	4025.122	7234.583	4021.334	7235.935	4.5	24	75	PORT	6.5	4.25	
5/20/2006	3	10:10	1:00	4020.608	7236.257	4015.861	7237.129	4.5	26	75	PORT	4.5	4.25	
5/20/2006	4	11:30	1:01	4015.023	7236.988	4013.035	7242.063	4.5	30	105	PORT	2.25	7.25	
5/20/2006	5	12:46	1:00	4013.011	7242.863	4012.14	7248.291	4.5	30	90	PORT	null	null	port side turtle drag twine top hung up on teeth
5/20/2006	6	13:55	1:21	4012.129	7248.763	4006.95	7249.209	4.5	28	90	PORT	6.75	6.75	
5/20/2006	7	15:29	1:09	4006.38	7248.95	4000.995	7247.676	4.6	28	90	PORT	7.5	4	
5/20/2006	8	17:16	1:12	4000.15	7247.11	4001.545	7241.776	4.6	30	90R	STARBOARD	5	7	switched turtle drag to stb side
5/20/2006	9	18:42	1:03	4002.03	7241.11	4006.117	7237.432	4.7	30	90R	STARBOARD	7	9	
5/20/2006	10	19:59	0:55	4006.493	7236.793	4010.616	7235.244	4.8	30	90R	STARBOARD	4.25	6.25	
5/20/2006	11	21:07	1:05	4011.29	7235.20	4016.129	7235.036	4.7	32	100	STARBOARD	5	5.25	
5/20/2006	12	22:14	0:34	4016.15	7235.04	4018.796	7234.935	4.7	28	90R	STARBOARD	2.25	2.5	

Appendix Table 2.1. Bridge Data Log F/V Celtic 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	LORAN		LORAN		Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
5/26/2006	1	7:21	0:59	13536	43501	13506	43500	4.5	38	120	PORT	1.5	2	experimental dredge hung up on teeth
5/26/2006	2	8:40	1:20	13497	43503	13467	43494	4.5	39	120 rail	PORT	9.5	8.5	
5/26/2006	3	10:14	1:08	13464	43494	13430	43492	4.6	40	120 water	PORT	4.5	5	
5/26/2006	4	11:41	1:04	13424	43491	43429	43464	4.5	36	120 rail	PORT	6	9.5	
5/26/2006	5	12:58	1:12	13429	43465	13448	43483	4.5	40	120 water	PORT	11	9	
5/26/2006	6	14:23	1:10	13448	43485	13474	43497	4.5	39	120 water	PORT	10	10	hole in corner of experimental dredge
5/26/2006	7	15:52	0:23	13474	43497	13490	43502	4.5	40	120 water	PORT	9.5	9.25	off watch
5/26/2006	8	17:25	0:45	13489	43503	13496	43503	4.8	40	120 water	PORT	11	10	off watch
5/26/2006	9	18:50	0:30	13495	43504	13495	43503	4.8	40	120 water	PORT	10	9	off watch
5/26/2006	10	20:10	1:10	13495	43503	13490	43502	4.8	40	120 water	PORT	11	9	off watch
5/26/2006	11	21:30	1:10	13488	43503	13492	43502	4.8	40	120 water	PORT	9	8	off watch
5/26/2006	12	22:50	1:10	13489	43504	13478	43499	4.8	40	120 water	PORT	10.5	9	off watch
5/27/2006	13	0:10	1:10	13480	43500	13477	43499	4.7	40	120 water	PORT	9.5	9	
5/27/2006	14	1:35	1:10	13428	43498	13464	43509	4.7	39	120 water	PORT	11	8	
5/27/2006	15	3:00	1:00	13468	43505	13487	43501	4.5	38	120 water	PORT	7	5	
5/27/2006	16	4:10	1:10	13485	43501	13452	43502	4.5	39	120 water	PORT	7	7	
5/27/2006	17	5:30	1:10	13449	43504	13418	43501	4.7	37	120 rail	PORT	9.5	6	
5/27/2006	18	6:50	1:10	13416	43503	13378	43518	4.8	38	125 gallows	PORT	9	6	
5/27/2006	19	8:10	1:10	13374	43520	13337	43535	4.7	38	120 rail	PORT	9.5	8	
5/27/2006	20	9:28	1:12	13333	43539	13319	43552	4.8	37	120 stern	PORT	9	8	off watch
5/27/2006	21	10:47	1:13	13316	43555	13313	43557	4.8	36	120 deck	PORT	11	8	off watch
5/27/2006	22	12:10	1:10	13312	43559	13308	43563	4.8	37	120 stern	PORT	9	9	off watch
5/27/2006	23	13:30	1:10	13304	43566	13310	43558	4.8	36	120 deck	PORT	8.5	7.5	off watch
5/27/2006	24	14:50	1:10	13308	43560	13281	42589	4.8	35	120 deck	PORT	8.2	6.5	
5/27/2006	25	16:10	1:15	13282	43588	13288	43558	4.9	35.5	120 deck	PORT	8	7	
5/27/2006	26	17:35	1:05	13268	43544	13266	43543	4.7	38.5	120 deck	PORT	11	7	
5/27/2006	27	18:50	1:20	13266	43543	13228	43546	4.8	40.5	120 rail	PORT	12	11	
5/27/2006	28	20:25	1:25	13229	43545	13212	53541	4.7	41	125 rail	PORT	2	9	
5/27/2006	29	22:00	1:20	13209	43540	13231	43540	4.7	41	140 deck	PORT	8	8	
5/27/2006	30	23:30	1:05	13229	43540	13200	43536	4.8	41	140	PORT	8	8	
5/28/2006	31	0:45	1:15	13200	43536	nk	43537	4.8	41	140 deck	PORT	11	10	off watch
5/28/2006	32	2:10	1:10	13202	43539	13182	43536	4.8	41	140 deck	PORT	8	11	off watch
5/28/2006	33	3:30	1:10	13185	43536	13192	43537	4.8	41	140 deck	PORT	9	9	off watch
5/28/2006	34	4:50	1:10	13193	43536	13207	43538	4.8	41	140 deck	PORT	8	10	off watch
5/28/2006	35	6:10	1:20	13208	43538	13179	43535	4.8	42	140 deck	PORT	10	10	off watch
5/28/2006	36	7:40	1:10	nk	43535	13212	43539	4.7	40	140 deck	PORT	7	11.5	port hung up on copper tubing
5/28/2006	37	9:05	1:10	13211	43540	13197	43536	4.7	42	140 deck	PORT	2	8.5	port twine top hung on teeth
5/28/2006	38	10:30	1:05	13201	43537	13231	43536	4.7	42	145 gallows	PORT	6	0	starbd flipped, didn't fish
5/28/2006	39	11:50	1:15	13226	43538	13194	43536	4.9	42	145 gallows	PORT	8	8	
5/28/2006	40	13:15	1:15	13196	43535	13179	43534	4.7	41	140 deck	PORT	5	9	port has hole in upper right coner of chain bag

Appendix Table 2.2. Bridge Data Log F/V Celtic 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	LORAN		LORAN		Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
5/28/2006	41	14:45	1:10	13181	43534	13211	43536	4.8	41	125 water	PORT	13	9.5	capt. 12 bags
5/28/2006	42	16:05	1:15	13210	43576	13180	43534	4.8	41	125 water	PORT	13	12	off watch
5/28/2006	43	17:30	1:10	13180	43534	13211	43537	4.8	41	125 water	PORT	10	10	off watch
5/28/2006	44	18:50	1:10	13209	43538	13186	43536	4.8	41	125 water	PORT	10	9	off watch
5/28/2006	45	20:10	1:15	13189	43556	13226	43540	4.8	41	125 water	PORT	10	9	
5/28/2006	46	21:35	1:10	13226	43541	13197	43537	4.8	41	125 water	PORT	9	9	
5/28/2006	47	22:55	1:05	13194	43537	13214	43536	4.5	42	125 water	PORT	6	6	
5/29/2006	48	0:10	1:10	13212	43537	13181	43534	4.6	42	125 water	PORT	11	10	
5/29/2006	49	1:30	1:20	13183	43537	13219	43532	4.7	42	140 deck	PORT	12	9	
5/29/2006	50	3:02	1:18	13196	43533	nk	nk	4.7	42	140 deck	PORT	9.5	10	
5/29/2006	51	4:16	1:39	26211	43539	26213	43539	4.7	42	125 deck	PORT	7.5	8	
5/29/2006	52	6:05	1:10	26246	43547	26213	43539	4.8	40	125 water	PORT	9	9	
5/29/2006	53	7:25	1:13	26249	43545	13253	43545	4.8	42	125 water	PORT	10	9	lookin for new area
5/29/2006	54	8:50	1:10	13252	43548	13260	43555	4.8	39	125 rail	PORT	14	12	
5/29/2006	55	10:10	1:10	13259	43554	13257	43552	4.8	38	125 rail	PORT	11	11	
5/29/2006	56	11:30	1:15	13257	43549	13258	43547	4.8	39	125 rail	PORT	16	13	
5/29/2006	57	12:57	1:23	13260	43546	13261	43551	4.8	39	125 rail	PORT	14	11	
5/29/2006	58	14:30	1:15	13260	43553	13261	43553	4.8	39	125 rail	PORT	12	10	
5/29/2006	59	15:55	1:25	13259	43555	13251	43562	4.6	38	125 rail	PORT	14	11	
5/29/2006	60	17:30	1:20	13251	43560	13250	43562	4.6	38	125 rail	PORT	12	10	
5/29/2006	61	19:05	1:20	13754	43557	1326	43554	4.7	37	125 rail	PORT	10.5	10.5	
5/29/2006	62	20:40	1:20	13261	43551	4058	6720	4.7	38	125 rail	PORT	14	13	
5/29/2006	63	22:15	1:15	4059	6770	4058	6720	4.6	40	125 rail	PORT	10.50	11.00	
5/30/2006	64	0:40	0:20	4059	6721	40	67	4.6	40	125 rail	PORT	13	11	
5/30/2006	65	1:12	1:20	nk	nk	nk	nk	4.8	39	125 rail	PORT	13	11	
5/30/2006	66	2:45	nk	nk	nk	nk	nk	4.8	39	125 rail	PORT	3	4	hung bad
5/30/2006	67	3:30	1:17	nk	nk	nk	nk	4.8	39	125 rail	PORT	9	9	
5/30/2006	68	5:00	1:20	nk	nk	13250	43550	4.8	39	125 rail	PORT	11	9	
5/30/2006	69	6:30	1:20	nk	nk	13274	43550	4.8	39	125 rail	PORT	9	9	
5/30/2006	70	8:05	1:10	13271	43551	13261	43550	4.7	38	125 rail	PORT	10	10	
5/30/2006	71	9:25	1:00	13260	43554	13760	43551	4.6	38	125 rail	PORT	6	8	
5/30/2006	72	10:35	1:00	13261	43553	13766	43542	4.7	39	125 rail	PORT	11	8	
5/30/2006	73	11:50	1:00	13265	43545	13249	43572	4.8	40	125 rail	PORT	1	7	bad tow on port, dump chain hiung on teeth
5/30/2006	74	13:00	1:05	13254	43571	13284	43566	4.7	33	125 rail	PORT	9	8.5	
5/30/2006	75	14:15	1:00	13286	43567	13	43	4.5	33	125 rail	PORT	7	7	
5/30/2006	76	15:30	1:00	13307	43576	13284	43566	nk	34	125 deck	PORT	8	9	
5/30/2006	77	16:42	1:00	13284	42566	13566	43575	4.8	34	125 deck	PORT	9	8	
5/30/2006	78	17:50	0:50	13307	43574	13288	43568	4.8	33	125 deck	PORT	7	7	
5/30/2006	79	18:50	1:00	13288	43568	13313	43577	4.8	34	125 water	PORT	10	7	
5/30/2006	80	20:00	1:00	13312	43577	13	43	4.8	33	125 water	PORT	11	9	

Appendix Table 2.3. Bridge Data Log F/V Celtic 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	LORAN		LORAN		Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
5/30/2006	81	21:10	1:05	13201	43569	13315	43579	4.8	34	125 water	PORT	nk	9	twine top hung on port side
5/30/2006	82	22:23	0:42	13314	43580	13293	43569	4.8	34	125 water	PORT	8.5	7.5	
5/30/2006	83	23:35	1:05	13296	43569	13285	43565	4.8	34	125 water	PORT	11	8	
5/31/2006	84	0:50	1:10	13288	43565	13295	43575	4.8	35	125 deck	PORT	9	9	sweep off on port side
5/31/2006	85	2:10	1:05	13296	43573	13287	43567	4.7	35	125 deck	PORT	8.5	8.5	
5/31/2006	86	3:25	1:00	13288	43507	13310	43577	4.7	35	125 deck	PORT	8.5	7	
5/31/2006	87	4:45	1:00	13308	43577	13285	43566	4.7	33	125 deck	PORT	8	8	
5/31/2006	88	5:55	1:05	13287	43565	13309	43575	4.7	35	125 deck	PORT	10	8	
5/31/2006	89	7:10	1:05	13308	43575	13	43	4.7	33	125 deck	PORT	10	8	
5/31/2006	90	8:25	1:00	13281	43566	13288	43570	4.8	34	125 deck	PORT	10	8	
5/31/2006	91	9:35	1:00	13290	43570	13288	43569	4.7	34	125 deck	PORT	12	11	
5/31/2006	92	10:46	1:00	13286	43568	13215	43570	4.7	34	125 deck	PORT	8.5	8.5	
5/31/2006	93	11:55	1:00	13295	43573	13296	43522	4.7	34	125 deck	PORT	11	9	
5/31/2006	94	13:00	1:00	13294	43573	13297	43573	4.7	34	125 deck	PORT	12	10	
5/31/2006	95	14:10	1:20	13297	43573	13320	43574	4.8	34	125 deck	PORT	9.5	8.5	
5/31/2006	96	15:40	1:05	13298	43574	13292	43569	4.84.7	34	125 deck	PORT	9.5	8.5	
5/31/2006	97	16:54	1:06	13295	43571	13287	43568	4.7	34	125 deck	PORT	9	9	
5/31/2006	98	18:15	1:15	13290	43568	13292	43569	4.7	34	125 deck	PORT	10	10	
5/31/2006	99	19:40	1:00	13295	43571	13292	43577	4.5	34	125 deck	PORT	9	7.5	
5/31/2006	100	20:50	1:15	13294	43576	13293	43572	4.7	34	125 deck	PORT	14	9	starboard twine top hung on frame
5/31/2006	101	22:15	1:07	13291	43572	13295	43573	4.7	34	125 deck	PORT	12	11	
5/31/2006	102	23:30	1:02	13294	43573	13288	43570	4.8	34	125 deck	PORT	10	8	
6/1/2006	103	0:43	1:00	13288	43570	13294	43573	4.8	34	125 deck	PORT	10	10	
6/1/2006	104	1:53	1:00	13294	43573	13291	43571	4.8	34	125 deck	PORT	11	8	
6/1/2006	105	3:00	1:05	13293	43572	13289	43570	4.8	34	125 deck	PORT	10	8.5	
6/1/2006	106	4:15	1:00	13291	43570	13291	43571	4.8	34	125 deck	PORT	9	8	
6/1/2006	107	5:25	1:10	13290	43571	13296	43572	4.8	34	125 deck	PORT	9	8	
6/1/2006	108	6:45	1:05	13294	43571	13303	43570	4.8	34	125 deck	PORT	11	10	
6/1/2006	109	8:00	1:00	13306	43570	13337	43570	4.7	34	125 deck	PORT	0	8	twine top on port side caught on teeth, did not fish
6/1/2006	110	9:15	1:05	13335	43570	13304	43568	4.7	32	125 deck	PORT	12	8.2	crew noticed that fish and scallops on port side are being split in half, the teeth are getting thin, there has also been a lot lot less trash on the port than on the starboard
6/1/2006	111	10:35	1:00	13308	43569	13335	43570	4.7	34	125 deck	PORT	8.5	8	
6/1/2006	112	11:47	1:04	13334	43591	13305	43569	4.5	33	120 rail	PORT	8	8	
6/1/2006	113	13:00	1:15	13307	43568	13305	43567	4.8	34	120 rail	PORT	10	9.5	
6/1/2006	114	14:25	1:05	13301	43567	13189	43567	4.7	34	120 rail	PORT	6	10	
6/1/2006	115	16:45	1:00	13276	43572	13298	43575	4.8	34	125	STARBOARD	9	9	switched dredge sides, switched watches
6/1/2006	116	17:35	0:56	13295	43575	13275	43566	4.8	34	125	STARBOARD	7	7.5	
6/1/2006	117	19:00	1:00	13274	43565	13298	43571	4.8	34	125	STARBOARD	7	9	
6/1/2006	118	20:05	1:05	13286	43570	13293	43574	4.8	34	125	STARBOARD	11	11	
6/1/2006	119	21:23	1:07	13288	43572	13292	43576	4.8	34	125	STARBOARD	10	9	
6/1/2006	120	22:40	1:05	13790	43576	13297	43575	4.8	34	125	STARBOARD	9	10	

Appendix Table 2.4. Bridge Data Log F/V Celtic 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	LORAN		LORAN		Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/1/2006	121	23:54	1:06	13295	43575	13288	43570	4.7	34	125 deck	STARBOARD	10	8	
6/2/2006	122	1:10	0:55	13289	43569	13319	43552	4.7	35	125 rail	STARBOARD	8	9	
6/2/2006	123	2:20	0:55	13325	43551	13392	43551	4.5	35	120 rail	STARBOARD	7	8	
6/2/2006	124	3:30	0:54	13350	43553	13329	43570	4.5	35	125 deck	STARBOARD	7.5	7.5	
6/2/2006	125	4:35	0:55	13332	43568	13358	43544	4.6	36	125 deck	STARBOARD	6	7.5	
6/2/2006	126	5:45	1:05	13354	43546	13321	43552	4.6	36	125 deck	STARBOARD	8	11	
6/2/2006	127	7:00	1:00	13318	43552	13326	43552	4.6	36	125 deck	STARBOARD	8.5	9	
6/2/2006	128	8:10	1:00	13324	43553	13348	43548	4.7	36	125 deck	STARBOARD	7	8	
6/2/2006	129	9:20	0:50	13348	43548	13318	43559	4.7	36	125	STARBOARD	6	8.5	
6/2/2006	130	10:20	0:50	13316	43561	13312	43556	4.7	36	125	STARBOARD	6	6.5	
6/2/2006	131	11:20	1:00	13308	43559	13305	43563	4.8	36	125	STARBOARD	6	7	
6/2/2006	132	12:30	1:00	13301	43565	13277	43569	4.8	33	125	STARBOARD	8	8	
6/2/2006	133	13:40	1:00	13278	43567	13279	43572	4.8	33	125	STARBOARD	7	9	
6/2/2006	134	14:50	1:17	13280	43572	13	43	4.8	33	125	STARBOARD	10.5	4.5	club stick hung up
6/2/2006	135	16:15	1:10	13301	43534	13331	43517	4.7	41	125 rail	STARBOARD	12	8	lots of dragger around
6/2/2006	136	17:35	1:20	13328	43517	13327	43519	4.9	42	140 deck	STARBOARD	8.5	6	
6/2/2006	137	19:05	1:15	13325	43520	13350	43516	4.7	41	125 water	STARBOARD	8	6	twine top
6/2/2006	138	20:33	1:00	13385	43514	13387	43498	4.8	40	125 water	STARBOARD	4.5	2	holes in starboard bag
6/2/2006	139	21:50	1:00	13391	43498	13421	43404	4.7	38	125 water	STARBOARD			
6/2/2006	140	23:05	1:15	13417	43493	13461	43490	4.7	37	125 water	STARBOARD	6	7	rain
6/3/2006	141	0:30	1:10	13463	43494	13494	43502	4.8	39	125 deck	STARBOARD	10	11	
6/3/2006	142	1:50	1:10	13494	43502	13488	43501	4.8	39	125 deck	STARBOARD	8	10	
6/3/2006	143	3:08	1:07	13486	43502	13493	43502	4.8	39	125 deck	STARBOARD	8.5	9	
6/3/2006	144	4:25	1:10	13492	43505	13483	43510	4.8	38	125 rail	STARBOARD	8	12	
6/3/2006	145	5:45	1:15	13484	43509	13487	43497	4.8	37	125 rail	STARBOARD	8	10	
6/3/2006	146	7:10	1:15	13446	43507	13	43	4.7	38	125 rail	STARBOARD	8.5	10	off watch
6/3/2006	147	8:35	1:05	13464	43509	13483	43500	4.7	38	125 rail	STARBOARD	7	8	off watch
6/3/2006	148	9:50	1:05	13483	43501	13493	43503	4.6	38	125 rail	STARBOARD	8	8	off watch
6/3/2006	149	11:10	1:10	13490	43504	13492	43498	4.7	38	125 rail	STARBOARD	8	7	off watch
6/3/2006	150	12:30	1:10	13490	43501	13489	43502	4.8	39	125 rail	STARBOARD	6	7	off watch
6/3/2006	151	13:55	1:03	13498	43502	13484	43507	4.8	39	125 rail	STARBOARD	8	9	
6/3/2006	152	15:10	1:10	13485	43506	13463	43492	4.7	38	125 rail	STARBOARD	8	10	
6/3/2006	153	16:33	1:10	13462	43493	13486	43503	4.8	38	125 deck	STARBOARD	8	8	
6/3/2006	154	17:55	1:05	13484	43503	13491	43502	4.8	38	125 deck	STARBOARD	8	9	
6/3/2006	155	19:08	1:07	13490	43504	13487	43506	4.8	38	125 deck	STARBOARD	8	10	off watch
6/3/2006	156	20:22	1:15	13483	43509	13487	43508	4.8	38	125 deck	STARBOARD	9	11	off watch
6/3/2006	157	21:50	1:15	13487	43509	13490	43499	4.8	38	125 deck	STARBOARD	8.2	9.5	
6/3/2006	158	23:15	1:10	13490	43500	13484	43506	4.8	40	125 deck	STARBOARD	8	8	
6/4/2006	159	0:35	1:10	43485	43504	13481	43484	4.7	40	125 deck	STARBOARD	10	10	
6/4/2006	160	1:55	1:20	13403	43486	13480	43484	4.5	40	125 deck	STARBOARD	10.5	10.5	

Appendix Table 2.5. Bridge Data Log F/V Celtic 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	LORAN		LORAN		Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/4/2006	161	3:25	0:50	13479	43486	13486	43505	4.7	42	125 deck	STARBOARD	8	8	
6/4/2006	162	4:30	1:10	13485	43504	13482	43488	4.8	38	125 gallows	STARBOARD	10	8	
6/4/2006	163	5:50	1:10	13480	43492	13512	43499	4.7	40	125 gallows	STARBOARD	9	7.5	
6/4/2006	164	7:10	1:10	13511	43494	13483	43505	4.5	40	125 rail	STARBOARD	6.5	9	inc. take of a pilot whale
6/4/2006	165	8:30	1:10	13482	43502	13473	43494	4.8	38	125 stern	STARBOARD	8	8	
6/4/2006	166	9:50	1:10	13470	43497	13474	43494	4.8	39	125 stern	STARBOARD	9	10	rain
6/4/2006	167	11:10	1:05	13471	43498	13478	43489	4.8	39	125 stern	STARBOARD	7.5	9	
6/4/2006	168	12:25	nk	13476	43492	13478	43493	4.8	39	125 stern	STARBOARD	9	11	
6/4/2006	169	nk	nk	13478	43495	13476	43498	4.8	39	125 stern	STARBOARD	10	12.5	fixed gear, shoes, and other gear work
6/4/2006	170	nk	nk	13463	43509	13418	43574	4.8	39	125 stern	STARBOARD	8.5	12	
6/4/2006	171	18:00	1:15	13418	43525	13457	43512	4.7	35	125 deck	STARBOARD	8	10	
6/4/2006	172	19:27	1:13	13454	43512	13414	43527	4.8	37	125 deck	STARBOARD	8	9.5	
6/4/2006	173	20:50	1:20	13416	43526	13459	43512	4.7	36	120 water	STARBOARD	9	10.5	
6/4/2006	174	22:20	0:10	13459	43511	13420	43524	4.5	38	120 rail	STARBOARD	8	7.5	sweep was off on starb. Side, did not fish right
6/4/2006	175	23:50	1:04	13424	43521	13458	43511	4.8	37	125 deck	STARBOARD	7	7.5	
6/5/2006	176	1:00	0:10	13457	43511	13420	43526	4.8	37	125 deck	STARBOARD	7	10.5	
6/5/2006	177	2:20	1:10	13418	43526	13440	43515	4.8	37	125 deck	STARBOARD	6.5	8	
6/5/2006	178	3:40	1:15	13440	43515	13433	43520	4.8	37	125 deck	STARBOARD	8	10.5	
6/5/2006	179	5:05	1:15	13433	13520	13440	43517	4.8	37	125 deck	STARBOARD	8.5	10	steaming to bottom of channel
6/5/2006	180	6:30	1:15	13440	43515	13430	43521	4.8	37	125 deck	STARBOARD	10	9	
6/5/2006	181	8:00	1:15	13426	43522	13447	43514	4.6	38	120 rail	STARBOARD	8	8	
6/5/2006	182	14:15	1:05	13721	43492	13712	43487	4.6	34	125 gallows	STARBOARD	8.5	10	
6/5/2006	183	15:30	1:00	13713	43488	13742	43495	nk	nk	125 gallows	STARBOARD	8	11	
6/5/2006	184	16:40	1:00	13741	43496	13736	43494	4.8	35	120 deck	STARBOARD	4	8	
6/5/2006	185	17:50	1:00	13734	43495	13708	43487	4.8	38	125 gallows	STARBOARD	6	10	
6/5/2006	186	19:00	0:00	13708	43487	13734	43492	4.3	35	120 stern	STARBOARD	9	12	
6/5/2006	187	20:10	1:00	13731	43494	13708	43486	4.3	38	120 stern	STARBOARD	7	6	
6/5/2006	188	21:20	1:00	13709	43487	13734	43493	4.3	34	120 stern	STARBOARD	7	10	
6/5/2006	189	22:30	1:00	13735	43493	13725	43474	4.7	34	120 stern	STARBOARD	7	10	
6/5/2006	190	23:41	1:01	13725	43475	13715	43504	4.7	32	120 water	STARBOARD	9.5	10	
6/6/2006	191	0:55	1:00	13715	43502	13726	43472	4.5	33	120 water	STARBOARD	11	7	
6/6/2006	192	2:10	1:00	13728	43474	13716	43503	4.7	33	120 water	STARBOARD	9.5	7	
6/6/2006	193	3:20	1:05	13716	43502	13705	43474	4.5	33	120 water	STARBOARD	10	10.5	
6/6/2006	194	4:35	1:05	13725	43476	13913	43506	4.6	33	120 rail	STARBOARD	9.5	7	
6/6/2006	195	5:50	1:05	13713	43506	13	43	4.7	33	120 rail	STARBOARD	8	8	
6/6/2006	196	7:05	1:00	nk	nk	13715	43500	4.8	33	120 rail	STARBOARD	8.5	10	
6/6/2006	197	8:15	1:10	13714	43506	13725	43473	4.8	33	120 rail	STARBOARD	6	6	
6/6/2006	198	9:35	1:00	13725	43474	13716	43500	4.8	33	120 rail	STARBOARD	8	10	
6/6/2006	199	10:47	1:03	13710	43502	13721	43486	4.8	33	120 rail	STARBOARD	5	6	
6/6/2006	200	12:00	0:55	13721	43486	13714	43509	4.8	33	120 rail	STARBOARD	7	8	

Appendix Table 2.6. Bridge Data Log F/V Celtic 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	LORAN		LORAN		Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/6/2006	201	13:05	1:05	13715	43508	13722	43479	4.8	33	120 rail	STARBOARD	8	7	
6/6/2006	202	14:18	1:00	13722	43478	13715	43509	4.8	33	120 rail	STARBOARD	7	7	
6/6/2006	203	15:27	1:03	13715	43503	13727	43477	4.7	33	120 rail	STARBOARD	9.5	10.5	
6/6/2006	204	16:45	1:00	13733	43478	13723	43486	4.7	35	120 rail	STARBOARD	6	7	
6/6/2006	205	18:00	1:00	13727	43486	13760	43474	4.7	34	120 rail	STARBOARD	5	7	
6/6/2006	206	19:10	1:05	13763	43474	13735	43484	4.8	36	120 rail	STARBOARD	5	7	
6/6/2006	207	20:25	1:00	13751	43484	13699	43498	4.7	33	120 rail	STARBOARD	7	7	
6/6/2006	208	21:35	1:05	13701	43497	13904	43505	4.8	34	120 rail	STARBOARD	6	6	
6/6/2006	209	22:50	0:55	13707	43503	13	nk	4.7	34	120 rail	STARBOARD	nk	nk	
6/7/2006	210	0:22	nk	13720	43493	nk	43	4.7	34	120 rail	STARBOARD	8	6	
6/7/2006	211	0:25	1:10	13724	43491	13721	43490	4.7	34	120 stern	STARBOARD	8	8	
6/7/2006	212	1:45	1:15	13723	43488	13722	43490	4.7	34	120 stern	STARBOARD	10	11	
6/7/2006	213	3:10	1:20	13727	43489	13718	43490	4.7	34	120	STARBOARD	9	11	
6/7/2006	214	4:40	1:20	13720	43490	13	43	4.7	34	120	STARBOARD	7	9	
6/7/2006	215	6:10	1:20	13719	43491	13718	43490	4.7	34	120	STARBOARD	8	8	
6/7/2006	216	7:40	1:10	13721	43490	13	43	4.5	34	120	STARBOARD	8	8	
6/7/2006	217	9:02	1:15	13939	43496	13	43	4.6	34	120 rail	STARBOARD	6	8	
6/7/2006	218	10:30	1:00	13724	43493	13726	43507	4.7	33	120	STARBOARD	6	8	
6/7/2006	219	11:43	1:02	13729	43508	13717	43503	4.7	35	125 gallows	STARBOARD	6	7	
6/7/2006	220	12:55	0:45	13721	43504	13724	43479	4.6	34	120 rail	STARBOARD	9	8	
6/7/2006	221	14:20	1:00	13724	43480	13715	43508	4.7	33	120 rail	STARBOARD	8	8	big swell
6/7/2006	222	15:40	1:10	13718	43511	13724	43491	4.7	35	120 rail	STARBOARD	6	7	
6/7/2006	223	17:00	0:55	13727	43493	13724	43492	4.7	34	120 rail	STARBOARD	6	6	
6/7/2006	224	18:05	1:10	13728	43493	13	43	4.7	34	120 rail	STARBOARD	7	9	
6/7/2006	225	19:24	1:16	13737	43492	13742	43495	4.5	34	120 rail	STARBOARD	6	6	
6/7/2006	226	20:50	1:10	13737	43496	13	43	4.6	34	120 rail	STARBOARD	4	5	
6/7/2006	227	22:10	1:10	13737	43493	13706	43482	4.7	34	120 rail	STARBOARD	6	7	
6/7/2006	228	23:30	1:00	13706	43479	13724	43473	4.7	32	120 rail	STARBOARD	3	3	
6/8/2006	229	0:50	1:00	13724	43473	13723	43482	4.7	33	120 rail	STARBOARD	6	6	
6/8/2006	230	2:10	1:05	13726	43479	13721	43483	4.6	34	120 rail	STARBOARD	9	10	
6/8/2006	231	3:25	1:15	13723	43480	13720	43485	4.6	33	120 deck	STARBOARD	7	9	
6/8/2006	232	4:30	1:00	13719	43487	13721	43481	4.7	34	120 rail	STARBOARD	8	7	
6/8/2006	233	6:00	1:10	13722	43484	13719	43483	4.5	33	120 rail	STARBOARD	9	8.5	
6/8/2006	234	7:20	1:20	13721	43485	13719	43485	4.5	33	120 rail	STARBOARD	9	12	
6/8/2006	235	8:50	1:20	13719	43486	13722	43489	4.5	33	120 rail	STARBOARD	10	11	
6/8/2006	236	10:20	1:10	13723	43486	13719	43478	4.5	33	120 rail	STARBOARD	6	7	
6/8/2006	237	11:40	1:20	13719	43481	13	43	4.5	33	120 rail	STARBOARD	8	8	
6/8/2006	238	1:10	1:20	13721	43481	13713	43513	4.6	33	120 rail	STARBOARD	8	8	

Appendix Table 3. Bridge Data Log F/V Westport 2006-1

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
8/1/2006	1	12:25	0:52	4100.916	6717.142	4100.46	6712.381	4.6	39.9	140d	PORT	38	33	
8/1/2006	2	13:28	1:02	4100.44	6711.64	4100.54	6705.60	4.1	41	140d	PORT	11.3	14	
8/1/2006	3	14:43	1:00	4100.37	6704.93	4100.59	6658.94	4.1	41	140	PORT	47	48	
8/1/2006	4	16:35	1:20	4100.57	6652.78	4102.66	6646.58	4.1	41	140	PORT	20	1.5	steamed to new grounds between 3 and 4
8/1/2006	5	20:21	0:39	4113.92	6628.98	4114.56	6628.46	4.1	51	155	PORT	19	25	turn around tow
8/1/2006	6	21:15	1:02	4114.53	6628.46	4114.22	6628.68	4.0	51	165	PORT	28	30	
8/1/2006	7	23:12	1:21	4113.88	6628.63	4120.09	6628.12	4.3	51	165	PORT	40	18	
8/2/2006	8	0:48	1:22	4120.11	6627.97	4120.36	6627.62	4.0	53	165	PORT	20	35	lobster gear on port side
8/2/2006	9	5:05	1:22	4120.80	6628.14	4119.21	6627.99	4.0	50.8	150	PORT	23	25	trouble setting experimental dredge, wouldn't flare
8/2/2006	10	8:17	1:06	4119.08	6629.26	4118.20	6627.63	4.1	51	165	PORT	33	51	
8/2/2006	11	9:37	1:26	4118.03	6627.25	4118.08	6627.57	4.2	52	165	PORT	45	46	
8/2/2006	12	13:11	1:24	4117.58	6628.45	4117.95	6627.67	4.1	52	165	PORT	28	39	
8/2/2006	13	16:30	1:15	4118.02	6627.23	4121.08	6628.99	4.0	53.2	165	PORT	32	46	load of starfish on starb. Side, more than on port
8/2/2006	14	18:43	1:33	4116.30	6628.11	4117.20	6227.76	4.0	51.9	165	PORT	28	nk	bad tow on port side, clubstick caught on teeth
8/2/2006	15	21:48	1:00	4116.06	6627.41	4117.24	6627.74	4.0	52.7	165	PORT	nk	37	bad tow on port side, bag caught on teeth
8/2/2006	16	23:00	1:25	4117.45	6627.48	4116.36	6627.96	4.5	52.6	165	PORT	24	30	
8/3/2006	17	1:48	1:21	4116.69	6628.40	4118.51	6628.30	4.1	52	165	PORT	38	44	
8/3/2006	18	3:22	1:17	4118.66	6628.24	4117.22	6627.34	4.2	52	165	PORT	47	36	
8/3/2006	19	7:20	1:20	4117.98	6627.01	4119.02	6628.21	4.2	52	165	PORT	34	36	
8/3/2006	20	10:55	1:28	4117.42	6628.45	4119.26	6628.03	4.5	52	165	PORT	44	48	
8/3/2006	21	13:55	1:10	4119.17	6628.12	4119.22	6627.84	4.6	52.5	165	PORT	43	51	
8/3/2006	22	16:45	1:07	4118.89	6627.43	4120.92	6628.99	4.0	52.8	165	PORT	32	41	
8/3/2006	23	20:38	1:13	4119.69	6627.66	4120.17	6628.88	4.3	52	165	PORT	41	39	
8/3/2006	24	22:04	1:10	4119.92	6628.86	4121.16	6629.01	4.0	52	165	PORT	40	47	large boulder on port side
8/4/2006	25	2:04	0:32	4125.52	6633.58	4127.85	6633.75	4.0	52	165	PORT	10	nk	just towed one dredge, port side
8/4/2006	26	2:50	0:35	4128.21	6634.42	4128.35	6634.67	4.0	52	165	PORT	nk	7	
8/4/2006	27	5:17	1:13	4120.83	6628.44	4121.11	6629.11	4.0	52	165	PORT	37	42	
8/4/2006	28	8:26	1:12	4120.70	6627.94	4112.69	6628.69	4.1	52	165	PORT	42	10	bad, starb side hung up
8/4/2006	29	9:50	1:21	4121.55	6628.62	4120.20	6628.91	4.3	52	165	PORT	42	31	
8/4/2006	30	12:54	1:05	4119.72	6628.48	4118.08	6627.51	4.2	52	165	PORT	39	15	both sides hung up
8/4/2006	31	14:13	nk	4118.00	6627.83	4118.78	6627.67	4.5	53	165	PORT	55	45	
8/4/2006	32	16:50	1:10	4119.00	6627.90	4120.25	6628.74	4.5	51	165	PORT	33	nk	busted rock chain on port side, busted sweep on starboard
8/4/2006	33	22:03	1:01	4119.32	6628.99	4119.07	6628.67	4.5	51	165	PORT	27	47	rain
8/4/2006	34	0:32	0:58	4119.15	6628.66	4118.60	6629.03	4.5	51	165	PORT	23	24	starfish
8/5/2007	35	3:31	1:04	4118.53	6628.45	4118.18	6627.71	4.5	51	165	PORT	37	44	
8/5/2007	36	4:48	1:25	4118.29	6627.78	4117.68	6627.55	4.5	51	165	PORT	42	40	
8/5/2007	37	8:50	null	4118.21	6628.23	null	null	4.5	null	165	PORT	null	null	busted winches, headed back early

Appendix Table 4.1. Bridge Data Log F/V Westport 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
9/15/2006	1	6:02	0:45	4102.95	6715.94	4104.88	6712.38	4.7	38	125	PORT	15	17	port = experimental dredge, starboard = standard NB dredge
9/15/2006	2	6:57	0:44	4105.11	6711.82	4106.73	6709.62	5.1	36	125	PORT	7	9	
9/15/2006	3	7:44	0:57	4106.61	6709.53	4109.08	6706.25	5.0	36	120	PORT	10	13	
9/15/2006	4	8:49	0:58	4109.09	6705.89	4109.13	6706.19	4.5	36	130/120	PORT	4.5	12.5	
9/15/2006	5	9:55	1:00	4109.21	6706.13	4106.97	6708.18	4.0	36	115	PORT	11.5	18	
9/15/2006	6	11:05	1:17	4106.92	6708.40	4107.40	6707.93	4.4	36	110	PORT	9	9.5	
9/15/2006	7	12:27	1:03	4107.42	6708.00	4107.63	6708.12	3.7	36	120	PORT	7.5	11.5	
9/15/2006	8	13:45	1:00	4107.63	6708.33	4104.94	6711.86	3.7	36	120	PORT	11	13	
9/15/2006	9	14:55	1:12	4105.21	6711.91	4103.93	6714.15	4.7	36	120	PORT	12	16	
9/15/2006	10	16:15	0:50	4103.98	6714.15	nk	nk	4.7	36	120	PORT	9.5	10.5	
9/15/2006	11	17:17	0:52	4104.46	6712.97	4103.48	6714.29	4.6	36	130/120	PORT	9.5	10.5	
9/15/2006	12	18:20	0:53	4103.47	6714.18	4102.89	6716.08	4.6	36	130/120	PORT	10.5	5	stb club stick hung on tw ine top
9/15/2006	13	19:28	0:52	4102.79	6716.04	4102.96	6716.31	4.6	36	130/120	PORT	9.5	14	
9/15/2006	14	20:32	0:55	4102.74	6716.15	4102.92	6716.24	4.6	37	130/120	PORT	5	17	port side had lobster traw l tangled up
9/15/2006	15	21:40	0:57	4102.86	6716.17	4102.83	6716.32	4.6	38	130/120	PORT	12	19	
9/15/2006	16	22:55	1:10	4102.63	6716.28	4102.61	6716.58	4.0	38	130/120	PORT	8	20	
9/16/2006	17	0:13	1:12	4102.49	6716.98	4103.20	6716.29	4.0	38	130/120	PORT	13.5	18	starfish
9/16/207	18	1:40	1:10	4103.20	6716.57	4103.31	6716.48	4.3	38	130/120	PORT	15.5	23	big bag of starfish
9/16/2006	19	3:02	1:10	4103.43	6716.81	4102.62	6717.25	4.3	38	130/120	PORT	14.5	14	
9/16/2006	20	4:28	1:11	4102.57	6717.33	4101.75	6714.66	4.5	39	130/120	PORT	20	20	
9/16/2006	21	5:50	1:19	4101.85	6714.51	4102.11	6714.10	4.7	38	130/120	PORT	12.5	20	
9/16/2006	22	7:21	1:13	4102.12	6713.92	4102.29	6713.19	4.7	37	130/120	PORT	11.5	20	
9/16/2006	23	8:45	1:00	4102.21	6713.24	4102.26	6713.48	4.7	37	130/120	PORT	13.5	18	
9/16/2006	24	10:09	1:16	4102.30	6713.55	4102.03	6713.93	4.7	37	130/120	PORT	13	19.5	
9/16/2006	25	11:36	1:13	4101.92	6713.90	4101.93	6713.79	4.7	37	130/120	PORT	17	16	
9/16/2006	26	13:01	1:03	4101.87	6713.82	4102.31	6713.67	4.7	37	130/120	PORT	12	16	
9/16/2006	27	14:16	1:01	4102.29	6713.70	4102.82	6713.18	4.7	37	130/120	PORT	nk	16	back job
9/16/2006	28	15:28	1:08	4102.88	6713.18	4101.88	6714.29	4.7	37	130/120	PORT	13	15	
9/16/2006	29	16:47	1:18	4101.96	6714.33	4101.98	6714.53	4.7	37	130/120	PORT	18	20	turn on port dredge
9/16/2006	30	18:16	1:33	4101.93	6714.46	4101.87	6714.31	5.0	39	130/120	PORT	9	9	
9/16/2006	31	19:55	1:21	4101.61	6714.37	4101.59	6714.66	4.9	39	130/120	PORT	14.5	19	
9/16/2006	32	21:30	1:23	4101.49	6714.55	4101.49	6714.45	4.8	39	130/120	PORT	15.5	20	
9/16/2006	33	23:01	1:14	4100.61	6714.47	4100.83	6714.09	4.5	40	130/120	PORT	13	14.5	
9/17/2006	34	0:26	1:09	4102.55	6714.11	4102.55	6714.15	4.6	37	130/120	PORT	13	17	
9/17/2006	35	1:47	1:10	4101.85	6714.22	4101.85	6714.39	4.5	37	130/120	PORT	13	14	
9/17/2006	36	3:09	1:14	4102.13	6714.47	4102.13	6714.47	4.6	37	130/120	PORT	14	17	
9/17/2006	37	4:35	1:11	4102.00	6714.58	4102.00	6714.29	4.6	37	130/120	PORT	13	16	
9/17/2006	38	5:58	1:13	4102.31	6714.25	4102.31	6713.87	4.5	38	130/120	PORT	15	17	
9/17/2006	39	7:24	1:11	4102.36	6713.87	4102.36	6709.75	4.5	38	130/120	PORT	13	17	
9/17/2006	40	8:47	1:18	4102.96	6709.03	4102.96	6708.05	4.5	38	135/130	PORT	7	2	drags crossed

Appendix Table 4.2. Bridge Data Log F/V Westport 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
9/17/2006	81	19:29	1:21	4108.49	6707.50	4103.78	6711.51	4.3	36	110/120	PORT	17	15	
9/17/2006	82	21:02	1:11	4103.50	6711.89	4104.53	6711.71	4.3	36	110/120	PORT	16	16.5	
9/17/2006	83	22:24	1:11	4104.48	6711.26	4103.97	6711.41	4.3	36	110/120	PORT	18	18	
9/17/2006	84	23:45	1:23	4104.25	6710.92	4108.61	6706.33	3.8	36	110/120	PORT	19	19	
9/18/2006	85	1:19	1:21	4108.43	6706.56	4103.88	6711.11	3.8	36	110/120	PORT	12	18	
9/18/2006	86	2:54	1:28	4103.79	6711.11	4108.53	6706.46	3.8	36	110/120	PORT	21	19	
9/18/2006	87	4:33	1:21	4108.42	6706.71	4103.96	6710.98	4.5	36	110/120	PORT	17	19	
9/18/2006	88	6:05	1:28	4104.11	6711.00	4108.56	6706.02	4.5	36	110/120	PORT	16	19	
9/18/2006	89	7:45	1:23	4108.57	6706.21	4104.27	6710.87	4.5	36	110/120	PORT	18	19	
9/18/2006	90	9:19	1:10	4104.37	6710.72	4108.81	6706.03	4.5	36	110/120	PORT	13	13	
9/18/2006	91	10:49	1:27	4108.75	6706.20	4103.90	6710.94	4.5	36	110/120	PORT	20	21	
9/18/2006	92	12:27	1:20	4104.07	6710.70	4108.32	6706.65	4.5	36	110/120	PORT	15	19	
9/18/2006	93	13:58	nk	4108.06	6706.63	nk	nk	4.5	36	110/120	PORT	15	18	
9/18/2006	94	15:21	1:17	4104.05	6710.50	4107.85	6706.85	4.5	37	110/120	PORT	15	17	24 bags
9/18/2006	95	16:46	1:13	4108.00	6706.51	4111.71	6702.51	4.5	37	110/120	PORT	16	19	heading west looking for yellow tail
9/18/2006	96	18:10	1:07	4112.05	6702.19	4115.70	6659.03	4.5	37	110/120	PORT	12	12	
9/18/2006	97	nk	nk	nk	nk	nk	nk	4	38	115/125	PORT	9	13	
9/18/2006	98	nk	nk	nk	nk	4117.74	6652.35	4	38	115/125	PORT	17	18	jag of yellow tail
9/18/2006	99	23:31	0:07	4116.78	6652.36	4116.61	6652.53	4	41	115/125	PORT	10	13	
9/19/2006	100	23:47	1:23	nk	6633.21	4115.80	6633.21	4	41	115/125	PORT	10	16.5	
9/19/2006	101	1:22	1:10	4115.77	6652.88	4119.54	6649.04	4.2	41	125/135	PORT	15	12.5	
9/19/2006	102	2:45	1:23	4119.80	6649.14	4119.70	6649.14	4.2	41	125/135	PORT	17	16	
9/19/2006	103	4:20	1:20	4119.87	6648.86	4119.70	6649.35	4.2	41	125/135	PORT	16	20.5	
9/19/2006	104	5:51	nk	4119.75	6649.84	nk	nk	4.2	41	125/135	PORT	13	16	
9/19/2006	105	7:22	1:17	4120.23	6649.27	4148.57	6648.57	4.2	41	125/135	PORT	10	11	
9/19/2006	106	8:49	1:16	4121.29	6648.34	4119.99	6647.46	4.2	41	125/135	PORT	14	14.5	
9/19/2006	107	10:15	1:13	4120.11	6647.74	4119.57	6646.53	4.2	41	125/135	PORT	10	13	
9/19/2006	108	11:38	1:09	4119.69	6646.11	4118.66	6643.92	4	40	125/135	PORT	16	16	monkey dung and shells
9/19/2006	109	12:58	1:11	4118.75	6643.84	4118.82	6644.40	4	40	125/135	PORT	14	14.5	monkey dung and shells
9/19/2006	110	14:20	1:10	4118.66	6644.45	4118.92	6647.72	4	40	125/135	PORT	11	11.5	
9/19/2006	111	16:45	1:14	4122.10	6647.47	4119.42	6651.54	4	41	125/135	PORT	10	14	
9/19/2006	112	18:12	1:08	4119.35	6651.81	4119.70	6651.60	4	41	125/135	PORT	11	11	
9/19/2006	113	19:31	1:07	4119.76	6651.71	4119.68	6648.95	4	41	125/135	PORT	13	12	
9/19/2006	114	20:50	1:09	4119.68	6649.17	4119.77	6649.44	4	41	125/135	PORT	9	13	sweep off port side
9/19/2006	115	22:13	1:07	4119.81	6649.50	4120.05	6649.39	4	41	125/135	PORT	10.5	11	
9/19/2006	116	nk	nk	nk	nk	nk	nk	4	40	125/135	PORT	12	12	
9/20/2006	117	0:48	1:11	4123.54	6650.75	4123.65	6650.66	4	40	125/135	PORT	12	12	head out east toward hauge line
9/20/2006	118	2:10	1:05	4123.51	6650.53	4124.86	6646.23	4	43	130/140	PORT	8	11	
9/20/2006	119	3:25	1:07	nk	nk	4126.60	6640.90	4	45	140/150	PORT	11	12	

Appendix Table 4.3. Bridge Data Log F/V Westport 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
9/20/2006	120	4:43	1:10	4126.70	6640.39	4128.05	6634.33	4	30	150	PORT	18	12	
9/20/2006	121	6:07	1:11	4127.66	6637.91	4123.88	6630.02	4	50	150	PORT	29	23	along hauge line
9/20/2006	122	7:30	1:07	4123.53	6629.72	4122.21	6628.98	4	52	150	PORT	23.5	30	
9/20/2006	123	8:49	1:21	4122.81	6629.34	4126.90	6634.26	4	40	130/140	PORT	27	26.5	
9/20/2006	124	11:03	1:21	4126.34	6641.50	4126.50	6640.33	4	40	130/140	PORT	12	13	
9/20/2006	125	12:35	1:07	4126.44	6641.13	4124.23	6646.84	4	40	130/140	PORT	10	15.5	
9/20/2006	126	14:00	1:11	4123.72	6647.00	4119.55	6649.83	4	40	130/140	PORT	8	14	
9/20/2006	127	nk	nk	nk	nk	4115.14	6654.52	4	40	130/140	PORT	4	9	22 bags
9/20/2006	128	nk	nk	nk	nk	4119.34	6652.69	4	40	130/140	PORT	7	12	
9/20/2006	129	18:09	1:14	4119.76	6652.69	4119.92	6652.55	4	40	140/130	PORT	7	13	
9/20/2006	130	19:35	0:59	4119.54	6653.05	4116.57	6656.56	4	40	140/130	PORT	3	10	head back to west, trying longer wire, buttons in starb but not in port
9/20/2006	131	20:45	1:05	4116.44	6656.92	4112.40	6653.38	4.1	38	110/120	PORT	9	10	shorter wire
9/20/2006	132	22:00	1:08	4116.56	6657.53	4113.31	6601.48	3.8	37	110/120	PORT	13	11	
9/21/2006	133	23:19	1:08	4112.99	6601.77	4111.12	6703.26	4.3	37	110/120	PORT	18	20	
9/21/2006	134	0:41	1:13	4111.04	6703.28	4112.28	6702.53	4.3	37	110/120	PORT	18	20	
9/21/2006	135	2:07	1:16	4112.15	6702.49	4112.24	6702.50	4.3	37	110/120	PORT	18	19	
9/21/2006	136	3:34	1:09	4112.07	6702.56	4112.08	6702.79	3.9	37	110/120	PORT	15	18	
9/21/2006	137	4:54	1:12	4111.85	6702.88	4112.08	6702.59	3.9	37	110/120	PORT	17	16	
9/21/2006	138	6:17	1:08	4111.83	6702.73	4108.21	6706.29	4.5	37	110/120	PORT	15	16	
9/21/2006	139	7:25	1:15	4108.21	6706.29	4112.52	6703.15	3.8	37.5	110/120	PORT	11	15	tagged yellow tail
9/21/2006	140	8:50	1:20	4112.96	6702.80	4116.75	6757.62	3.8	38	110/120	PORT	11	15	
9/21/2006	141	10:23	1:17	4117.03	6657.79	4117.16	6657.52	3.8	38	110/120	PORT	9	11	
9/21/2006	142	11:55	1:20	4117.42	6656.76	4116.53	6657.30	3.8	38	110/120	PORT	11	12	hole in port bag
9/21/2006	143	13:28	1:20	4116.56	6657.34	4112.74	6702.19	3.8	38	110/120	PORT	nk	nk	
9/21/2006	144	14:58	1:22	4112.51	6702.24	4111.88	6702.85	3.8	38	110/120	PORT	12	17	
9/21/2006	145	16:28	1:21	4111.91	6702.80	4112.50	6702.61	3.8	38	110/120	PORT	22	21	
9/21/2006	146	18:01	1:18	4112.43	6702.61	4111.95	6702.78	3.8	38	110/120	PORT	16	17	
9/21/2006	147	19:30	1:12	4111.98	6702.96	4111.97	6702.58	3.8	38	110/120	PORT	17	17	
9/21/2006	148	20:52	1:09	4112.10	6702.68	4111.67	6702.76	3.8	38	110/120	PORT	12	14.5	
9/21/2006	149	22:12	0:59	4111.84	6702.75	4111.54	6702.79	3.8	38	110/120	PORT	14	16	
9/21/2006	150	23:22	1:14	4111.58	6702.82	4110.77	6703.20	3.8	38	110/120	PORT	12	14	
9/22/2006	151	0:47	1:22	4110.87	6703.05	4111.46	6702.74	3.8	38	110/120	PORT	15	19	rougher weather
9/22/2006	152	2:21	1:24	4111.35	6702.63	4111.43	6703.47	3.8	38	110/120	PORT	15	15	
9/22/2006	153	4:00	1:25	4111.24	6703.50	4110.54	6704.01	3.8	38	110/120	PORT	15	13	
9/22/2006	154	5:36	1:24	4110.40	6704.13	4110.10	6704.51	3.8	38	110/120	PORT	14	16	
9/22/2006	155	7:13	1:18	4110.05	6704.77	4111.73	6702.88	3.8	38	110/120	PORT	15	18.5	
9/22/2006	156	8:41	1:09	4111.71	6703.18	4111.78	6702.80	3.8	38	110/120	PORT	17	16.5	
9/22/2006	157	10:01	1:13	4111.92	6702.80	4111.79	6702.74	3.8	38	110/120	PORT	16	16	
9/22/2006	158	11:22	1:10	4111.94	6702.79	4111.55	6702.73	3.8	38	110/120	PORT	12	16	slack set on port side
9/22/2006	159	12:46	1:05	4111.79	6702.74	4112.00	6702.62	3.8	38	110/120	PORT	13.5	16.5	
9/22/2006	160	14:09	1:04	4112.16	6702.29	4111.51	6702.59	3.8	38	110/120	PORT	11	12	

Appendix Table 4.4. Bridge Data Log F/V Westport 2006-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
9/22/2006	161	15:22	1:13	4111.45	6702.60	4110.42	6704.17	4.5	37	110/120	PORT	10	12	
9/22/2006	162	16:44	1:04	4110.31	6704.22	4108.42	6705.84	4.5	37	110/120	PORT	8.5	11	
9/22/2006	163	18:00	1:03	4108.33	6705.97	4106.86	6708.57	4.1	36	110/120	PORT	8.5	8	
9/22/2006	164	19:14	1:04	4106.82	6708.77	4104.77	6710.90	4.1	36	110/120	PORT	9	11	
9/22/2006	165	20:28	1:09	4104.89	6710.96	4104.05	6711.62	4.1	36	110/120	PORT	13	14	
9/22/2006	166	21:48	1:18	4104.17	6711.69	4103.99	6712.10	4	38	110/120	PORT	14	15	
9/23/2006	167	23:19	1:01	4104.09	6712.28	4104.39	6711.81	4	38	110/120	PORT	12	13	
9/23/2006	168	0:32	1:11	4104.33	6711.85	4103.93	6711.88	4	38	110/120	PORT	13	15	
9/23/2006	169	1:54	1:16	4103.95	6711.85	4104.14	6711.31	4	38	110/120	PORT	17	20	
9/23/2006	170	3:22	1:20	4103.99	6711.22	4103.93	6711.52	4	38	110/120	PORT	21	20	
9/23/2006	171	nk	nk	4103.78	6711.65	4104.13	6711.38	4	38	110/120	PORT	18	21	

Appendix Table 5.1. Bridge Data Log F/V Celtic 2006-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
10/7/2006	1	20:23	1:37	4121.9386	665.7181	4121.17	6652.0489	4.8	35	120	PORT	12	12	measuring wire, strong tide
10/7/2006	2	22:14	1:16	4121.26	6651.63	4120.80	6650.57	4.5	38	140 Winch	PORT	12	10	
10/7/2006	3	23:40	1:23	4120.83	6651.09	4120.92	6650.37	4.5	3737	120 rail	PORT	10	10	3 bags down
10/8/2006	4	1:13	1:28	4120.88	6650.64	4120.78	6650.47	4.5	38	120 rail	PORT	12.3	11	
10/8/2006	5	2:44	1:16	4120.74	6650.48	4120.50	6652.83	5.0	37	120	PORT	12	12.5	
10/8/2006	6	4:05	1:20	4120.48	6652.88	4120.71	6650.07	5.1	37	120	PORT	5.25	10	port dredge fish poorly
10/8/2006	7	5:29	1:17	4120.62	6650.17	4120.66	6652.55	5.1	38	120	PORT	14.5	14.5	
10/8/2006	8	6:55	1:13	4120.52	6653.53	4120.55	6647.31	5.1	38	120	PORT	0	12	bad tow, twine top hung on teeth, not enough rpm during set
10/8/2006	9	8:20	0:07	4120.65	6646.84	4120.80	6646.40	4.7	38	120	PORT	0	0	hung up, hauled back early
10/8/2006	10	8:37	1:11	4120.79	6646.02	4120.76	6646.29	4.3	40	140 deck	PORT	9	12	16 bags, 12 count
10/8/2006	11	10:00	1:13	4121.14	6639.01	4119.30	6633.70	4.6	45	140 water	PORT	16	25	starfish
10/8/2006	12	11:22	1:18	4119.32	6633.77	4122.65	6639.61	4.6	46	140 water	PORT	30	16.5	
10/8/2006	13	12:50	1:12	4122.64	6639.55	4119.43	6633.51	4.4	43/47	140 water	PORT	21	25	ended in 47 f
10/8/2006	14	14:10	1:23	4119.53	6633.60	4122.62	6639.30	4.4	47	140 water	PORT	20	20	practice deck loading
10/8/2006	15	15:42	1:17	4122.40	6639.27	4119.16	6633.04	4.2	47	140 water	PORT	12	26	bad tow ,twine top hung on teeth
10/8/2006	16	17:09	1:20	4118.96	6632.71	4122.54	6639.20	4.0	47	140 water	PORT	3	9.5	bad tow ,twine top hung on teeth
10/8/2006	17	18:34	1:20	4122.37	6639.26	4119.38	6633.32	4.0	43	140 water	PORT	25.5	22	
10/8/2006	18	20:02	1:13	4119.27	6633.56	4122.46	6639.36	4.0	43	140 water	PORT	24.5	30	estimate on bushel count
10/8/2006	19	21:19	1:16	4122.39	6639.59	4119.28	6633.08	4.3	43/47	140 water	PORT	14	14	
10/8/2006	20	22:48	1:14	4119.40	6633.34	4122.16	6638.89	4.3	45	140 water	PORT	27	27	
10/9/2006	21	0:09	1:20	4122.27	639.02	4119.93	6634.34	4.6	46	140 water	PORT	28	31	
10/9/2006	22	1:36	1:27	4119.90	6634.23	4122.60	6640.42	4.0	47	140 water	PORT	21	21	
10/9/2006	23	3:09	1:27	4122.53	6640.22	4119.18	6633.56	4.0	47	140 water	PORT	16	25	
10/9/2006	24	4:45	1:32	4119.18	6633.46	4122.92	6640.24	4.1	47	140 water	PORT	11	29	
10/9/2006	25	6:21	1:35	4122.84	6640.12	4119.13	6633.54	4.1	47	140 water	PORT	34	25	
10/9/2006	26	7:59	1:25	4119.09	6633.64	4122.79	6639.09	4.1	47	140 water	PORT	16	21	
10/9/2006	27	9:28	1:33	4122.77	6638.97	4119.13	6633.04	4.1	47	140 water	PORT	18	17.5	
10/9/2006	28	11:03	1:22	4119.23	6633.24	4122.24	6639.32	4.2	47	140 water	PORT	18.5	25	
10/9/2006	29	12:31	1:14	4122.23	6639.00	4188.98	6632.77	4.2	47	140 water	PORT	6.5	22	twine top hung on port
10/9/2006	30	13:54	1:27	4118.88	6632.60	4122.19	6639.31	4.2	47	140 water	PORT	1	18	twine top hung on port, starb. Corner hung up
10/9/2006	31	15:35	0:42	4121.98	6638.66	4120.01	6635.16	4.1	43/46	140 water	PORT	20	22	28 bags
10/9/2006	32	16:24	1:00	4119.81	6635.26	4122.37	6639.41	4.1	46/43	140 water	PORT	22	21	
10/9/2006	33	17:31	1:16	4122.27	6639.32	4119.16	6633.53	4.6	43/47	140 water	PORT	23	24	
10/9/2006	34	19:00	1:15	4119.18	6634.03	4120.20	6635.62	4.1	46/45	140 water	PORT	DL	DL	
10/9/2006	35	20:30	1:35	4122.60	6639.70	4118.90	6632.39	4.2	45	140 deck	PORT	DL	DL	
10/9/2006	36	22:20	1:25	4119.11	6632.06	4122.60	6633.60	4.4	44	140 deck	PORT	DL	DL	
10/9/2006	37	23:55	1:30	4122.65	6639.33	4119.35	6631.95	4.3	44/48	140 rail	PORT	DL	DL	
10/10/2006	38	1:40	1:15	4119.55	6632.13	4121.77	6638.04	4.3	47/44	140 rail	PORT	DL	DL	27 bags
10/10/2006	39	3:10	1:10	4121.52	6637.45	4119.27	6631.87	4.3	45/48	140 water	PORT	DL	DL	
10/10/2006	40	4:30	1:15	4119.29	6631.90	4121.92	6637.57	4.3	48/44	140 water	PORT	DL	DL	

Appendix Table 5.2. Bridge Data Log F/V Celtic 2006-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
10/10/2006	41	5:55	1:20	4121.64	6637.25	41.00	66.00	4.6	45	140 w ater	PORT	DL	DL	
10/10/2006	42	7:30	1:40	4130.22	6619.20	41225.79	6639.80	4.7	47/44	140 w ater	PORT	DL	DL	
10/10/2006	43	9:25	1:20	4122.47	6639.71	4119.73	6633.54	4.4	44/47	140 w ater	PORT	DL	DL	
10/10/2006	44	10:55	1:27	4119.84	6653.65	4122.79	6641.13	4.0	46	140 rail	PORT	DL	DL	
10/10/2006	45	12:35	1:15	4122.66	6641.76	4118.71	6645.98	4.4	43	140 deck	PORT	DL	DL	
10/10/2006	46	14:05	1:25	4119.47	6646.19	41.00	66.00	4.0	40/41	120 w ater	PORT	12	12	new area, getting yt
10/10/2006	47	15:40	1:10	4121.38	6643.04	4117.82	6646.99	4.0	41/38	140 rail	PORT	16	12	new area, getting yt
10/10/2006	48	17:05	1:25	4117.77	6646.66	4122.76	6641.90	4.8	38/43	140 rail	PORT	9	8.5	new area, getting yt
10/10/2006	49	18:45	1:10	4122.85	6641.32	4120.44	6635.09	4.5	42/46	140 w ater	PORT	26	23.5	new area, getting yt
10/10/2006	50	20:05	1:25	4120.40	6635.44	4123.32	6692.62	4.7	42	140 w ater	PORT	24	24.5	going back, 24 bags
10/10/2006	51	21:40	0:50	4123.11	6642.55	4122.22	6638.92	4.3	44	140 w ater	PORT	5	10	
10/10/2006	52	22:45	0:35	4122.00	6638.27	4120.48	6635.79	4.3	45/46	140 w ater	PORT	19	15	
10/10/2006	53	23:30	1:20	4120.29	6635.35	4121.41	6637.46	4.3	46/45	140 w ater	PORT	28	21	25 bags
10/11/2006	54	1:05	1:30	4121.98	6638.36	4120.74	6636.31	4.6	45/47	140 w ater	PORT	25	34	
10/11/2006	55	2:50	1:30	4120.89	6636.43	4121.90	6638.20	4.7	46/44	140 w ater	PORT	26	32	
10/11/2006	56	4:30	1:40	4121.98	6638.29	4120.63	6636.02	4.5	44/46	140 w ater	PORT	38	36	
10/11/2006	57	6:20	1:40	4120.69	6636.34	4122.07	6638.39	4.5	46	140 rail	PORT	DL	DL	29 bags
10/11/2006	58	8:10	1:20	4122.15	6638.75	4121.92	6637.74	4.5	45	140 rail	PORT	39	19	
10/11/2006	59	9:45	1:30	4121.71	6638.29	4121.70	667.65	4.3	45/44	140 rail	PORT	9	15	gear w ork on port side
10/11/2006	60	11:35	1:25	4122.11	6638.40	4121.68	6638.23	4.5	45	140 w ater	PORT	21	19.5	
10/11/2006	61	13:10	1:10	4121.86	6638.67	4122.19	6638.38	4.3	45	140 rail	PORT	7	6	
10/11/2006	62	14:30	1:25	4122.43	6638.80	4122.86	6639.37	4.8	44	140 rail	PORT	19	22	mate 29 bags, 15 ct
10/11/2006	63	16:05	1:05	4126.64	6639.87	4121.89	6638.20	4.5	45	140 w ater	PORT	17	22	
10/11/2006	64	17:20	1:15	4121.89	6638.20	4122.25	6637.62	4.4	45	140 w ater	PORT	16	18	
10/11/2006	65	18:50	1:20	4121.82	6639.39	4122.46	6638.30	4.3	45	140 w ater	PORT	17	19	
10/11/2006	66	20:25	1:15	4122.26	6639.44	4127.78	6640.22	4	43	140 w ater	PORT	16.5	17	
10/11/2006	67	21:50	1:25	4122.95	6641.18	4123.03	6639.60	4.5	42	140 w ater	PORT	16	16	capt 28 bags, 15 ct
10/11/2006	68	23:25	1:35	4123.21	6640.25	4121.41	6637.88	4.5	43	140 w ater	PORT	23	20	
10/12/2006	69	1:00	1:35	4121.68	6639.34	4121.54	6637.94	4.5	45	140 w ater	PORT	29	25	
10/12/2006	70	2:50	1:35	4121.98	6638.74	4122.62	6639.09	4.5	45	140 w ater	PORT	23	22	
10/12/2006	71	4:40	1:30	4122.79	6639.84	4122.74	6639.65	4.3	44	140 w ater	PORT	18	16	
10/12/2006	72	6:25	1:29	4123.33	640.08	4121.68	6637.64	4.4	42	140 w ater	PORT	16	16	
10/12/2006	73	8:10	1:50	4122.03	6638.30	4123.14	6640.46	4.3	45/42	140 w ater	PORT	21	27	mate 23 bags, 15 ct
10/12/2006	74	10:10	1:30	4123.34	6641.28	4121.85	6639.80	4.4	45	140 w ater	PORT	16	16.5	
10/12/2006	75	11:55	1:20	4122.08	6638.54	4121.18	6638.01	4.2	45	140 w ater	PORT	17.5	17.5	
10/12/2006	76	13:40	1:15	4122.34	6638.99	4121.02	6637.34	4.3	46	140 w ater	PORT	20	18	
10/12/2006	77	15:05	1:15	4120.18	6636.69	4121.90	6638.38	4	46	140 w ater	PORT	17	17	
10/12/2006	78	16:30	1:15	4122.11	6638.86	4121.83	6638.19	4.3	45	140 w ater	PORT	11	13.5	
10/12/2006	79	18:05	1:15	4122.16	6638.74	4120.57	6637.23	4.3	45	140 w ater	PORT	22	20	capt 24 bags
10/12/2006	80	19:40	1:15	4120.07	6636.49	4121.74	6639.24	4.3	45	140 w ater	PORT	6	16	port side hung

Appendix Table 5.3. Bridge Data Log F/V Celtic 2006-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
10/12/2006	81	21:05	1:10	4122.15	6640.14	4122.23	6640.75	4.5	43	140 water	PORT	13	13	
10/12/2006	82	22:25	1:20	4122.15	6639.92	4121.42	6637.69	4.2	44/46	140 water	PORT	26	24	
10/12/2006	83	23:55	1:20	4121.75	6638.32	4121.16	6637.19	4.5	46	140 water	PORT	24	25	
10/13/2006	84	1:25	1:30	4121.49	6637.95	4120.55	6636.36	4.3	45	140 water	PORT	DL	6	bad tow on starb
10/13/2006	85	3:08	1:42	4120.80	6636.59	4121.92	6638.42	4.3	45	140 water	PORT	DL	DL	
10/13/2006	86	5:00	1:38	4121.54	6637.89	4123.46	6640.73	4.2	45/42	140 water	PORT	DL	DL	
10/13/2006	87	6:50	1:30	4123.20	6640.19	4121.49	6638.59	4.2	42	140 water	PORT	DL	DL	
10/13/2006	88	8:55	1:10	4121.64	6638.82	4121.05	6636.99	4.3	45	140 water	PORT	DL	DL	
10/13/2006	89	10:15	1:20	4120.98	6637.13	4122.76	6639.66	4.7	46	140 water	PORT	17	21	
10/13/2006	90	11:45	0:30	4122.80	6639.80	4120.66	6637.66	4.5	45	140 water	PORT	DL	DL	
10/13/2006	91	13:25	1:00	412085.00	6638.03	4123.26	6640.51	4.3	45	140 water	PORT	DL	DL	
10/13/2006	92	14:35	1:40	4123.02	6640.07	4118.29	6642.35	4.7	43	140 water	PORT	24	21.5	mate 29 bags, 15 ct
10/13/2006	93	16:25	1:25	4117.94	6643.64	4113.77	6649.72	4.8	42	140 deck	PORT	25.5	24	looking for YT
10/13/2006	94	18:00	1:20	4113.43	6650.12	4109.14	6655.86	4.5	37	140 Winch	PORT	18	16	
10/13/2006	95	19:30	1:20	4109.19	6655.74	4113.49	6650.78	4.4	36/37	140 deck	PORT	10	12	
10/13/2006	96	20:58	1:22	4113.46	6650.21	4117.41	6694.21	4.5	38/41	140 deck	PORT	16	15	
10/13/2006	97	20:35	1:35	4117.14	6644.80	4113.99	6649.49	4.4	41	140 deck	PORT	DL	DL	
10/14/2006	98	0:12	1:18	4114.08	6649.36	4118.10	6643.47	4.4	38	140 deck	PORT	12.5	11	capt 21 bags, 15 ct
10/14/2006	99	1:40	1:20	4117.92	6643.64	4113.96	6647.47	4.4	41	140 deck	PORT	9	12	
10/14/2006	100	3:10	nk	4112.12	6649.54	4117.93	6643.85	4.7	38	140 deck	PORT	9	11	
10/14/2006	101	4:40	1:26	4117.87	6643.85	4114.11	6649.06	4.3	42	140 deck	PORT	11	11	
10/14/2006	102	6:10	1:25	4114.17	6649.01	4117.12	6644.49	4.3	38	140 deck	PORT	7	9	
10/14/2006	103	7:40	1:20	4116.67	6644.25	4115.06	6652.25	4.5	40/37	140 water	PORT	11	12	
10/14/2006	104	9:15	1:25	4114.83	6653.02	4110.72	6659.42	4.5	35	140 water	PORT	11	13	
10/14/2006	105	10:50	1:20	4110.36	6759.94	4108.46	6707.63	4.4	35/33	140 water	PORT	13	15	
10/14/2006	106	13:45	nk	4108.06	6707.68	4102.62	6712.08	4.8	34	140 water	PORT	23	17	starb. Side hung up
10/14/2006	107	14:00	1:25	4102.76	6712.04	4108.46	6707.62	4.9	36	140 water	PORT	17	24	
10/14/2006	108	15:39	1:21	4108.02	6707.68	4103.16	6711.49	4.2	35	120	PORT	18	15.5	
10/14/2006	109	17:05	1:27	4103.23	6711.46	4108.42	6707.34	4.5	35	120	PORT	10	3	starb. Did not fish right
10/14/2006	110	18:41	1:26	4108.45	6707.07	4103.53	6711.03	4.3	34	120	PORT	7.5	15.5	
10/14/2006	111	20:13	1:17	4103.55	6710.72	4108.12	6707.56	4.4	34	120 water	PORT	13	16	
10/14/2006	112	21:36	1:34	4107.90	6707.57	4102.24	6712.18	4.5	33	120 gal	PORT	10	11	
10/15/2006	113	0:15	1:22	4101.50	6718.85	4105.03	6718.63	4.4	33	120 deck	PORT	11	14	
10/15/2006	114	1:48	1:02	4105.02	6712.91	4105.37	6712.26	4.6	33	120 deck	PORT	15.5	17	gear work, fixed chains, new shoes
10/15/2006	115	2:58	1:22	4105.48	6714.81	4105.12	6713.98	4.6	33	120 deck	PORT	15	19	
10/15/2006	116	4:30	1:20	4105.28	6713.91	4105.37	6715.17	4.6	33	120 deck	PORT	17	20	
10/15/2006	117	6:00	1:40	4105.19	6714.25	4105.19	6714.11	4.8	32	120 deck	PORT	18.5	19	
10/15/2006	118	7:50	1:25	4105.20	6713.62	4105.12	6714.57	4.6	33	120 deck	PORT	14	16.5	
10/15/2006	119	9:22	1:24	4105.07	6714.21	4105.50	6712.78	4.6	33	120 deck	PORT	14	15	

Appendix Table 5.4. Bridge Data Log F/V Celtic 2006-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
10/15/2006	120	10:52	1:25	4105.44	6712.49	4105.12	6715.35	4.6	33	120 deck	PORT	15	15	
10/15/2006	121	12:22	1:06	4105.18	6715.07	4105.31	6711.41	4.6	33	120 deck	PORT	11	11	
10/15/2006	122	13:32	0:58	4105.29	6711.67	4105.34	6717.45	5	34	120 deck	PORT	7	11	twine top hung on port dredge
10/15/2006	123	14:40	1:30	4105.34	6717.28	4105.65	6710.33	4.8	34	120 deck	PORT	15	13	mate 22 bags, 15 ct
10/15/2006	124	16:20	1:25	4105.60	6711.34	4111.26	6711.51	4.8	34	120 deck	PORT	15	17	
10/15/2006	125	17:53	0:22	4105.53	6710.58	4108.25	6707.24	4.4	34	120 deck	PORT	8	8	
10/15/2006	126	18:17	1:09	4112.23	6701.21	4115.03	6655.11	4.4	34	120 deck	PORT	8	10	
10/15/2006	127	20:15	1:10	4112.25	6701.16	4115.06	6655.08	4.5	35	120 deck	PORT	12	14	
10/15/2006	128	21:40	1:20	4115.23	6654.36	4121.55	6652.28	4.5	35/37	120 deck	PORT	14.5	13	
10/15/2006	129	23:15	1:19	4121.71	6651.78	4122.15	6644.22	4.4	41	120 rail	PORT	17	18	
10/16/2006	130	0:45	1:26	4122.00	6644.53	4121.78	6652.81	4.4	41	120 rail	PORT	18	18	clean catch
10/16/2006	131	2:17	1:29	4121.83	6652.77	4122.17	6644.80	4.4	39	120 rail	PORT	17.5	14.5	
10/16/2006	132	3:56	1:16	4122.07	6645.35	4121.91	6652.43	4.5	38	120 rail	PORT	17	13	gear work on port
10/16/2006	133	5:15	1:21	4121.99	6651.92	4122.07	6644.79	4.5	39	120 rail	PORT	17	15.5	yellow tail
10/16/2006	134	6:41	1:13	4122.01	6644.92	4121.84	6651.58	4.4	39	120 water	PORT	14	13	yellow tail
10/16/2006	135	7:59	1:11	4121.92	6651.35	4112.04	6644.21	4.3	38	120 deck	PORT	16	13	yellow tail
10/16/2006	136	9:20	1:20	4121.95	6644.53	4121.82	6652.65	4.5	40	120 water	PORT	14	11	yellow tail
10/16/2006	137	10:50	1:15	4121.89	6652.21	4122.03	6645.26	4.5	37	120 winch	PORT	14	12	yellow tail
10/16/2006	138	12:18	1:26	4121.94	6645.58	4121.88	6650.77	4.4	39	120 winch	PORT	11.5	11.5	
10/16/2006	139	13:48	1:23	4121.83	6650.76	4122.06	6643.92	4.5	39	120 winch	PORT	14.5	11.5	
10/16/2006	140	15:15	1:18	4122.03	6644.21	4121.68	6651.74	4.4	39	120 winch	PORT	9.5	13.5	PORT=EXPERIMENTAL STARB = STANDARD
10/16/2006	141	16:58	1:22	4121.83	6651.82	4122.29	6643.82	4.4	39	120 winch	STARBOARD	14	16.5	STARB = EXPERIMENTAL STARB=STANDARD, SWITCHED SIDES
10/16/2006	142	18:25	1:25	4122.33	6643.99	4121.71	6652.07	4.5	39	120 winch	STARBOARD	14	13	
10/16/2006	143	19:56	1:04	4121.75	6651.92	4122.02	6646.00	4.7	37	120 winch	STARBOARD	12	9	
10/16/2006	144	21:07	1:13	4121.91	6646.14	4121.77	6652.85	4.7	39	120 winch	STARBOARD	12.5	12	
10/16/2006	145	2:35	1:25	4121.62	6652.45	4121.98	6644.62	4.7	37	120 winch	STARBOARD	14	14.5	
10/17/2006	146	0:10	1:10	4121.68	6644.41	4121.65	6652.00	4.5	38	120 winch	STARBOARD	14	13.5	
10/17/2006	147	1:30	1:15	4121.59	6652.66	4120.97	6600.15	4.6	38	120 winch	STARBOARD	12	12	
10/17/2006	148	2:55	1:20	4120.49	6659.94	4121.67	6652.30	4.5	34	120 deck	STARBOARD	11	12	
10/17/2006	149	4:25	1:20	4121.78	6652.70	4120.97	6601.12	4.8	38/34	120 water	STARBOARD	11	11	
10/17/2006	150	5:55	1:50	4121.24	6659.87	4121.70	6652.20	4.5	34	120 water	STARBOARD	11	11	
10/17/2006	151	7:22	1:16	4121.02	6652.39	4121.02	6659.74	4.5	38	120 water	STARBOARD	10	10	LAST TOW

Appendix Table 6.1. Bridge Data Log F/V Friendship 2007-1

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire out (Fathoms)			Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Stbd	Heading	Port	Stbd	Comments
5/17/2007	1	6:00	1:25	3925.86	7301.23	3922.57	7305.18	4.5	33.9	100	100	WSW			Twine top/dumping chain hooked on rollers/bale (turtle dredge only). Turtle Dredge on stbd side for entire trip
5/17/2007	2	8:00	1:15	3921.98	7307.71	3919.95	7311.41	4.8	31.4	100	100	WSW			Turtle chain hooked on half of the rollers on experimental dredge (picture).
5/17/2007	3	9:20	1:00	3919.33	7312.46	3916.75	7314.93	5.0	33.2	120	125	WSW	2	3	Experimental dredge had problem flaring. Started sampling on this tow.
5/17/2007	4	10:50	1:40	3917.17	7314.48	3920.21	7306.73	5.0	32	100	100	E	9	6.5	Double the catch on starboard, more buttons on starboard side.
5/17/2007	5	12:45	1:25	3919.97	7306.56	3920.00	7258.93	5.0	34	140	140	SE	5	6	
5/17/2007	6	14:20	1:20	3919.92	7258.87	3924.6	7303.69	5.0	31	100	100	NW	9	9	
5/18/2007	7	1:30	1:30			3908.74	7319.05	5.0	31	100	100	NW	7	2	Did not sample (experimental dredge too long in water).
5/18/2007	8	3:30	1:30	3906.88	7320.00			5.0	30	100	100	SW	6	6	
5/18/2007	9	5:30	1:15			3858.1	7328.21	4.5	26.8	100	100	SW	6	6.5	Tied rope to flare experimental dredge.
5/18/2007	9	17:30	1:15	3854.43	7330.06	3857.52	7328.45	3.1	30	100	100	NE	5.5	5	
5/19/2007	10	2:00	1:30	3858.39	7326.81	3859.53	7326.32	4.4	29.9	100	100	SW	8	7	
5/19/2007	11	4:00	1:15	3858.54	7327.67	3858.7	7327.14	4.4	27.8	100	100	NE			Problem with exp. dredge, twine top and turtle chains hung up on teeth and rollers.
5/19/2007	12	5:45	1:30	3858.72	7327.72	3859.62	7327.24	4.0	28.4	100	100	NE			Took rollers off and made a tickle chain.
5/19/2007	13	7:30	0:45	3859.62	7327.24	3859.41	7326.81	4.3	29.7	100	100	SW			
5/19/2007	14	8:30	0:45	3859.41	7326.81	3856.16	7320.28	3.8	32.6	100	100	SE			Put an 8 and 6 inch shoe on port drag and a one 6 inch shoe on exp. drag.
5/19/2007	15	10:30	0:45	3856.16	7320.28	3853.72	7321.39	5.2	33.8	100	100	SW	4	4	This is the tow with new shoes
5/19/2007	16	11:30	0:45	3853.72	7321.39	3850.13	7323.31	4.1	34.2	100	100	SW	4.5	4	
5/19/2007	17	12:30	1:15	3850.13	7323.31	3844.86	7327.78	4.7	36.7	100	100	SW			
5/20/2007	18	13:15	1:15	3856.29	7327.88	3856.05	7328.64	4.5	30.4	100	100	NE	7.5	8	Took teeth off the experimental drag.
5/20/2007	19	14:45	1:00	3855.98	7328.23	3853.27	7328.76	4.4	33.6	100	100	S	3.25	6	
5/20/2007	20	16:00	1:15	3853.26	7328.72	3851.52	7328.64	4.5	32.9	100	100	S	4.5	3	
5/20/2007	21	17:30	1:15	3851.61	7328.63	3855.96	7328.46	4.8	31.6	100	100	NE	3	3	
5/20/2007	22	19:00	0:30	3859.09	7321.31	3858.62	7327.37	4.0	30	100	100	N	2	2	
5/20/2007	23	19:45	1:00	3859.10	7321.42	3854.58	7329.11	4.6	30.4	100	100	SW			
5/21/2007	24	8:30	1:00	3858.93	7323.47	3858.5	7325.11	4.4	33.3	100	100		5	6	put tickler on experimental dredge
5/21/2007	25	9:45	1:00	3858.50	7325.11	3858.68	7324.68	4.5	32.2	100	100		5.5	4	
5/21/2007	26	12:30	1:15	3858.44	7324.46	3853.27	7326.17	4.4	33	100	100		5	5	took off tickler experimental dredge
5/21/2007	27	13:55	1:05	3852.81	7326.51	3848.1	7329.11	4.5	30.5	100	100		6	5.5	
5/21/2007	28	15:15	1:30	3848.01	7329.08	3854.76	7329.28	5.5	30	100	100		11.5	11	
5/21/2007	29	17:00	1:30	.3854.76	7329.28	3847.97	7328.86	6.1	30.8	100	100		6.5	7	
5/21/2007	30	18:45	1:15	3851.46	7328.65	3855.18	7329.23	4.9	32.2	100	100		11	12.5	
5/21/2007	31	20:15	1:30	3855.25	7329.29	3848.8	7328.72	4.8	36.6	100	100		7	8	
5/22/2007	32	8:45	1:30	3851.07	7338.04	3852.07	7333.23	4.6	29.3	100	100		9	9	
5/22/2007	33	10:30	1:15	3850.78	7330.49	3850.8	7335.05	4.3	30.1	100	100		6.5	4	
5/22/2007	34	12:00	1:00	3850.81	7335.08	3852.1	7332.68	4.6	30.1	100	100		9	7	
5/22/2007	35	13:15	1:15	3850.88	7330.73	3850.69	7334.55	4.2	30.8	100	100		4	4	
5/22/2007	36	16:00	1:15	3852.26	7332.04	3850.32	7329.18	4.7	31.8	100	100		7	6.5	
5/22/2007	37	19:15	1:30	3850.46	7339.03	3850.23	7329.27	4.9	29.3	100	100		7.5	6.5	
5/23/2007	38	6:45	1:30	3850.66	7337.14	3848.93	7329.1	4.6	30.4	100	100		12	11	
5/23/2007	39	9:30	0:40	3849.04	7329.37	3846.79	7328.78	5.1	36	100	100		4	7	
5/23/2007	40	10:15	1:15	3846.79	7328.78	3852.11	7331.06	4.4	31.4	100	100		7.5	6	

Appendix Table 6.2. Bridge Data Log F/V Friendship 2007-1

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire out (Fathoms)			Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Stbd	Heading	Port	Stbd	Comments
5/23/2007	41	13:15	1:15	3849.44	7329.43	3853.85	7332.49	4.2	30.7	100	100		6.5	5.5	
5/23/2007	42	14:45	1:00	3853.85	7332.49	3849.21	7329.16	4.6	35	100	100		5	5.5	
5/23/2007	43	17:30	1:00			3849.16	7329.44	4.5	33.9	100	100		4.5	3	
5/23/2007	44	18:40	1:20	3849.16	7329.44	3851.04	7330.7	4.9	32.4	100	100		8	7.5	
5/23/2007	45	20:15	1:15	3851.04	7330.70	3853.15	7332.13	4.5	31.1	100	100		8	5	
5/24/2007	46	10:15	1:20	3852.84	7332.26			4.3	29.4	100	100		8	7	
5/24/2007	47	11:45	1:30			3849.56	7329.08	4.9	30.6	100	100		6	4.5	
5/24/2007	48	13:30	1:30	3849.56	7329.00	3852.48	7331.06	4.5	31.1	100	100		5	5.5	Engine problem, dredges were not fishing for ~ 0.5 hrs.
5/25/2007	49	17:30	1:15	3850.70	7326.94	3850.78	7327.11	4.6	34.7	100	100		6	11	put chain on experimental drag to raise scraper bar higher off bottom
5/26/2007	50	6:00	1:00	3850.03	7327.91	3850.95	7326.82	3.9	35.2	100	100		3	4	
5/26/2007	51	8:00	1:15	3850.95	7326.82	3850.17	7327.25	4.3	35.4	100	100		5	6	
5/26/2007	52	9:30	1:30	3850.17	7327.25	3850.06	7327.49	4.4	34.4	100	100		7.5	6	
5/26/2007	53	11:00	1:30	3850.06	7327.49	3848.23	7329.52	4.2	36	100	100		7	7	
5/26/2007	54	12:45	0:55	3848.23	7329.52	3849.78	7328.49	4.2	34.7	100	100		7.5	7	
5/27/2007	55	0:00	1:30			3858.17	7328.56	4.0	29.9	100	100		3.5	5.5	
5/27/2007	56	1:50	1:00	3858.17	7328.56	3903.82	7324.23	3.9	28.3	100	100		5	5.5	
5/27/2007	57	3:00	1:30	3903.82	7324.28	3908.66	7317.75	4.5	31.1	100	100		7	6	
5/27/2007	58	4:45	1:30	3908.66	7317.75	3911.61	7312.56	4.2	32.9	100	100		8	7	
5/27/2007	59	6:30	1:00	3911.61	7312.29	3915.77	7311.75	4.2	34.4	100	100		6.5	7	
5/27/2007	60	7:45	1:15	3915.77	7311.75	3920.45	7308.5	3.9	33.6	100	100		5	5	

Appendix Table 7.1. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd	Latitude (dd)	Longitude (dd	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/6/2006	1	4:55	0:45	3929.201	7242.243	3928.77	7246.320	4.8	39.5	125r	starboard	2	2	experimental dredge has wheels, standard New Bedford dredge without wheels, starb side is experimental dredge, port side is standard NB dredge, deeper water test tow, no sample on first tow
6/6/2006	2	5:49	1:07	3928.77	7246.63	3928.05	7253.35	4.9	32.5	110w, 125d	starboard	4.5	3.5	
6/6/2006	3	7:04	1:03	3928.04	7253.53	3925.27	7259.16	5.3	32.5	120d	starboard	4	4	no sampling, crew tossed fish
6/6/2006	4	8:15	1:12	3925.17	7259.28	3921.63	7304.86	4.9	34	125	starboard	3.25	4	
6/6/2006	5	9:35	1:21	3921.48	7305.04	3924.55	7258.87	4.1	34	120r	starboard	1.75	1.5	
6/6/2006	6	11:03	1:05	3924.67	7258.73	3925.70	7258.93	5.0	34	125	starboard	4	3.5	
6/6/2006	7	12:15	1:20	3925.64	7259.13	3926.49	7258.52	5.2	33.5	125	starboard	3.5	4	
6/6/2006	8	13:43	1:14	3926.53	7258.12	3927.32	7301.92	5.0	32	125	starboard	4	3.5	
6/6/2006	9	15:06	1:15	3927.26	7302.17	3927.65	7305.95	4.8	34.5	125	starboard	2.5	4	
6/6/2006	10	16:28	1:27	3927.62	7305.68	3927.74	7256.83	5.4	34.7	125	starboard	6.5	5	trash tow, lots of buttons few scallops, no fish sampled because crew tossed them
6/6/2006	11	18:04	1:11	3927.69	7256.50	3927.46	7254.08	4.7	33	125	starboard	4	4	
6/6/2006	12	19:23	1:10	3927.49	7254.15	3928.18	7255.95	5.1	32	125d	starboard	3.5	4	off watch
6/6/2006	13	20:45	1:00	3927.99	7255.88	3924.42	7253.08	5.0	34	125d	starboard	3.5	3.5	off watch
6/6/2006	14	21:55	0:50	3924.49	7253.20	3924.96	7249.27	5.0	34	125d	starboard	2.5	2.5	off watch
6/6/2006	15	22:55	1:20	3924.89	7248.59	3927.62	7254.77	5.0	34	125d	starboard	5	4.5	off watch
6/7/2007	16	0:25	1:20	3927.62	7255.42	3928.26	7300.54	5.0	34	125d	starboard	4	4	off watch
6/7/2007	17	1:55	1:20	3928.24	7300.17	3927.85	7252.02	5.0	34	125d	starboard	5	5	off watch
6/7/2007	18	3:25	1:20	3927.87	7251.53	3928.54	7256.78	5.0	34	125d	starboard	4	3.5	off watch
6/7/2007	19	4:55	1:25	3928.54	7257.43	3927.72	7256.54	5.0	34	125d	starboard	3	2	no sample, crew kicked over fish
6/7/2007	20	6:29	1:25	3927.76	7256.51	3927.74	7259.95	5.0	34	125	starboard	4	6	
6/7/2007	21	7:59	0:39	3927.77	7300.04	3929.13	7301.46	5.0	34	125	starboard	6	4	tightened up the clubstick on both sides, headed south a bit
6/7/2007	22	9:31	1:06	3927.20	7302.52	3927.17	7255.88	5.1	34	135g	starboard	2.25	1	cut wheels off experimental dredge, going south
6/7/2007	23	10:54	1:07	3927.25	7255.90	3923.51	7301.30	5.1	33	125	starboard	5	5.5	towing to new spot south
6/7/2007	24	12:08	1:02	3923.49	7301.40	3920.52	7306.57	5.1	33	125	starboard	3	5.5	towing to new spot south, twine top hung on scupper and let fish out
6/7/2007	25	13:20	1:02	3920.48	7306.68	3916.18	7308.52	4.8	34	125	starboard	1.5	4	
6/7/2007	26	14:31	1:09	3916.07	7308.53	3912.52	7306.33	4.7	35	125	starboard	2	2.5	
6/7/2007	27	15:45	1:15	3912.52	7306.32	3907.75	7301.84	4.5	39	125	starboard	1.5	3.5	
6/7/2007	28	17:10	1:10	3907.54	7301.68	3904.59	7307.79	5.0	37	145	starboard	1	2.5	
6/7/2007	29	18:30	1:10	3904.34	7308.93	3900.40	7313.87	5.0	37	140	starboard	1	2	
6/7/2007	30	19:50	1:20	3859.99	7314.45	3854.15	7316.56	5.0	38	140	starboard	1	1	
6/7/2007	31	21:20	1:20	3853.76	7316.99	3851.08	7322.41	5.0	38	140	starboard	10	15	
6/7/2007	32	22:50	1:00	3851.10	7323.09	3851.14	7323.00	4.6	35	140	starboard	3	2	
6/8/2007	33	0:00	1:00	3851.14	7321.18	3850.77	2319.74	4.7	37	140	starboard	5	6	
6/8/2007	34	1:12	1:03	3850.62	7320.36	3850.46	7326.93	4.7	35	140	starboard	5	5.25	
6/8/2007	35	2:30	1:20	3850.54	7327.57	3850.05	7334.68	4.7	30	100	starboard	5	5	
6/8/2007	36	4:00	1:20	3850.62	7335.08	3850.81	7332.37	4.3	30	100	starboard	4.5	4.5	
6/8/2007	37	5:30	1:26	3850.79	7331.71	3850.63	7336.22	4.5	30	100	starboard	6	7	crew tossed fish
6/8/2007	38	7:05	1:14	3850.65	7336.22	3851.67	7332.21	4.7	31	100	starboard	5.5	4	sunny, morning fog
6/8/2007	39	8:27	1:13	3851.68	7332.06	3850.43	7335.54	4.5	31	100	starboard	3.75	4.5	
6/8/2007	40	9:47	1:13	3850.48	7335.81	3851.99	7333.46	4.7	30	100	starboard	4.75	4.5	

Appendix Table 7.2. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/6/2006	1	4:55	0:45	3929.201	7242.243	3928.77	7246.320	4.8	39.5	125r	starboard	2	2	experimental dredge has wheels, standard New Bedford dredge without wheels, starb side is experimental dredge, port side is standard NB dredge, deeper water test tow, no sample on first tow
6/6/2006	2	5:49	1:07	3928.77	7246.63	3928.05	7253.35	4.9	32.5	110w, 125d	starboard	4.5	3.5	
6/6/2006	3	7:04	1:03	3928.04	7253.53	3925.27	7259.16	5.3	32.5	120d	starboard	4	4	no sampling, crew tossed fish
6/6/2006	4	8:15	1:12	3925.17	7259.28	3921.63	7304.86	4.9	34	125	starboard	3.25	4	
6/6/2006	5	9:35	1:21	3921.48	7305.04	3924.55	7258.87	4.1	34	120r	starboard	1.75	1.5	
6/6/2006	6	11:03	1:05	3924.67	7258.73	3925.70	7258.93	5.0	34	125	starboard	4	3.5	
6/6/2006	7	12:15	1:20	3925.64	7259.13	3926.49	7258.52	5.2	33.5	125	starboard	3.5	4	
6/6/2006	8	13:43	1:14	3926.53	7258.12	3927.32	7301.92	5.0	32	125	starboard	4	3.5	
6/6/2006	9	15:06	1:15	3927.26	7302.17	3927.65	7305.95	4.8	34.5	125	starboard	2.5	4	
6/6/2006	10	16:28	1:27	3927.62	7305.68	3927.74	7256.83	5.4	34.7	125	starboard	6.5	5	trash tow, lots of buttons few scallops, no fish sampled because crew tossed them
6/6/2006	11	18:04	1:11	3927.69	7256.50	3927.46	7254.08	4.7	33	125	starboard	4	4	
6/6/2006	12	19:23	1:10	3927.49	7254.15	3928.18	7255.95	5.1	32	125d	starboard	3.5	4	off watch
6/6/2006	13	20:45	1:00	3927.99	7255.88	3924.42	7253.08	5.0	34	125d	starboard	3.5	3.5	off watch
6/6/2006	14	21:55	0:50	3924.49	7253.20	3924.96	7249.27	5.0	34	125d	starboard	2.5	2.5	off watch
6/6/2006	15	22:55	1:20	3924.89	7248.59	3927.62	7254.77	5.0	34	125d	starboard	5	4.5	off watch
6/7/2007	16	0:25	1:20	3927.62	7255.42	3928.26	7300.54	5.0	34	125d	starboard	4	4	off watch
6/7/2007	17	1:55	1:20	3928.24	7300.17	3927.85	7252.02	5.0	34	125d	starboard	5	5	off watch
6/7/2007	18	3:25	1:20	3927.87	7251.53	3928.54	7256.78	5.0	34	125d	starboard	4	3.5	off watch
6/7/2007	19	4:55	1:25	3928.54	7257.43	3927.72	7256.54	5.0	34	125d	starboard	3	2	no sample, crew kicked over fish
6/7/2007	20	6:29	1:25	3927.76	7256.51	3927.74	7259.95	5.0	34	125	starboard	4	6	
6/7/2007	21	7:59	0:39	3927.77	7300.04	3929.13	7301.46	5.0	34	125	starboard	6	4	tightened up the clubstick on both sides, headed south a bit
6/7/2007	22	9:31	1:06	3927.20	7302.52	3927.17	7255.88	5.1	34	135g	starboard	2.25	1	cut wheels off experimental dredge, going south
6/7/2007	23	10:54	1:07	3927.25	7255.90	3923.51	7301.30	5.1	33	125	starboard	5	5.5	towing to new spot south
6/7/2007	24	12:08	1:02	3923.49	7301.40	3920.52	7306.57	5.1	33	125	starboard	3	5.5	towing to new spot south, twine top hung on scupper and let fish out
6/7/2007	25	13:20	1:02	3920.48	7306.68	3916.18	7308.52	4.8	34	125	starboard	1.5	4	
6/7/2007	26	14:31	1:09	3916.07	7308.53	3912.52	7306.33	4.7	35	125	starboard	2	2.5	
6/7/2007	27	15:45	1:15	3912.52	7306.32	3907.75	7301.84	4.5	39	125	starboard	1.5	3.5	
6/7/2007	28	17:10	1:10	3907.54	7301.68	3904.59	7307.79	5.0	37	145	starboard	1	2.5	
6/7/2007	29	18:30	1:10	3904.34	7308.93	3900.40	7313.87	5.0	37	140	starboard	1	2	
6/7/2007	30	19:50	1:20	3859.99	7314.45	3854.15	7316.56	5.0	38	140	starboard	1	1	
6/7/2007	31	21:20	1:20	3853.76	7316.99	3851.08	7322.41	5.0	38	140	starboard	10	15	
6/7/2007	32	22:50	1:00	3851.10	7323.09	3851.14	7323.00	4.6	35	140	starboard	3	2	
6/8/2007	33	0:00	1:00	3851.14	7321.18	3850.77	2319.74	4.7	37	140	starboard	5	6	
6/8/2007	34	1:12	1:03	3850.62	7320.36	3850.46	7326.93	4.7	35	140	starboard	5	5.25	
6/8/2007	35	2:30	1:20	3850.54	7327.57	3850.05	7334.68	4.7	30	100	starboard	5	5	
6/8/2007	36	4:00	1:20	3850.62	7335.08	3850.81	7332.37	4.3	30	100	starboard	4.5	4.5	
6/8/2007	37	5:30	1:26	3850.79	7331.71	3850.63	7336.22	4.5	30	100	starboard	6	7	crew tossed fish
6/8/2007	38	7:05	1:14	3850.65	7336.22	3851.67	7332.21	4.7	31	100	starboard	5.5	4	sunny, morning fog
6/8/2007	39	8:27	1:13	3851.68	7332.06	3850.43	7335.54	4.5	31	100	starboard	3.75	4.5	
6/8/2007	40	9:47	1:13	3850.48	7335.81	3851.99	7333.46	4.7	30	100	starboard	4.75	4.5	

Appendix Table 7.3. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/8/2007	41	11:07	1:23	3852.09	7333.26	3850.22	7327.78	4.7	30	100	starboard	5.75	5.5	
6/8/2007	42	12:39	1:21	3850.28	7327.84	3850.21	7335.24	3.9	30	100	starboard	5	5.5	near elephant trunk area boudary
6/8/2007	43	14:09	1:21	3850.21	7335.54	3850.23	7338.12	4.4	30	100	starboard	5	5	
6/8/2007	44	15:40	1:22	3850.25	7337.58	3850.31	7329.50	4.9	30	100	starboard	6	5	
6/8/2007	45	17:17	1:18	3850.19	7329.23	3849.13	7329.20	4.1	30	115	starboard	5	5	
6/8/2007	46	18:42	1:00	3849.11	7329.15	3848.87	7323.54	4.5	35	125	starboard	3	3.5	
6/8/2007	47	19:53	0:50	3849.13	7323.07	3851.12	7319.40	4.5	39	135	starboard	9	7	
6/8/2007	48	20:53	1:00	3851.44	7318.87	3852.12	7319.50	4.5	37	125	starboard	12	1.5	
6/8/2007	49	22:05	0:45	3852.10	7320.15	3852.93	7322.30	4.5	34	125	starboard	3	1.5	
6/8/2007	50	21:05	0:40	3853.16	7321.82	3850.90	7326.72	4.5	34	125	starboard	5	5.5	
6/9/2007	51	0:35	1:15	3851.08	7326.52	3853.54	7320.48	4.3	33	125	starboard	4.5	5.6	
6/9/2007	52	2:00	1:00	3851.72	7319.96	3851.72	7318.25	4.3	38	125	starboard	8.5	9.5	
6/9/2007	53	3:10	1:10	3851.33	7317.67	3857.33	7319.04	4.3	38	125	starboard	9.5	11.5	
6/9/2007	54	4:30	1:24	3850.74	7320.14	3850.74	7326.76	4.8	34.5	125	starboard	3.5	3	
6/9/2007	55	6:05	1:02	3852.51	7326.54	3852.51	7321.56	4.8	34	125	starboard	5	5	
6/9/2007	56	7:15	1:10	3852.34	7321.28	3852.47	7315.28	4.8	40	125	starboard	shoveled	shoveled	seed shovled
6/9/2007	57	8:31	1:06	3853.28	7315.23	3854.00	7315.53	4.9	0.35	125	starboard	shoveled	shoveled	port side washed out, seed, shoveled
6/9/2007	58	10:00	1:11	3854.95	7318.83	3858.08	7318.42	4.9	36	125	starboard	shoveled	shoveled	lobster trap in starb. Side, some of last tow was still on deck
6/9/2007	59	11:20	1:10	3857.88	7318.48	3857.80	7317.15	4.9	35.5	125	starboard	2	3	crew kicked over fish
6/9/2007	60	12:40	1:09	3857.75	7317.32	3855.29	7321.94	4.9	33.5	125	starboard	4	3.75	hole on side of port dreedge, crew kicked fish
6/9/2007	61	14:11	0:24	3855.10	7322.15	3856.91	7321.92	nk	35	nk	starboard	1	1.5	haul back early to meet other boat to pick up eggs
6/9/2007	62	15:00	0:54	3856.92	7322.21	3856.68	7327.23	5.3	35	nk	starboard	3	4	
6/9/2007	63	16:00	1:10	3856.53	7327.34	3858.47	7330.71	4.0	27	nk	starboard	4	3.5	
6/9/2007	64	17:18	1:20	3858.21	7330.90	3900.54	7329.61	4.5	28	nk	starboard	1.5	2.5	
6/9/2007	65	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	
6/9/2007	66	20:15	1:00	3903.04	7329.43	3859.32	7332.25	4.6	29	90	starboard	2	3	
6/9/2007	67	21:25	1:20	3858.94	7332.63	3859.33	7333.01	4.6	24	90	starboard	3	3.5	
6/9/2007	68	22:55	1:20	3859.28	7333.04	3901.88	7330.55	4.5	29	90	starboard	4.5	3.5	
6/10/2007	69	0:30	1:10	3901.55	7329.78	3903.78	7329.78	4.5	30	90	starboard	3	3	
6/10/2007	70	1:47	0:53	3903.34	7330.19	3902.54	7327.42	4.6	30	100	starboard	3	3	
6/10/2007	71	2:50	0:50	3902.49	7327.00	3902.24	7322.43	4.5	30	100	starboard	2	2.5	
6/10/2007	72	3:47	1:03	3902.31	7322.00	3858.27	7321.93	4.3	32	110	starboard	3.5	2	
6/10/2007	73	4:55	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	welded shoes on both sides, set just port dredge
6/10/2007	74	6:00	1:01	3853.66	7322.63	3852.47	7317.56	4.7	31.8	110	starboard	4	6	new shoes
6/10/2007	75	7:10	0:40	3852.30	7317.50	3853.20	7316.40	4.8	39	110	starboard	6	10	small stuff
6/10/2007	76	nk	nk	nk	nk	3849.15	7322.31	4.9	39	110	starboard	nk	nk	dredges didn't fish the same
6/10/2007	77	9:23	1:03	3848.94	7322.83	3845.88	7327.69	4.8	36	110	starboard	1.75	3.5	cap using 3:1+10
6/10/2007	78	10:34	1:13	3845.62	7327.99	3848.18	7323.56	4.5	37	110	starboard	0.75	1	
6/10/2007	79	12:21	0:37	3844.66	7327.71	3842.03	7328.17	4.7	39		starboard	15	25	loading up on seed, deck loaded
6/10/2007	80	13:08	0:44	3842.00	7328.47	3841.98	7328.20	4.4	39	140-port, 125-star	starboard	DL	DL	loading up on seed, put more wire on port, seemed to work

Appendix Table 7.4. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/10/2007	81	14:00	0:26	3841.92	7328.40	3843.18	7328.33	4.8	38	140/125	starboard	DL	DL	short tow , loading up on small stuff, deck loaded
6/10/2007	82	14:57	0:53	3846.29	7328.62	3850.18	7328.95	4.8	36	140/125	starboard	3.5	3	going for bigger stuff to bring count up
6/10/2007	83	15:56	1:10	3850.28	7329.16	3850.66	7335.43	4.8	30	140/125	starboard	3	3	
6/10/2007	84	17:12	1:28	3850.61	7335.51	3850.25	7326.99	4.2	30	140/125	starboard	6	6	
6/10/2007	85	18:47	1:33	3850.25	7326.86	3851.69	7325.06	4.3	36	125/110	starboard	6	6	
6/10/2007	86	20:30	1:20	3851.69	7325.06	3851.14	7326.18	4.5	33/36	125/110	starboard	nk	nk	
6/10/2007	87	22:05	1:15	3851.21	7326.00	3851.44	7325.48	4.5	33/36	125/110	starboard	5	5	
6/10/2007	88	23:35	1:20	3851.46	7325.55	3851.09	7326.55	4.5	33/36	125/110	starboard	4.5	5	
6/11/2007	89	1:25	1:20	3851.08	7326.28	3850.42	7327.49	4.1	34	110	starboard	5	6	
6/11/2007	90	3:00	1:45	3850.40	7327.54	3851.74	7324.91	4.3	34	110	starboard	5	5	
6/11/2007	91	4:55	1:35	3851.93	7324.47	3847.74	7328.04	4.2	33	110	starboard	5	7	
6/11/2007	92	7:02	0:28	3843.06	7328.16	3842.83	7327.89	4.3	37	110	starboard	DL	DL	loading up on small stuff
6/11/2007	93	7:37	0:28	3842.86	7327.89	3842.87	7328.31	4.3	36.5	110	starboard	DL	DL	loading up on small stuff
6/11/2007	94	8:54	1:01	3849.83	7327.44	3852.59	7322.74	4.2	35	110	starboard	3	4	bigger stuff
6/11/2007	95	10:04	0:56	3852.59	7322.68	3853.67	7325.81	4.5	31	110	starboard	3	4	
6/11/2007	96	11:07	0:58	3853.63	7325.93	3855.32	7326.42	4.6	31	110	starboard	1	3	port side did not fish right
6/11/2007	97	12:13	1:27	3855.33	7326.49	3850.38	7329.06	4.7	34	110	starboard	4	6	
6/11/2007	98	13:53	1:23	3850.38	7329.12	3856.26	7328.88	4.9	30	110	starboard	3	3	
6/11/2007	99	15:21	1:34	3856.28	7328.81	3849.11	7329.26	5.4	35	110	starboard	7	5.5	
6/11/2007	100	17:01	1:34	3849.07	7329.28	3853.61	7328.61	nk	35/30	110	starboard	4.5	5	
6/11/2007	101	18:46	1:34	3855.64	7328.49	3849.17	7329.34	4.2	30/35	110	starboard	5	5	
6/11/2007	102	20:27	1:33	3849.02	7329.28	3849.00	7328.86	4.5	35	110	starboard	5	5	
6/11/2007	103	22:10	1:00	3848..46	7328.86	3844.54	7329.01	4.5	35	110	starboard	3	3	
6/11/2007	104	23:30	0:15	3843.01	7328.80	3842.03	7328.07	4.2	38	140/125	starboard	27	30	30/40 count
6/12/2007	105	0:30	1:05	3844.00	7328.93	3849.48	7328.93	4.5	38/34	140/125	starboard	3	3	
6/12/2007	106	1:50	0:45	3849.86	7328.67	3850.40	7327.41	4.3	33	115	starboard	3.5	3	
6/12/2007	107	2:45	1:20	3850.19	73277.77	3854.34	7328.39	4.5	34	115	starboard	5.5	4.5	
6/12/2007	108	4:20	1:15	3855.30	nk	3849.15	7329.37	4.5			starboard	5	5	
6/12/2007	109	5:41	1:04	3849.08	7329.31	3851.29	7329.95	4.5	35/30		starboard	3.5	4	
6/12/2007	110	6:52	1:25	3851.29	7329.99	3850.18	7329.14	4.5	30		starboard	5	4.5	
6/12/2007	111	8:25	1:41	3850.13	7329.05	3850.46	73332.17	4.3	30	90/100	starboard	5	2	TURTLE IN PORT SIDE DREDGE (see notes)
6/12/2007	112	nk	nk	nk	nk	3845.21	7328.95	4.7	35	90/100	starboard	5.5	4.5	
6/12/2007	113	11:52	0:38	3844.94	7328.94	3841.92	7329.07	4.7	36.5	90/100	starboard	DL	DL	
6/12/2007	114	12:40	0:45	3841.94	7329.09	3844.68	7329.49	4.4	36.5	120W/140D	starboard	2.5	2	starting to breeze up
6/12/2007	115	13:31	1:00	3844.78	7329.53	3848.13	7329.38	4.5	36.6		starboard	2	4.25	port side did not fish right
6/12/2007	116	14:42	0:48	3847.56	7329.46	3844.00	7329.91	4.4	35/36.5		starboard	3	3	
6/12/2007	117	15:40	0:29	3843.89	7328.99	3841.97	7328.28	4.4	35/36.5		starboard	DL	DL	smaller stuff
6/12/2007	118	16:15	0:30	3841.97	7328.29	3842.40	7328.18	4.4	39		starboard	DL	DL	smaller stuff
6/12/2007	119	16:56	1:14	3842.37	7328.34	3847.85	7328.45	5.2	39		starboard	4	4.5	bigger stuff
6/12/2007	120	18:14	1:31	3847.98	7328.55	3851.44	7334.46	4.6	36		starboard	nk	nk	

Appendix Table 7.5. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/12/2007	121	19:59	0:28	3851.00	7334.00	3851.96	7337.80	4.5	33/30	100	starboard	6	7.5	
6/12/2007	122	20:35	nk	3851.96	7337.80	nk	nk	4.2	29/25	75	starboard	2.5	1.5	
6/12/2007	123	22:00	1:10	3851.24	7333.93	3849.99	7328.50	4.4	30	100	starboard	DL	DL	
6/12/2007	124	23:20	1:25	3849.99	7328.61	3851.73	7335.96	4.5	30/34	100/110	starboard	4	3.5	
6/13/2007	125	0:55	1:30	3851.39	7376.76	3852.51	7334.49	4.0	27	90/80	starboard	3.5	3.75	
6/13/2007	126	2:35	1:25	3852.23	7335.11	3853.14	7330.85	4.6	30	100/90	starboard	4.5	4.5	
6/13/2007	127	4:10	1:39	3853.26	7330.39	3852.01	7328.81	4.5	33/34	100/90	starboard	5	6	getting sloppy
6/13/2007	128	5:58	1:15	3851.73	7328.84	3845.98	7328.80	4.6	37	110/100	starboard	4.5	4	smalls
6/13/2007	129	7:20	0:50	3845.71	7328.86	3841.82	7328.23	4.6	37/39		starboard	DL	DL	smalls
6/13/2007	130	8:17	0:43	3841.76	7328.33	3841.34	7328.55	5	38		starboard	DL	DL	
6/13/2007	131	9:04	1:00	3841.30	7328.59	3844.40	7328.90	4.5	36		starboard	1.5	1.5	
6/13/2007	132	10:09	1:24	3844.41	7328.98	3849.42	7328.93	nk	36.6		starboard	3	3	little rougher
6/13/2007	133	11:38	1:37	3849.35	7329.11	3854.55	7330.00	4.3	34		starboard	3	3	
6/13/2007	134	13:21	1:24	3854.43	7330.39	3849.76	7328.93	4.4	33		starboard	nk	nk	
6/13/2007	135	15:05	1:17	3849.48	7329.15	3843.79	7328.35	4	34		starboard	2	2	
6/13/2007	136	16:30	nk	3843.69	7328.51	nk	nk	nk	39	140/120	starboard	DL	0	starb didn't fish
6/13/2007	137	nk	nk	nk	nk	3841.93	7328.06	4.8	40	140/120	starboard	DL	0	starb didn't fish, sweep was off, fixed and tried with shorter wire
6/13/2007	138	17:45	0:32	3841.69	7328.43	3842.06	7328.62	4.8	39	125	starboard	DL	DL	much better tow
6/13/2007	139	18:25	nk	3841.97	7328.91	nk	nk	nk	nk		starboard	DL	DL	
6/13/2007	140	19:15	nk	3855.51	7328.23	3853.48	7328.24	4	28/33	90/100	starboard	3.5	4	heading to buttons
6/13/2007	141	23:05	nk	3853.39	7328.29	nk	nk	nk	32	110/100	starboard	nk	nk	sloppy weather, off watch crew did not record
6/14/2007	142	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	sloppy weather, off watch crew did not record
6/14/2007	143	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	sloppy weather, off watch crew did not record
6/14/2007	144	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	sloppy weather, off watch crew did not record
6/14/2007	145	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	sloppy weather, off watch crew did not record
6/14/2007	146	5:10	1:31	nk	nk	3902.65	7330.08	3	28	110/100	starboard	0.5	1	sloppy weather, off watch crew did not record
6/14/2007	147	6:48	0:39	3902.53	7332.13	3900.42	7330.37	4	28	75	starboard	1	0.5	club stick was hung on port, and doubled dipped
6/14/2007	148	7:38	1:22	3900.63	7331.37	3900.63	7331.37	4.2	27	75	starboard	4	4	towing fair wind, shorter wire
6/14/2007	149	9:08	1:35	3901.04	7330.93	3901.04	7330.93	4.2	27	75	starboard	4.5	3.5	better tow
6/14/2007	150	10:51	1:34	3900.82	7331.15	3901.20	7330.71	4.4	27.5	75	starboard	nk	nk	
6/14/2007	151	13:31	0:30	3901.12	7330.84	3901.32	7330.51	4.4	27	75	starboard	5	4	
6/14/2007	152	14:12	1:46	3901.17	7330.72	3854.15	7330.44	4.4	28/30	90	starboard	5	4.5	
6/14/2007	153	16:03	1:24	3854.12	7330.58	3849.48	7329.14	4.5	29/34	90	starboard	3	2.5	
6/14/2007	154	17:34	1:02	3849.39	7329.25	3845.30	7329.28	4.3	34/38	115	starboard	1.5	2.5	sun, calming down
6/14/2007	155	19:36	0:09	3845.30	7328.41	38481.83	7328.75	4.2	38/39	125	starboard	1.5	2	
6/14/2007	156	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	DL	DL	
6/14/2007	157	10:15	1:15	3841.74	7328.47	nk	nk	nk	nk	nk	starboard	DL	DL	
6/14/2007	158	11:40	1:25	3846.88	7327.98	3851.97	7327.98	4.5	31/38	100/125	starboard	5	4.5	
6/14/2007	159	2:25	1:45	3846.68	7328.49	3852.50	7328.49	4.7	31/35	100/90	starboard	4.5	6	
6/14/2007	160	4:25	1:25	3853.04	7329.12	3849.40	7329.12	5	32	100/90	starboard	4	6	

Appendix Table 7.6. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/14/2007	161	6:00	1:35	3849.54	7329.17	3852.39	7328.64	4.5	33	100/90	starboard	nk	nk	turtle chains were overlapping sweep
6/14/2007	162	7:50	1:23	3851.44	7328.82	3848.08	7329.20	4.8	33	100/90	starboard	3	3.5	tightened the turtle chains
6/14/2007	163	9:17	1:09	3848.08	7329.23	3842.72	7328.38	5.7	36	100/90	starboard	2.5	3.5	
6/14/2007	164	10:30	0:30	3842.73	7328.43	3842.53	7328.06	nk	39	nk	starboard	DL	DL	small stuff
6/14/2007	165	11:07	0:39	3842.51	7328.08	3843.11	7327.36	4.8	39	nk	starboard	DL	DL	
6/14/2007	166	11:52	0:48	3843.07	7327.43	3842.94	7328.10	4.8	38/36	nk	starboard	0.5	2.5	not much here
6/14/2007	167	12:47	0:43	3842.75	7328.24	3842.43	7378.61	4.8	36	nk	starboard	DL	DL	small stuff
6/14/2007	168	13:37	1:10	3842.34	7328.67	3847.30	7328.70	4.8	36	135	starboard	3.5	4	lots of cut shells
6/14/2007	169	14:47	1:06	3850.79	7327.02	3850.77	7327.09	5	35	nk	starboard	6	5.5	lots of coal
6/14/2007	170	16:45	1:15	3850.50	7327.63	3848.51	7328.23	5	34	nk	starboard	2.25	4	
6/14/2007	171	18:09	2:06	3848.65	7328.23	3847.38	7328.67	4.5	37	140/130	starboard	3	4	
6/14/2007	172	20:25	1:15	3846.88	7328.91	3849.71	7327.46	4.3	35/37	125/135	starboard	3	3	
6/14/2007	173	21:45	1:00	3849.66	7327.46	3849.50	7327.47	4.2	35	125	starboard	3	3.5	
6/14/2007	174	22:55	1:05	3849.51	7327.42	3852.42	7323.13	4	33	115	starboard	1.5	2	
6/15/2007	175	0:20	0:40	3852.42	7323.13	3850.90	7326.17	4	33	115	starboard	2	2	
6/15/2007	176	1:10	0:50	3850.90	7326.17	3851.21	7305.98	4.1	34	115	starboard	3	3	
6/15/2007	177	2:08	0:47	3851.12	7326.00	3848.60	7328.33	4.2	34	115	starboard	2	2	
6/15/2007	178	3:05	0:45	3848.62	7328.33	3845.01	7327.85	4.5	34/36	115	starboard	2	2	
6/15/2007	179	4:10	0:25	3844.00	7327.85	3840.92	7327.97	4.4	37/38	125	starboard	20	20	
6/15/2007	180	5:00	nk	3841.60	7327.96	nk	nk	nk	nk	nk	starboard	nk	nk	steamed 10 min to small stuff
6/15/2007	181	5:40	1:05	3845.57	7328.15	3850.65	7327.02	4.6	36	115	starboard	3	3	
6/15/2007	182	7:48	0:07	nk	7327.11	3849.92	7327.11	4.8	36	115	starboard	2	2	
6/15/2007	183	8:01	1:02	3849.90	7327.17	3851.07	7327.15	5.2	37/31	115	starboard	3	3	
6/15/2007	184	9:10	1:05	3851.15	7327.14	3848.77	7327.85	nk	36.6	115	starboard	3	3	
6/15/2007	185	10:29	1:08	3849.04	7327.79	3848.06	7327.44	5 to 3	36.5/35	115	starboard	4	4	
6/15/2007	186	11:43	1:17	3848.05	7327.41	3847.83	7327.99	4.8	35	115	starboard	4	4.5	
6/15/2007	187	13:07	1:21	3847.66	7328.01	3847.09	7327.98	4.8	35/37	140	starboard	5	3.5	
6/15/2007	188	14:37	0:38	3846.89	7328.14	3843.74	7327.99	5.7	36/38.8	140	starboard	1.5	1.5	
6/15/2007	189	15:18	0:25	3843.65	7328.03	3841.89	7328.12	5.2	39	140	starboard	DL	DL	
6/15/2007	190	15:51	0:12	3841.83	7328.14	3842.69	7329.14	5	39	140	starboard	DL	DL	
6/15/2007	191	16:11	1:24	3842.93	7327.99	3849.60	7326.76	4.5	37	115	starboard	nk	nk	
6/15/2007	192	17:50	nk	3849.97	7326.79	nk	nk	4.4	37	115	starboard	nk	nk	
6/15/2007	193	18:45	0:45	3849.87	7326.49	3849.92	7326.81	4.5	38	115	starboard	3	2.5	
6/15/2007	194	19:37	0:44	3849.98	7326.77	3850.08	7326.41	nk	38	115	starboard	2.5	2.5	
6/15/2007	195	20:25	0:37	3850.13	7326.40	3851.25	7324.08	4.5	38	115	starboard	3	2.75	
6/15/2007	196	21:15	0:50	3851.24	7324.10	3851.47	7324.15	4.5	31/35	105	starboard	4	3.25	
6/15/2007	197	22:15	0:55	3851.42	7324.27	3851.50	7323.85	4.5	37/31	115	starboard	4	3.25	
6/15/2007	198	0:00	1:30	3851.20	7324.50	3851.35	7323.76	4.5	37/31	115	starboard	2.5	3.5	
6/16/2007	199	1:40	1:05	3851.34	7323.37	3851.67	7324.07	4.4	37/31	115	starboard	4	3	
6/16/2007	200	2:55	1:00	3851.50	7324.06	3851.27	7324.12	4.6	37/31	115	starboard	3.5	4.5	

Appendix Table 7.7. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/16/2007	201	4:00	1:00	3851.21	7324.24	3851.16	7325.13	4.8	35/31	115	starboard	4	4	
6/16/2007	202	5:15	1:00	3851.48	7324.17	3847.99	7327.02	5.2	36	115	starboard	3	3	
6/16/2007	203	6:22	0:47	3847.91	7327.00	3844.20	7327.61	4.9	36	115	starboard	1.5	1.5	
6/16/2007	204	7:15	0:33	3844.21	7327.59	3841.88	7328.14	3.5	39	115	starboard	DL	DL	lobster pot in starb.
6/16/2007	205	7:58	0:43	nk	nk	3843.00	7327.85	3.6	38	115	starboard	0	0	tow no good, no catch in area
6/16/2007	206	8:47	0:19	3842.86	7327.85	3841.41	7328.21	3.6	38	100	starboard	DL	DL	big load of small stuff
6/16/2007	207	10:10	1:05	3849.22	7326.65	3851.98	7323.58	4.1	37/35	100	starboard	3	2	turtle chain on port is busted
6/16/2007	208	11:23	0:53	3851.93	7323.48	3851.81	7324.68	4	35/34	100	starboard	2	2	
6/10/2007	209	12:21	0:54	3851.82	7324.64	3852.49	7322.41	4.5	34	100	starboard	1.5	2.5	
6/10/2007	210	13:21	0:39	3852.50	7322.36	3851.38	7324.24	4.5	34/36	100	starboard	2	2	
6/10/2007	211	14:06	0:59	3851.37	7324.45	3851.09	7327.29	4.5	36	100	starboard	3	3	
6/10/2007	212	15:14	1:20	3851.06	7327.19	3851.67	7326.17	4.3	30/32	100	starboard	4	3.5	
6/10/2007	213	16:41	1:31	3851.76	7326.00	3851.48	7325.85	4.5	32	100/110	starboard	5.75	5.5	
6/10/2007	214	18:20	1:28	3851.48	7325.86	3851.04	7326.37	4.3	34	100/110	starboard	5	5	
6/10/2007	215	19:54	1:26	3851.12	7326.09	3849.86	7328.62	4.6	34	100/110	starboard	5	5	
6/10/2007	216	21:30	nk	3849.88	7328.54	nk	nk	nk	nk	nk	starboard	nk		
6/10/2007	217	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	off watch, crew did not record
6/10/2007	218	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	off watch, crew did not record
6/10/2007	219	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	off watch, crew did not record
6/10/2007	220	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	off watch, crew did not record
6/10/2007	221	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	off watch, crew did not record
6/10/2007	222	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	nk	nk	off watch, crew did not record
6/10/2007	223	nk	nk	nk	nk	3844.33	7327.86	4.7	36	nk	starboard	3	3	no time to count, clear deck for smalls
6/10/2007	224	7:00	0:15	3842.76	7327.86	3842.76	7328.06	3.5	38	125/140	starboard	DL	DL	fill up on smalls
6/10/2007	225	7:48	1:02	3841.88	7322.69	3850.68	7327.04	5.3	36		starboard	3	3	fill up on smalls
6/10/2007	226	9:00	1:30	3850.91	7326.47	3851.24	7325.03	4.6	34/33	110/100	starboard	5	6.5	fill up on smalls
6/10/2007	227	10:37	1:28	3851.50	7324.56	3850.99	7325.66	4.4	34/35	110/100	starboard	5	4.5	
6/10/2007	228	12:16	1:14	3851.21	7324.99	3850.25	7327.32	4.5	35/33	110/100	starboard	5	4	
6/10/2007	229	1:43	13:27	3850.48	7326.88	3845.90	7327.52	4.4	35/33	110/100	starboard	5	5	
6/10/2007	230	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	DL	DL	loading up on small stuff for to head back north with
6/10/2007	231	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	DL	DL	loading up on small stuff for to head back north with
6/10/2007	232	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	DL	DL	loading up on small stuff for to head back north with
6/10/2007	233	17:29	1:18	3847.17	7326.79	3852.00	7324.71	nk	33		starboard	nk	nk	loading up on small stuff for to head back north with
6/10/2007	234	18:51	1:19	3852.17	7324.69	3858.13	7323.07	4.6	34	100	starboard	5	4	towing as we head north
6/10/2007	235	20:20	1:10	3858.27	7323.11	3902.98	7319.36	4.6	34	100	starboard	3.5	3.5	
6/10/2007	236	21:40	0:40	3903.26	7319.14	3907.02	7315.30	4.6	34	100	starboard	5	5	
6/10/2007	237	22:50	1:15	3907.31	7315.05	3912.06	7313.42	4.5	33	100	starboard	4	4	
6/19/2007	238	0:15	1:20	3912.55	7313.31	3910.09	7313.36	4	33	100	starboard	4	5	
6/19/2007	239	1:40	1:30	3910.96	7313.39	39117.76	7314.00	4.2	33	110/100	starboard	5	7	
6/19/2007	240	3:20	1:30	3911.77	7313.87	3913.54	7313.30	4.2	33	110/100	starboard	5	6.5	

Appendix Table 7.8. Bridge Data Log F/V Friendship 2007-2

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
6/19/2007	241	5:00	1:18	0.00	7313.52	3915.34	7313.52	5.1	33	100/100	starboard	nk	nk	
6/19/2007	242	6:25	1:00	3913.12	7312.69	3919.68	7312.69	nk	34	110/100	starboard	nk	nk	
6/19/2007	243	7:37	nk	3919.68	7309.73	nk	nk	nk	nk	nk	starboard	4	4	
6/19/2007	244	nk	nk	nk	nk	nk	nk	nk	nk	nk	starboard	3	3	
6/19/2007	245	nk	nk	nk	nk	3927.52	7256.30	nk	34	nk	starboard	nk	nk	
6/19/2007	246	11:07	nk	3927.54	72544.00	nk	nk	nk	nk	nk	starboard	nk	nk	last tow

Appendix Table 8.1. Bridge Data Log F/V Friendship 2007-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out (fathoms)		Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Starboard	Port	Stbd	Comments
6/27/2007	1	6:05	50	3929.03	7257.21	3927	7300	4.3	34.6	100	100	2	2	Experimental Dredge on stbd side until tow #89
6/27/2007	2	7:00	60	3926.27	7300.79	3923.06	7303.81	4.2	33.5	100	100	5	5	
6/27/2007	3	8:15	30	3921.97	7304.71	3920.89	7305.75	4.8	34.5	100	100	0.75	1.75	
6/27/2007	4	9:00	60	3920.31	7305.95	3917.40	7309.87	4.4	32.7	100	100	4	3	
6/27/2007	5	10:10	75	3917.17	7310.27	3911.84	7313.54	4.6	32.5	100	110	5	5	
6/27/2007	6	11:35	85	3912.10	7313.52	3912.23	7313.99	4.3	33	95	110	5.5	6	see logsheets for lat/long on turnaround tow
6/27/2007	7	13:05	70	3911.81	7314.10	3912.78	7313.45	4.4	33.5	95	110	2.5	3	
6/27/2007	8	14:25	65	3913.27	7313.33	3914.54	7313.70	4.6	33	95	110	3	4	
6/27/2007	9	15:45	59	3914.88	7313.50	3918.38	7309.75	4.6	33	100	110	3.5	3	
6/27/2007	10	16:52	38	3918.78	7309.22	3920.66	7306.74	4.2	33	100	110	1	1	
6/27/2007	11	17:45	30	3921.28	7305.88	3922.99	7303.97	4.4	33	100	110	2	1.5	
6/27/2007	12	18:26	39	3923.34	7303.62	3925.80	7301.37	4.6	33	100	110	2	1.5	
6/27/2007	13	19:15	75	3925.76	7301.43	3924.82	7306.90	4.0	34	110	110	4.5	4	
6/27/2007	14	20:40	60	3924.82	7306.90	3924.30	7311.16	4.0	33	90	100	2.5	3.5	
6/27/2007	15	21:50	80	3924.68	7310.90	3922.32	7311.48	3.5	30	100	100	1.5	1.5	
6/27/2007	16	23:20	65	3922.49	7310.96	3924.35	7306.30	4.3	33	120	120	3.5	3	
6/27/2007	17	0:35	90	3924.60	7305.54	3922.00	7308.66	4.2	32	110	100	2	2.5	
6/27/2007	18	2:15	75	3922.30	7308.08	3919.41	7312.14	4.5	33	100	90	3	3	
6/27/2007	19	3:40	80	3919.60	7311.58	3917.08	7312.94	4.6	33	100	100	3	3.5	
6/27/2007	20	5:06	79	3917.24	7312.37	3913.46	7313.27	4.5	34	90	100	5.3	2	Twine top was hung up on starboard
6/27/2007	21	6:30	60	3913.92	7313.00	3913.06	7313.46	4.4	32	95	110			
6/28/2007	22	8:00	60	3910.33	7317.58	3910.33	7317.56	4.3	31	90	100	2.5	2	Possible turn around tow
6/28/2007	23	9:07	63	3910.67	7317.37	3909.58	7320.15	4.6	30	90	100	2.5	2	
6/28/2007	24	10:20	80	3908.33	7320.16	3903.19	7319.20	4.6	33	90	100	3.5	4.5	
6/28/2007	25	11:47	58	3903.46	7319.22	3900.59	7316.87	4.2	35	115	110	3	3	
6/28/2007	26	13:05	50	3900.69	7316.11	3958.92	7311.63	4.8	37	120	110	1	1	
6/28/2007	27	14:07	23	3958.74	7311.34	3957.24	7312.76	4.7	35	110	100	1	1	
6/28/2007	28	14:37	18	3956.98	7312.99	3955.94	7314.15	4.6	35	110	100	0.75	0.5	
6/28/2007	29	15:05	20	3955.68	7314.50	3854.66	7315.72	4.6	36	110	100	0.5	0.5	
6/28/2007	30	15:37	18	3854.47	7316.02	3853.26	7316.52	4.6	37			2.5	3	
6/28/2007	31	16:05	35	3853.25	7316.55	3853.05	7316.42	4.6	42	130	135	0	0	Dredges crossed
6/28/2007	32	16:55	60	3853.33	7316.44	3853.17	7316.75	4.6	42	130	135	0.5	4.5	
6/28/2007	33	18:05	65	3853.65	7315.94	3851.60	7318.31	4.2	40	125	135	0.5	1	
6/28/2007	34	19:25	30	3852.30	7317.33	3850.93	7320.32	4.2	39	140	135	25	23	
6/28/2007	35	22:05	40	3842.11	7328.16	3842.45	7327.86	4.3	38	140	125	30	25	
6/28/2007	36	22:55	60	3841.92	7327.98	3842.24	7327.97	4.3	38			25	20	
6/29/2007	37	0:05	80	3842.75	7327.96	3848.63	7326.87	4.6	37	120	110	1.75	3	
6/29/2007	38	1:35	85	3845.21	7326.75	3855.04	7324.93	4.7	34	110	100	2.5	3	
6/29/2007	39	3:10	65	3855.59	7324.80	3858.64	7327.67	4.6	30	90	90	1.5	2	
6/29/2007	40	4:23	60	3858.92	7327.43	3901.94	7323.61	4.6	30	90	90	3	2.5	

Appendix Table 8.2. Bridge Data Log F/V Friendship 2007-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out (fathoms)		Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Starboard	Port	Stbd	Comments
6/29/2007	41	5:30	65	3902.17	7323.24	3905.87	7320.29	4.6	30	90	90	2.5	2.5	On port side, clubstick caught in bag
6/29/2007	42	7:00	100	3905.87	7320.12	3909.40	7321.09	4.3	33	90	100	3.75	3.5	
6/29/2007	43	8:55	70	3909.29	7320.87	3904.19	7320.34	4.5	32	90	100	4.5	4	
6/29/2007	44	10:15	65	3903.44	7320.72	3900.13	7324.99	4.2	30			3.5	3	
6/29/2007	45	12:50	30	3859.64	7325.30	3854.47	7328.46	4.5	30					
6/29/2007	46	14:23	14	3842.58	7328.21	3841.68	7327.95	4.4	38	130	125	12	16	
6/29/2007	47	14:55	55	3842.58	7328.21	3841.54	7327.91	3.8	38	130	125	10	15	Hole in bag near lower corner on starboard
6/29/2007	48	16:05	25	3841.77	7328.26	3841.96	7328.30	4.5	38	140	125	15	25	
6/29/2007	49	16:45	25	3841.84	7328.44	3842.17	7328.44	4.3	38	140	130	20	20	
6/29/2007	50	18:05	35	3847.64	7328.32	3847.64	7328.32	4.5	36	125	125	5	7	
6/29/2007	51	19:40	55	3853.04	7327.98	3857.24	7327.65	4.6	31	100	100	3	3	
6/29/2007	52	20:43	62	3857.56	7327.63	3902.17	7326.81	4.5	30	90	100	3.75	4	
6/29/2007	53	21:53	32	3902.50	7326.71	3904.23	7325.69	4.2	30	90	100	2	2	
6/29/2007	54	22:31	34	3904.40	7325.53	3906.42	7323.72	4.2	30	90	100			
6/29/2007	55	23:17	43	3906.63	7323.23	3907.92	7320.88	4.3	30	90	100	4	4	
6/30/2007	56	0:20	65	3907.88	7320.86	3903.82	7324.22	4.5	31	90	100	5.5	5	
6/30/2007	57	1:35	60	3903.48	7324.51	3859.78	7326.51	4.2	30	90	100	4	3.5	
6/30/2007	58	2:45	60	3859.41	7326.70	3855.17	7328.48	4.0	32	90	100	4	3.5	
6/30/2007	59	3:55	85	3854.73	7328.55	3849.52	7328.33	4.0	35			3.5	4	
6/30/2007	60	5:30	65	3849.90	7328.38	3854.31	7328.36	4.2	35	90	100	2.5	2.5	
6/30/2007	61	6:45	60	3854.23	7328.38	3850.22	7329.03	4.1	30	90	100			
6/30/2007	62	7:55	51	3849.86	7329.12	3846.17	7328.94	4.3	36	125	120	2	4	
6/30/2007	63	9:15	10	3842.58	7328.55	3841.80	7328.23	4.2	39	140	125	10	10.5	
6/30/2007	64	9:37	28	3841.99	7328.40	3841.67	7328.30	4.3	39	140	125	15	15	
6/30/2007	65	10:20	10	3841.84	7328.19	3842.69	7327.76	4.4	38	140	125	30	30	Loaded up on small stuff
6/30/2007	66	11:00	45	3846.79	7328.49	3850.20	7328.89	4.5	36	115	115	2.5	2	
6/30/2007	67	11:55	80	3850.49	7328.85	3856.50	7328.41	4.5	33	90	90	3	4.25	
6/30/2007	68	13:30	60	3856.87	7328.45	3859.00	7328.51	4.5	29	90	90	3	2.5	
6/30/2007	69	14:40	40	3900.87	7328.50	3903.80	7324.65	4.5	30	90	90	3.5	3.5	
6/30/2007	70	15:30	65	3904.18	7324.49	3907.67	7321.24	4.2	30	90	100	3.5	4	
6/30/2007	71	16:45	60	3907.60	7321.28	3904.50	7324.63	4.1	31	90	100	6	5.5	
6/30/2007	72	17:55	60	3904.18	7324.82	3900.50	7326.88	4.6	30	90	100	3.25	2.75	
6/30/2007	73	19:07	63	3900.13	7327.02	3856.00	7328.43	4.5	29	90	100	3.5	3.5	
6/30/2007	74	20:20	70	3855.56	7328.57	3850.64	7329.85	4.5	30	90	100	3.5	3.5	
6/30/2007	75	21:40	50	3850.25	7329.60	3842.85	7327.74	4.6	38	120	125			
7/1/2007	76	0:05	85	3847.56	7327.85	3850.52	7328.16	4.6	35	120	110	2.75	2.75	
7/1/2007	77	1:40	60	3850.88	7328.15	3855.26	7328.32	4.5	29	100	90	4.5	5	
7/1/2007	78	2:47	60	3855.62	7328.27	3859.72	7327.00	4.3	30	100	90	3	3	
7/1/2007	79	3:56	60	3859.94	7326.90	3903.43	7324.79	4.3	30	100	90	2	2.5	
7/1/2007	80	5:08	52	3903.69	7324.62	3906.95	7322.41	4.3	30	110	90	3	3	

Appendix Table 8.3. Bridge Data Log F/V Friendship 2007-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out (fathoms)		Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Starboard	Port	Stbd	Comments
7/1/2007	81	6:10	30	3907.22	7322.18	3907.82	7323.65	4.3	30	90	100	2.25	2.25	
7/1/2007	82	6:47	43	3907.57	7323.96	3905.55	7325.87	4.2	29	90	100	2.5	2.5	
7/1/2007	83	7:37	68	3905.55	7325.87	3908.25	7322.86	4.6	30	90	100	3	3.5	
7/1/2007	84	8:55	70	3907.84	7322.73	3903.33	7326.18	4.5	30	90	100	3.5	3	
7/1/2007	85	10:15	60	3903.25	7326.36	3859.12	7327.35	4.1	29	90	100	2.5	3.5	
7/1/2007	86	11:25	65	3858.61	7327.60	3854.41	7329.50	4.6	30	90	100	2.5	3	
7/1/2007	87	12:40	60	3853.93	7329.58	3853.90	7329.46	4.4	35	125	135	2	2.5	
7/1/2007	88	13:50	45	3849.07	7329.02	3845.83	7328.46	4.4	39	140	125	2.5	3	
7/1/2007	89	14:55	20	3843.20	7327.86	3941.72	7328.20	4.3	40	125	140	25	35	Switched turtle dredge (drag+gear) to port side after this tow
7/1/2007	90	15:50	55	3940.96	7328.31									
7/1/2007	91	17:15	60	3847.88	7328.15	3851.67	7327.73	4.5	36	125	125	3	1.75	First sampling tow with Exp. Dredge on port
7/1/2007	92	18:25	60	3851.64	7327.60	3856.27	7327.67	4.4	35	100	100	3.25	3	
7/1/2007	93	19:35	60	3856.72	7327.70	3900.65	7326.08	4.2	29	100	100	3	3	
7/1/2007	94	20:45	45	3900.92	7325.95	3903.84	7323.84	4.2	29	100	100	3	3.5	
7/1/2007	95	21:40	55	3904.10	7323.57	3907.32	7320.84	4.2	29	100	100	3	4.5	
7/1/2007	96	22:45	60	3907.69	7320.57	3907.35	7320.93	4.2	29	100	100	3.25	4	
7/1/2007	97	23:55								100	100			
7/2/2007	98	1:00	60	3908.15	7321.95	3904.42	7324.79	4.5	30	100	90	4.75	3.5	
7/2/2007	99	2:10	60	3904.21	7324.97	3901.00	7327.88	4.8	30	110	95	4	3	
7/2/2007	100	3:20	60	3900.57	7328.21	3856.33	7328.59	4.2	29	110	95	4	4	
7/2/2007	101	4:30	60	3855.77	7328.61	3850.86	7328.41	4.2	30	110	95	3.5	3	
7/2/2007	102	5:40	70	3850.78	7328.39	3844.24	7328.43	4.5	38	140	140	30	25	Exp dredge caught more on this tow loading up
7/2/2007	103	7:00		3844.00	7328.40									
7/2/2007	104	9:50		3846.90	7328.77	3849.97	7328.41	4.5	34	125	125	2.5	2.5	
7/2/2007	105	13:20		3859.58	7326.87			4.3	31					
7/2/2007	106	17:10	60	3903.50	7325.13	3859.93	7327.83	4.1	30	90	100	2.5	2.5	
7/2/2007	107	18:18	67	3859.52	7328.01	3854.93	7328.56	4.3	31	90	100	3.5	3	
7/2/2007	108	19:35	60	3854.51	7328.55	3851.69	7328.54		35	90	100	2.5	2	
7/2/2007	109	20:45		3851.63	7328.58									
7/2/2007	110													
7/3/2007	111	23:40	50	3846.11	7328.42	3849.85	7328.80	4.5	36	125	125	2.75	2.75	
7/3/2007	112	0:50	50	3850.19	7328.81	3854.47	7329.12	4.6	30	100	100	4	3	
7/3/2007	113	1:50	55	3854.74	7329.13	3858.33	7329.36	4.4	30	90	100	2.5	2.5	
7/3/2007	114	2:55	40	3858.45	7329.36	3859.99	7329.37	4.4	27	75	75	2	2	
7/3/2007	115	3:42	43	3900.40	7329.53	3903.33	7330.60	4.5	27	75	75	2.5	2	
7/3/2007	116	4:40	35	3903.66	7330.38	3904.00	7328.10	4.4	28	75	75	2	2.5	
7/3/2007	117	5:30	30	3903.96	7327.55	3904.63	7325.20	4.5	32	100	100	2.5	2	
7/3/2007	118	6:10	55	3904.63	7325.20	3907.13	7321.16	4.5	30	100	100	3.25	3	
7/3/2007	119	9:10	60	3903.29	7323.26	3859.90	7325.08	4.1	30	100	110	2.25	2	
7/3/2007	120	10:20	60	3859.41	7325.28	3855.58	7327.03	4.2	32	100	110	3	3	

Appendix Table 8.4. Bridge Data Log F/V Friendship 2007-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out (fathoms)		Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Starboard	Port	Stbd	Comments
7/3/2007	121	11:30	60	3855.16	7327.19	3851.32	7328.37	4.5	30	90	100	2.75	2.5	
7/3/2007	122	12:40		3851.26	7328.04	3849	7327							
7/3/2007	123	14:35	20	3842.69	7329.39	3841.15	7329.40	4.6	37.5	130	130			Loaded up on small stuff
7/3/2007	124	15:10	30	3840.87	7329.52	3842.69	7327.76	4.7	36.7	125	125			Loaded up on small stuff
7/3/2007	125	16:15	55	3846.62	7328.40	3850.96	7328.08	4.5	34.9	115	115	3.5	3.5	Back to the big stuff here
7/3/2007	126	17:20	50	3850.96	7328.08	3854.71	7327.94	4.5	30.1	100	100			
7/3/2007	127	18:20	55	3855.37	7327.94	3859.34	7326.96	4.5	30.3	100	100	3	3	
7/3/2007	128	19:25	50	3859.34	7326.96	3902.21	7325.13	4.5	28.9	100	100	2.5	3	
7/3/2007	129	20:25	50	3902.60	7324.98	3903.16	7324.75	4.5	30.3	100	100	2.75	3.25	
7/3/2007	130											3.25	4	
7/3/2007	131	21:30	55	3906.47	7322.95	3902.62	7325.09	4.5	30.2	100	100	3	2	
7/3/2007	132	22:40	55	3902.08	7325.37	3859.27	7326.89	4.5	30.8	100	100	3	3	
7/4/2007	133	23:45	55	3859.22	7326.91	3904.19	7324.33	4.5	30.1	100	100	3.75	4	
7/4/2007	134	0:55	55	3904.44	7324.13	3902.04	7325.36	4.5	30.6	100	110	2.5	3	
7/4/2007	135	2:00	60	3901.66	7325.54	3857.86	7327.93	4.5	30	100	100	2.5	3	
7/4/2007	136	3:10	60	3857.82	7327.95	3853.46	7328.73	4.3	29	100	100	3	3	
7/4/2007	137	4:20	55	3853.02	7328.63	3848.77	7329.42	4.3	30	100	100			
7/4/2007	138	6:00	30	3842.35	7329.48	3842.16	7328.00	4.3	36	125	125	20	20	loaded up on smalll stuff
7/4/2007	139	8:05	25	3842.15	7328.03	3841.27	7328.35	4.5	36	125	125	60	40	loaded up on smalll stuff
7/4/2007	140	9:10	70	3846.00	7328.74	3850.68	7326.10	4.5	37	125	125	4	3.25	Went back to big stuff; starting to rain
7/4/2007	141	10:30	60	3850.81	7326.04	3849.41	7328.15	4.5	35.4	125	125	3.25	3	
7/4/2007	142	11:40		3849.41	7328.15			4.5	34	125	125			
7/4/2007	143	12:25	55	3850.68	7325.93	7329.67	7329.67	5.0	31.4	125	125			
7/4/2007	144	13:30	55	3853.83	7329.67	3858.35	7327.91	5.0	29.4	125	125	4	4.25	
7/4/2007	145	14:30	50	3858.46	7327.85	3901.52	7325.50	4.5	28.6	125	125			
7/4/2007	146	16:05	55	3901.60	7325.42	3905.44	7323.25	4.5	30.1	125	125			
7/4/2007	147	17:10	60	3905.93	7322.97	3905.06	7324.13	4.7	29.9	125	125	3	3	turn around tow
7/4/2007	148	18:20		3905.29	7324.02			4.5	29.5	125	125	3.5	4	turn around tow
7/4/2007	149	18:30	55	3905.00	7324.15	3903.23	7326.64	3.9	29.8	125	125	3	2	
7/4/2007	150	19:30	65	3905.42	7324.70	3904.63	7323.92	3.9	29	125	125	3	3.25	turn around tow
7/4/2007	151	20:40	65					4.1	30.7	125	125			
7/5/2007	152	17:00	50	3942.45	7327.73	3942.53	7327.82	4.5	38.2	125	125	30	30	
7/5/2007	153	18:05	45	3942.48	7327.75	3942.13	7327.98	4.5	37	125	125			
7/5/2007	154	19:50	65	3849.35	7326.33	3854.02	7324.86	4.5	37	115	115	3	1	
7/5/2007	155	21:05	55	3854.62	7324.72	3859.07	7323.41	4.5	33.1	100	100			
7/5/2007	156	22:20	60	3859.59	7323.27	3903.18	7320.52	4.5	32.5	100	100			
7/6/2007	157	23:30	60	3903.54	7320.11	3908.10	7320.23	4.5	31.5	100	100	2.5	2.5	
7/6/2007	158	0:45	70	3908.61	7320.22	3912.27	7315.73	4.6	33	100	100	5.5	4	
7/6/2007	159	2:05	75	3912.67	7315.17	3911.32	7317.36	4.2	33	100	100	2.5	2.5	
7/6/2007	160	3:30	60	3911.67	7316.86	3910.08	7318.97	4.0	30	100	100	2	1.5	

Appendix Table 8.5. Bridge Data Log F/V Friendship 2007-3

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out (fathoms)		Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Port	Starboard	Port	Stbd	Comments
7/6/2007	161	4:40		3910.45	7318.55			4.5	29.7	100	100			Changed 15 to 14 diamonds on NB dredge
7/6/2007	162	8:30	70	3959.17	7325.25	3853.97	7327.28	4.5	31	100	100	2.5	0.5	Twine top hung on starboard side
7/6/2007	163	9:50	60	3852.50	7327.52	3848.06	7327.97	4.5	31.5	100	100			Changed 15 to 14 diamonds on Exp dredge
7/6/2007	164	11:20	45	3847.40	7327.92	3843.94	7327.94	4.5	35	100	100	1	1.75	
7/6/2007	165	12:20	25	3842.53	7328.06	3841.91	7329.11	4.5	38.4	100	100			
7/6/2007	166	12:55		3841.98	7328.74					100	100			steaming to big stuff
7/6/2007	167	14:20	50	3851.35	7327.37	3853.66	7327.14	4.5	30	100	100	2	2.25	
7/6/2007	168	15:20	60	3854.09	7327.06	3858.06	7326.30	4.5	33.1	100	100	3.25	2.5	
7/6/2007	169	16:30	55	3857.88	7326.15	3853.35	7327.69	4.6	32	100	100	3	3.25	
7/6/2007	170	17:45	65	3853.41	7327.64			4.6	32.3	100	100	3	3.25	
7/6/2007	171	19:00	60	3857.55	7326.67	3853.06	7328.16	4.5	30.4	100	100	2	2.5	
7/6/2007	172	20:10	60	3852.66	7328.84	3848.31	7328.31	4.5	31	100	100			Hole in portside gear
7/6/2007	173	21:35	40	3847.97	7328.24	3844.73	7328.58	4.4	36	125	125			
7/6/2007	174													
7/7/2007	175	0:15	50	3848.28	7326.62	3852.96	7327.11	4.5	37	115	115	2	2	
7/7/2007	176	1:15	60	3852.96	7327.11	3856.64	7326.49	4.4	34	100	100	4	5	
7/7/2007	177	2:25	60	3856.41	7326.42	3856.24	7326.65	4.4	34	115	115	4	5	
7/7/2007	178	3:35	60	3856.00	7326.60	3856.18	7326.33	4.4	34	115	115	5.5	5.5	
7/7/2007	179	4:45	30	3855.96	7326.31	3856.48	7326.27	4.4	34	115	115	5.5	6	
7/7/2007	180	6:05	75	3856.61	7326.47	3856.64	7326.46	4.4	36	115	115	6	6.5	
7/7/2007	181	7:35	70	3856.36	7326.50	3856.39	7326.58	5.1	30	120	120	5.5	5.5	
7/7/2007	182	8:55	75	3856.49	7326.44	3855.93	7326.50	5.2	33	120	120	5.5	6	
7/7/2007	183	10:20	60	3855.71	7326.51	3856.37	7326.14	5.0	33	120	120	5.5	5.5	
7/7/2007	184	11:30	70	3856.28	7326.08	3856.54	7325.67							
7/7/2007	185	12:50		3856.39	7325.76									
7/7/2007	186	15:20	30	3842.46	7327.98	3841.49	7329.24	4.5	38	140	140	20	20	
7/7/2007	187	16:00	30	3841.89	7329.34	3842.98	7328.01	4.4	38	140	140	30	30	
7/7/2007	188	17:55	65	3850.40	7326.59	3856.12	7326.29	4.4	34	115	115	6.5	7	
7/7/2007	189	19:10	75	3855.98	7326.65	3850.14	7326.78	5.0	36	115	115	7	6	
7/7/2007	190	20:35	70	3850.29	7326.76	3856.28	7326.20	5.0	33	115	115	7	7	
7/7/2007	191	22:00	70	3856.05	7326.20	3850.51	7326.81	5.5	33	120	120	7	7	
7/8/2007	192	23:20	70	3850.51	7326.81	3856.68	7325.86	5.5	33	120	120	5.25	6.25	
7/8/2007	193	0:40	75	3856.44	7325.91	3850.86	7326.38	5.5	33	120	120	5	5.25	
7/8/2007	194	2:05	70	3851.10	7326.36	3856.76	7325.38	5.5	33	120	120	5	5	
7/8/2007	195	3:25	65	3856.65	7325.43	3851.87	7326.13	5.5	33	120	120			
7/8/2007	196	4:40	80	3851.98	7326.17	3850.62	7326.83			120	120			
7/8/2007	197	11:10	75	3850.16	7327.05	3856.78	7325.99	5.5	33	120	120	5	4.5	
7/8/2007	198	12:35	80	3856.81	7325.95	3850.47	7326.64	5.1	33	120	120	5	6	
7/8/2007	199	14:05	60	3851.45	7326.42	3855.35	7325.80	5.1	33	120	120	5	4	
7/8/2007	200	15:15	50	3855.28	7325.81	3850.28	7326.71	5.1	30	120	120	5	5	

Appendix Table 9.1 Bridge Data Log F/V Friendship 2007-4

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
7/17/2007	1	5:27	0:47	3915.7390	7313.8534	3912.47	7316.2199	5.0	31	115	PORT	6.5	5.5	all GPS data is bieng recorded, TD probe, and Temp loggers on both dredges
7/17/2007	2	6:17	1:00	3912.43	7316.21	3913.03	7315.92	5.4	31	115	PORT	4.5	5.5	
7/17/2007	3	7:23	1:08	3913.11	7315.91	3912.69	7316.88	3.3	31	115	PORT	1.5	4.5	
7/17/2007	4	8:34	0:28	3917.68	7316.89	3912.71	7319.41	3.5	31	115	PORT	1.5	1.5	
7/17/2007	5	9:06	0:33	3912.87	7319.56	3913.59	7318.11	4.5	29	115	PORT	2.25	2.25	
7/17/2007	6	9:41	0:44	3913.58	7318.10	3913.60	7317.83	5.2	29	115	PORT	2.5	2.5	
7/17/2007	7	10:31	0:37	3913.58	7317.76	3910.95	7318.80	5.0	30	115	PORT	3.5	3	
7/17/2007	8	11:11	0:36	3910.93	7318.82	3908.15	7320.13	5.0	30.5	115	PORT	2.5	2	
7/17/2007	9	11:49	0:37	3908.15	7320.14	3905.64	7322.28	5.3	31	115	PORT	2	2	
7/17/2007	10	12:28	0:44	3905.64	7322.28	3902.54	7324.65	5.0	30.5	115	PORT	4.5	3.75	
7/17/2007	11	13:15	0:39	3902.49	7324.68	3859.45	7325.82	4.9	30.5	115	PORT	null	null	clubstick hung on experimental teeth, did not fish
7/17/2007	12	13:58	0:57	3859.30	7325.87	3854.45	7326.64	4.6	30	115	PORT	5	3.5	chop is calming down
7/17/2007	13	15:02	0:57	3854.34	7326.66	3849.41	7327.35	5.6	34	130/135	PORT	4	3.5	
7/17/2007	14	16:07	0:20	3849.18	7327.42	3847.45	7327.38	null	36	null	PORT	null	null	hard snag on starboard side, haul back early, lobster pot in starboard, steaming to smaller stuff now
7/17/2007	15	16:56	0:24	3843.20	7327.93	3841.51	7328.01	3.7	36	125/140	PORT	DL	DL	captain says he always puts longer wire on the turtle drag
7/17/2007	16	17:26	0:32	3841.54	7327.97	3841.55	7327.87	3.9	37	125/140	PORT	DL	DL	small stuff, deck loaded
7/17/2007	17	18:41	0:59	3848.04	7327.58	3853.14	7326.58	nk	37	nk	PORT	nk	nk	
7/17/2007	18	19:47	0:13	3853.31	7326.58	3859.25	7326.12	5.6	33	115	PORT	nk	nk	crew kicked over fish
7/17/2007	19	21:10	0:45	3859.28	7326.11	3903.19	7324.09	5.0	30	115	PORT	3.5	3	
7/17/2007	20	22:05	0:55	3903.54	7323.89	3907.83	7320.64	5.0	30	115	PORT	4	3.5	
7/17/2007	21	23:10	0:40	3907.90	7320.56	3910.49	7318.34	4.8	31	115	PORT	5	5	
7/17/2007	22	0:00	0:55	3912.80	7318.32	39144.60	7314.17	4.8	31	115	PORT	5	5	
7/18/2007	23	1:15	0:40	3914.28	7314.17	3915.08	7315.87	4.8	30	115	PORT	3	1.75	
7/18/2007	24	2:10	0:45	3914.80	7316.19	3912.20	7318.55	4.5	30	115	PORT	3	2.5	
7/18/2007	25	3:05	0:45	3911.85	7318.74	3908.30	7320.33	5.0	30	115	PORT	5	4	
7/18/2007	26	4:10	0:55	3907.81	7320.62	3910.45	7319.30	4.8	30	115	PORT	4	3.5	
7/18/2007	27	5:15	0:55	3910.70	7319.10	39144.80	7315.96	4.8	30	115	PORT	4.5	4	
7/18/2007	28	6:15	0:49	nk	nk	3911.30	7317.01	5.0	30	115	PORT	5	4.5	crew kicked fish over
7/18/2007	29	7:13	1:07	3911.33	7317.14	3911.48	7317.14	5.4	31	115	PORT	6	5.25	crew kicked fish over
7/18/2007	30	8:56	0:44	3911.65	7317.06	3908.87	7319.34	5.0	30	115	PORT	5	4	problem setting out, wire messed up on reel
7/18/2007	31	9:49	0:51	3908.80	7319.40	3905.75	7321.82	4.8	30.5	115	PORT	3.5	2	delay getting starboard side up, some washed out
7/18/2007	32	10:46	0:46	3905.65	7321.90	3902.60	7324.14	4.8	31	115	PORT	4	3	
7/18/2007	33	11:38	0:44	3902.59	7324.17	3859.38	7325.83	4.7	31	115	PORT	3	2.5	
7/18/2007	34	12:25	0:50	3859.41	7325.78	3855.52	7326.41	5.3	30	115	PORT	3.5	3	
7/18/2007	35	13:22	0:48	3855.30	7326.39	3856.35	7325.74	5.5	33.5	115	PORT	3	3	
7/18/2007	36	14:19	0:41	3856.35	7325.62	3852.92	7326.30	5.2	34	115	PORT	3	2.5	
7/18/2007	37	15:11	0:31	3852.58	7326.73	3850.04	7326.69	5.2	34	115	PORT	1.75	1.5	
7/18/2007	38	15:49	0:38	3849.81	7326.62	3846.63	7327.25	5.2	37	115	PORT	3.25	2	
7/18/2007	39	16:54	0:30	3842.91	7327.64	3842.41	7327.14	5.1	38	140	PORT	DL	DL	
7/18/2007	40	nk	nk	nk	nk	3842.57	7326.94	4.9	38	140	PORT	DL	DL	

Appendix Table 9.2. Bridge Data Log F/V Friendship 2007-4

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
7/18/2007	41	18:42	0:46	3847.21	7325.60	3850.71	7325.65	4.7	34.5	115	PORT	3.25	2.25	
7/18/2007	42	19:36	#VALUE!	3850.71	7325.65	nk	nk	4.5	31.5	115	PORT	nk	nk	
7/18/2007	43	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/18/2007	44	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/18/2007	45	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/19/2007	46	0:50	0:50	3911.83	7317.18	3914.78	7314.44	4.6	31	115	PORT	3.5	2.5	
7/19/2007	47	1:50	1:00	3914.64	7314.38	3910.63	7317.47	4.8	32	115	PORT	4.5	4.5	
7/19/2007	48	3:05	0:55	3910.21	7317.76	3907.66	7320.32	4.8	30	115	PORT	6	4.5	
7/19/2007	49	4:10	0:55	3907.96	7320.08	3911.53	7317.36	4.5	30	115	PORT	6	4.5	
7/19/2007	50	5:20	nk	3911.38	7317.35	nk	nk	4.8	nk	115	PORT	nk	nk	
7/19/2007	51	7:11	0:52	3910.94	7317.47	3913.29	7313.89	4.9	31	115	PORT	7.25	5.25	
7/19/2007	52	8:05	0:48	3913.29	7313.84	3913.66	7313.19	4.8	33.5	115/125	PORT	3	1.5	
7/19/2007	53	8:55	0:41	3913.67	7313.18	3912.07	7316.16	4.9	33	115/125	PORT	2.5	2.5	
7/19/2007	54	9:40	0:46	3912.11	7316.16	3912.81	7315.42	4.9	32	115/125	PORT	5	2.5	added some shackles to starb. Side
7/19/2007	55	10:43	0:41	3912.93	7315.36	3913.17	7315.13	4.9	32	115/125	PORT	1.5	3	port side did not fish right, might have been on starb drag
7/19/2007	56	11:31	0:34	3913.31	7314.99	3913.33	7315.06	4.9	32	115/125	PORT	3	2	shorter tows
7/19/2007	57	12:08	0:42	3913.36	7315.05	3910.99	7317.57	5.3	32	115/125	PORT	3.5	4	lots of buttons and sand
7/19/2007	58	13:30	0:35	3908.67	7319.36	3910.94	7317.37	5.0	30.5	115/125	PORT	5.5	5	lots of buttons and sand
7/19/2007	59	14:09	0:42	3910.97	7317.40	3908.22	7319.78	5.3	31	115/125	PORT	5	1	starb may not have fished right
7/19/2007	60	14:56	0:42	3908.25	7319.72	3910.89	7317.48	5.3	30	115/125	PORT	5	4	lots of buttons and sand
7/19/2007	61	15:41	0:37	3910.89	7317.50	3911.75	7317.13	5.3	31	115/125	PORT	6	4	lots of buttons and sand
7/19/2007	62	16:24	0:59	3908.28	7319.71	3911.50	7316.94	5.0	31	115	PORT	4	3.5	lots of buttons and sand
7/19/2007	63	17:24	0:53	3911.48	7316.47	3908.31	7319.68	5.1	31	115	PORT	4.75	3.75	lots of buttons and sand
7/19/2007	64	18:30	0:50	3908.55	7319.54	3911.78	7316.58	5.1	30	115	PORT	3.5	4.5	lots of buttons and sand
7/19/2007	65	19:28	0:52	3911.97	7316.38	3908.94	7318.81	4.5	31	115	PORT	5.5	1.5	lots of buttons and sand
7/19/2007	66	20:35	0:35	3909.36	7318.48	3911.78	7316.73	4.5	31	115	PORT	4.5	3.5	lots of buttons and sand
7/19/2007	67	21:20	1:00	3912.42	7316.32	3909.84	7318.66	4.5	31	115	PORT	5	4	lots of buttons and sand
7/19/2007	68	22:30	0:25	3909.67	7318.65	3909.56	7319.68	4.5	31	115	PORT	3	3	lots of buttons and sand
7/19/2007	69	23:05	0:35	3909.56	7319.69	3910.88	7317.41	5	31	115	PORT	3.5	3	lots of buttons and sand
7/19/2007	70	23:50	0:55	3910.88	7317.41	3909.35	7320.44	4.6	31	115	PORT	5	3	lots of buttons and sand
7/20/2007	71	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/20/2007	72	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/20/2007	73	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/20/2007	74	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/20/2007	75	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/20/2007	76	nk	nk	nk	nk	nk	nk	nk	nk	nk	PORT	nk	nk	off watch, crew did not record info
7/20/2007	77	nk	nk	nk	nk	3915.05	7318.42	5.3	30	100	PORT	2.25	2.25	off watch, crew did not record info
7/20/2007	78	6:17	0:38	3915.13	7318.34	3915.98	7318.74	5.3	30	100	PORT	2.25	3.25	lots of buttons and sand
7/20/2007	79	6:57	0:30	3916.02	7318.70	3915.16	7319.51	5.3	31	100	PORT	3.25	3	lots of buttons and sand
7/20/2007	80	7:31	0:53	3915.20	7319.49	3912.38	7320.57	5	31	100	PORT	3.25	3	lots of buttons and sand

Appendix Table 9.3. Bridge Data Log F/V Friendship 2007-4

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
7/20/2007	81	8:26	0:47	3912.49	7320.43	3911.80	7321.62	4.3	30	100	PORT	3	3	lots of buttons and sand
7/20/2007	82	9:15	0:50	3911.81	7321.61	3910.66	7321.83	5.3	30	100	PORT	3.25	2.25	lots of buttons and sand
7/20/2007	83	10:09	0:36	3910.70	7321.79	3909.14	7322.59	5.3	31	100	PORT	2.5	3.5	lots of buttons and sand
7/20/2007	84	10:57	0:43	3909.15	7322.55	3905.81	7324.28	5.3	31	100	PORT	3.25	2.5	lots of buttons and sand
7/20/2007	85	11:47	0:48	3905.72	7324.26	3902.43	7325.90	5.3	31	100	PORT	4	3.5	lots of buttons and sand
7/20/2007	86	12:37	0:43	3902.28	7325.88	3858.89	7327.69	4.9	35	100	PORT	4	2.5	lots of buttons and sand
7/20/2007	87	13:27	0:56	3858.74	7327.71	3854.08	7328.68	5	35	95/100	PORT	4	3.5	lots of buttons and sand
7/20/2007	88	14:28	0:57	3850.39	7328.75	3850.39	7330.26	5	30	95/100	PORT	4	4.25	lots of buttons and sand
7/20/2007	89	15:28	1:14	3850.37	7330.24	3850.14	7329.32	4.6	30	115	PORT	4	3.5	heading south back to the small stuff
7/20/2007	90	16:45	0:42	3848.28	7329.30	3848.28	73848.28	4.9	31	15	PORT	nk	nk	did gear work and changed sides after this tow
7/20/2007	91	18:11	0:20	3842.96	7327.19	3841.83	7327.82	4.8	38	125	STARBOARD	DL	DL	switched sides, exp drag still needs new shoes
7/20/2007	92	19:15	0:49	3847.91	7326.79	3851.77	7326.02	5.3	36	115	STARBOARD	3	3	
7/20/2007	93	20:07	0:43	3851.81	7325.94	3855.37	7325.98	5.1	33	115	STARBOARD	3	3	
7/20/2007	94	21:00	0:40	3855.75	7326.00	3858.90	7325.68	5.1	31	115	STARBOARD	3	3	
7/20/2007	95	21:50	0:35	3859.28	7325.56	3901.59	7324.48	5.1	31	115	STARBOARD	2	3	
7/20/2007	96	22:32	0:28	3901.95	7324.28	3904.08	7323.00	5.1	31	115	STARBOARD	2.5	2.5	
7/20/2007	97	23:07	0:33	3904.31	7322.83	3906.40	7321.33	5.1	30	115	STARBOARD	6	6	
7/20/2007	98	23:50	1:10	3906.65	7321.03	3910.25	7317.92	5.1	30	115	STARBOARD	2.5	2.5	
7/21/2007	99	1:10	0:40	3910.23	7317.98	3907.58	7320.18	5.2	31	115	STARBOARD	nk	nk	
7/21/2007	100	2:00	0:50	3907.05	7320.51	3910.12	7318.22	5.2	31	115	STARBOARD	1	2.5	
7/21/2007	101	3:00	0:40	3909.31	7318.60	3907.35	7320.31	5	31	115	STARBOARD	1	3	
7/21/2007	102	3:50	1:00	3906.85	7320.05	3909.12	7318.80	5	31	115	STARBOARD	1	4	
7/21/2007	103	6:00	0:46	3909.07	7318.90	3906.72	7320.86	5	31	115/90	STARBOARD	4	4	trying more wire on control drag
7/21/2007	104	6:50	0:36	3909.07	7318.90	3908.39	7319.32	4.5	30.5	115/90	STARBOARD	1.5	2	trying more wire on control drag
7/21/2007	105	7:31	0:48	3908.36	7319.28	3906.95	7323.55	4.5	30	115/90	STARBOARD	2	3	
7/21/2007	106	8:24	nk	3906.88	7323.70	nk	nk	5	30	115/90	STARBOARD	1.75	3	
7/21/2007	107	nk	nk	nk	nk	3901.55	7325.91	5	30	115/90	STARBOARD	2	3	
7/21/2007	108	9:54	0:57	3900.34	7326.17	3857.57	7326.47	5	30	115/90	STARBOARD	1.75	2.5	
7/21/2007	109	10:37	0:50	3857.44	7326.52	3853.42	7327.05	5.3	30	115/90	STARBOARD	2	2.5	
7/21/2007	110	11:34	0:50	3853.31	7327.10	3849.41	7327.28	5.1	31	115/90	STARBOARD	3	4	
7/21/2007	111	12:37	0:56	3843.15	7326.89	3841.55	7327.32	5	32	115/90	STARBOARD	nk	nk	put new shoes on exp drag and steamed to small stuff
7/21/2007	112	13:43	0:29	3841.54	7327.25	3842.03	7327.63	5.1	32	115/90	STARBOARD	DL	DL	deckloading small scallops, experimental dredge had more scallops
7/21/2007	113	16:10	0:30	3841.84	7327.78	3841.87	7327.76	4.9	32	115/90	STARBOARD	DL	DL	deckloading small scallops, experimental dredge had more scallops
7/21/2007	114	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	DL	DL	deckloading small scallops and sitting, experimental dredge had more
7/22/2007	115	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	DL	DL	did some gear work to control
7/22/2007	116	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	DL	DL	off watch, crew did not record info
7/22/2007	117	nk	nk	nk	nk	3914.66	7313.71	4.5	32	115	STARBOARD	6	4	off watch, crew did not record info
7/22/2007	118	6:41	0:54	3914.77	7313.61	3915.00	7313.20	4.7	32	115	STARBOARD	8	4	
7/22/2007	119	7:37	0:54	3914.97	7313.20	3914.97	7313.44	4.4	32	115	STARBOARD	4	4	
7/22/2007	120	8:36	0:48	3914.92	7313.54	3914.71	7313.43	4.9	33	115	STARBOARD	3	3.25	

Appendix Table 9.4. Bridge Data Log F/V Friendship 2007-4

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
7/22/2007	121	9:31	0:59	3914.78	7313.37	3914.73	7313.52	4.9	32.5	115	STARBOARD	DL	DL	
7/22/2007	122	10:34	0:58	3914.72	7313.56	3915.39	7312.66	4.9	33	115	STARBOARD	DL	DL	
7/22/2007	123	11:39	1:03	3915.41	7312.65	3914.98	7313.18	4.9	33	115	STARBOARD	5	6	
7/22/2007	124	12:46	0:58	3914.95	7313.23	3914.71	7314.04	4.9	34	100W/120	STARBOARD	NULL	NULL	old trans cable entangled in starb side, may not have fished right, was caught in teeth
7/22/2007	125	13:54	0:52	3914.56	7314.16	3914.40	7314.19	5.2	32	100W/120	STARBOARD	3	3	
7/22/2007	126	14:51	0:54	3914.29	7314.33	3914.45	7313.88	5.5	32	100W/120	STARBOARD	2	2.75	
7/22/2007	127	15:50	1:03	3914.35	7314.02	3915.16	7313.72	5.3	33	100W/120	STARBOARD	2.5	2.25	
7/22/2007	128	16:56	1:10	3915.12	7313.78	3914.95	7313.97	5	33	100W/120	STARBOARD	4	6.25	no fish
7/22/2007	129	18:11	1:27	3914.78	7314.02	3914.27	7314.13	4.9	32	100W/120	STARBOARD	4.5	6.25	
7/22/2007	130	19:42	nk	3914.07	7314.27	nk	nk	4.7	32	100W/120	STARBOARD			
7/22/2007	131	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD			off watch, crew did not record info
7/22/2007	132	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD			off watch, crew did not record info
7/22/2007	133	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD			rougher weather, heavy rain
7/23/2007	134	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	1.5	3	off watch, crew did not record info
7/23/2007	135	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	1	3	off watch, crew did not record info
7/23/2007	136	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	1	3	off watch, crew did not record info
7/23/2007	137	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	2	5	off watch, crew did not record info
7/23/2007	138	6:56	0:45	3911.67	7317.37	3909.75	7321.00	4.9	30	115	STARBOARD	2	4	looks like weather might break
7/23/2007	139	7:48	0:38	3909.65	7321.31	3909.01	7324.29	4.3	30	90/100	STARBOARD	NULL	NULL	going to use short wire on control dredge and do short tows, gillnet caught in control, may not have fished, did some gear work to control, added shakels
7/23/2007	140	8:49	0:41	3908.64	7325.27	3909.04	7325.69	5.7	29	90/100	STARBOARD	2	2.5	big bag of buttons, 8 bushels in experimental drag, very little in control
7/23/2007	141	9:33	0:47	3909.04	7325.69	3909.52	7321.21	5	30	90/100	STARBOARD	2.5	2.5	
7/23/2007	142	10:22	0:55	3909.54	7321.18	3911.07	7317.93	5	30	90/100	STARBOARD	2.75	2.75	
7/23/2007	143	10:26	1:01	3911.07	7317.93	3906.51	7321.99	5	31	90/100	STARBOARD	2.5	3	wind is picking back up seas are rising again
7/23/2007	144	11:35	0:50	3906.51	7321.99	3906.51	7317.83	4	31	90/100	STARBOARD	2.5	2.5	
7/23/2007	145	12:32	1:14	3906.51	7321.99	3910.76	7317.83	5.5	31	115	STARBOARD	4.5	4.75	
7/23/2007	146	13:53	0:40	3910.71	7317.75	3912.69	7315.31	5.1	32	115	STARBOARD	2.5	2.5	
7/23/2007	147	14:44	0:50	3912.73	7314.95	3916.62	7312.75	5.1	32	115	STARBOARD	NULL	NULL	twine tip on starb side (control) was hung on sweep
7/23/2007	148	15:40	0:58	3916.65	7312.54	3920.03	7312.29	5.3	32	115	STARBOARD	4	4	big load of buttons on both sides
7/23/2007	149	16:38	0:58	3920.03	7312.29	3921.29	7316.31	5.1	32	115	STARBOARD	2.5	2.25	big load of buttons on both sides
7/23/2007	150	17:40	0:35	3921.29	7316.21	3922.48	7313.96	5.1	30	100/110	STARBOARD	1	1	big load of buttons on both sides
7/23/2007	151	18:22	0:40	3920.75	7312.24	3917.31	7314.45	5.2	33	100/110	STARBOARD	3	3	
7/23/2007	152	nk	nk	3917.31	7314.45	3920.40	7312.20	5	32	115	STARBOARD	nk	nk	
7/23/2007	153	nk	nk	3920.40	7312.03	nk	nk	nk	nk	115	STARBOARD	nk	nk	
7/23/2007	154	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	off watch, crew did not record info
7/24/2007	155	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	off watch, crew did not record info
7/24/2007	156	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	off watch, crew did not record info
7/24/2007	157	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	off watch, crew did not record info
7/24/2007	158	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	nk	off watch, crew did not record info
7/24/2007	159	nk	nk	nk	nk	nk	nk	nk	nk	nk	STARBOARD	6	8	turned on control drag

Appendix Table 9.5. Bridge Data Log F/V Friendship 2007-4

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Experimental	Catch (bu)		
Date	Tow	Start (24 hr)	Hour:Min	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Dredge	Port	Stbd	Comments
7/24/2007	160	6:34	0:56	nk	nk	3915.93	7306.33	5.3	33	115	STARBOARD	7	8	
7/24/2007	161	7:33	0:57	3915.93	7306.33	3915.62	7307.13	5.3	33	115	STARBOARD	6	7	
7/24/2007	162	8:33	0:57	3915.61	7307.05	3915.81	7306.53	5.3	34	115	STARBOARD	7	7	
7/24/2007	163	9:33	1:07	3915.81	7306.53	3915.82	7305.86	5.3	35	115	STARBOARD	7	8.25	
7/24/2007	164	10:46	1:08	3915.77	7306.13	3920.00	7305.72	5.3	35	115	STARBOARD	9	9	trans cable caught up in control sweep
7/24/2007	165	12:05	0:57	3920.04	7305.49	3922.89	7301.10	5.3	35	115	STARBOARD	nk	nk	

Appendix Table 10.1. Bridge Data Log F/V Friendship 2007-5

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Port	Stbd	Comments
8/23/2007	1	12:30	30	3848.70	7334.88	3847	7336	4.6	28.6	100	9.5	11.5	Left on 8/22/07; Turtle Dredge on stbd all trip
8/23/2007	2	13:15	25	3847	7336	3846	7340	4.5	29	100	16	14	
8/23/2007	3	13:50	30	3845	7340	3844	7342	4.0	30	100	15	17	
8/23/2007	4	14:27	43	3844	7342	3843	7344	4.0	30	100	35	25	
8/23/2007	5	16:00	40	3843	7344	3839	7348	4.0	30	100			
8/23/2007	6	21:00	40	3839	7347	3841	7345	3.8	30	100			
8/23/2007	7	21:50		3841	7345			3.8	30	100			
8/24/2007	8	5:25	5	3839	7348	3839	7345	3.9	30	100	22	23	
8/24/2007	9	6:00	30	3839	7345	3841	7346	4.0	28	100	65	62	
8/24/2007	10	13:30	30	3840	7347	3841	7345			100	55	58	
8/24/2007	11	14:45	35	3841	7346	3839	7347	3.8	28	100	58	70	
8/24/2007	12	17:50	30	3840	7347	3841	7345	3.9	28	100	75	68	
8/24/2007	13	23:40	25	3841	7346	3840	7347	3.9	28	100	62	83	
8/25/2007	14	5:30	20	3840	7347	3840	7346	4.0	28	100	56	62	
8/25/2007	15	6:00	15	3840	7346	3840	7347	4.2	28	100	76	71	
8/25/2007	16	14:20	20	3840	7347	3841	7346	4.1	28	100	39	46	
8/25/2007	17	16:10	20	3841	7346	3840	7348	4.0	28	100	70	63	
8/25/2007	18	19:50	20	3840	7347	3841	7346	4.1	28	100	65	65	
8/25/2007	19	6:30	25	3841	7345	3840	7347	4.0	28	100	100	100	
8/26/2007	20	11:05	15	3840	7347	3841	7346	4.1	28	100	47	52	
8/26/2007	21	14:00	15	3840	7346	3840	7348	4.1	28	100	80	60	
8/26/2007	22	17:20	30	3840	7348			4.1	28	100	48	58	
8/26/2007	23	21:10	25	3840	7346	3840	7348	4.1	28	100	70	57	
8/26/2007	24	22:50	30	3840	7347	3841	7345	4.1	28	100			
8/26/2007	25	5:15	20	3841	7345	3839	7348	4.0	28	100	55	38	
8/26/2007	26	9:10	25	3840	7348	3841	7345	3.8	28	100	45	40	
8/27/2007	27	9:45	20	3840	7346	3840	7348	4.0	28	100	75	85	
8/27/2007	28	15:10	30	3840	7348	3841	7346	4.0	28	100			
8/27/2007	29	9:45	20	3840	7346	3840	7348	4.1	28	100	37	17	
8/27/2007	30	15:10	30	3842	7344	3843	7342	4.0	29.5	100			
8/27/2007	31	15:55	35	3844	7341	3845	7339	4.1	30	100	18	17	
8/27/2007	32	16:40	35	3845	7339	3847	7337	4.2	28	100			
8/27/2007	33	17:30	35	3847	7337	3848	7334	4.1	27	100	22	25	
8/27/2007	34	18:20	25	3848	7334	3847	7336	4.1	27	100	15	28	
8/27/2007	35	18:55	35	3847	7336	3848	7334	4.1	27	100	15	33	
8/27/2007	36	22:25	20	3848	7335	3848	7336	4.3	28	100	6	7	
8/27/2007	37	22:55	25	3848	7337	3848	7339	4.1	29	100	6	13	
8/27/2007	38	23:30	30	3848	7339	3849	7342	4.2	26	100	11	12	
8/27/2007	39	12:35	25	3848	7342	3848	7340	4.1	26	100	9	14	
8/28/2007	40	13:15		3848	7339	3848	7336			100			

Appendix Table 10.2. Bridge Data Log F/V Friendship 2007-5

		Time	Tow Time	Start Position		End Position		Speed	Depth	Wire Out	Catch (bu)		
Date	Tow	Start (24 hr)	Minutes	Latitude (dd)	Longitude (dd)	Latitude (dd)	Longitude (dd)	Knots	Fathoms	Fathoms	Port	Stbd	Comments
8/28/2007	41	2:05	20	3848	7336	3845	7334	4.2	29	100	35	40	
8/28/2007	42	4:20	30	3848	7335	3848	7337	4.1	29	100	15	25	
8/28/2007	43	5:05	25	3848	7338	3849	7340	4.0	29	100	40	55	
8/28/2007	44	7:00	60	3848	7340	3847	7336	4.1	29	100	17	20	
8/28/2007	45	9:40	60	3847	7336	3847	7336	4.1	29	100	38	35	
8/28/2007	46	13:30	20	3847	7337	3847	7336	4.1	29	100	7.5	11	
8/28/2007	47	13:57	33	3847	7335	3847	7335	4.1	29	100	10	12	
8/28/2007	48	14:35	40	3847	7335	3847	7335	4.1	26	100	20	18	
8/28/2007	49	15:30	50	3847	7335	3847	7335	4.1	26	100	24	25	
8/28/2007	50	16:30	50	3847	7337	3846	7336	4.1	27	100	21	25	
8/28/2007	51	18:40		3846	7337			4.4	27	100			

Appendix Table 11. Catch Data Log F/V Celtic 2006-1

	Experimental Dredge								Control Dredge							
	Scallop	Skates	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Scallop	Skates	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
1	4.3	125	9	1	0	5	0	11	2.5	75	3	0	0	0	0	4
2	6.5	100	6	0	0	1	0	8	4.3	75	4	0	0	1	0	10
3	4.5	100	9	0	0	1	0	0	4.3	88	11	1	3	1	0	5
4	2.3	50	8	0	0	0	0	0	7.3	75	12	0	1	3	0	7
6	6.8	175	7	0	0	0	0	1	6.8	200	6	0	0	3	0	0
7	7.5	225	15	6	0	1	0	4	4.0	125	17	0	0	2	0	0
8	7.0	200	10	0	0	4	0	0	5.0	200	20	0	0	1	0	0
9	9.0	250	15	0	1	0	0	4	7.0	225	15	0	0	0	0	0
10	6.3	100	13	1	0	2	0	6	4.3	125	13	0	0	0	0	0
11	5.3	188	17	0	4	0	0	1	5.0	200	12	0	0	1	0	0
12	2.5	50	4	0	0	0	0	0	2.3	75	5	0	0	0	1	1

Appendix Table 12. Catch Data Log F/V Celtic 2006-2

	Experimental Dredge																										Control Dredge																									
	Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Cod	Haddock	Torpedo Ray	Ocean Pout	Am. Lobster	Spiny Dogfish		Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Cod	Haddock	Torpedo Ray	Ocean Pout	Am. Lobster	Spiny Dogfish
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)		(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)		(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
1	1.5	12	0	1	31		4	0		2			0		0	1								2.0	49	1	0	32		8	2		8			2		1	2										
2	9.5	66	9		21		17	1		5					3									8.5	69	6	0	18		8	1		7					6										
3	4.5	47	2		18	1	3			5				1	0									5.0	74		0	10	1	3			6	1				2										
4	6.0	28	4		17		0			0					0									9.5	30	1	0	7		1			1					4										
5	11.0	79	15		9		2			14					2	1								9.0	67	11	0	12		1			10					2	0									
6	10.0	29	2		10	0	5						0		0									10.0	33	4	0	9	1	2						2		4										
14	11.0	30	5		30	1	7	0		6			0		3						1			8.0	57	5	0	35	0	13	3		5			1		7							1			
15	7.0	62	4		30	1	10	2		6					2						1			5.0	69	10	0	15	0	3	4		10					2										
16	7.0	24	4		15		5	0		2				0	0									7.0	34	3	0	13		8	2		3					1										
17	9.5	38	9		nk	1	9	1		2			2		1									6.0	34	5	0	0	1	6	1		3					6										
19	9.5	85	2		19	0	3	5		9				0		0								8.0	98	15	0	16	1	4	4		11				1		1									
24	8.3	48	15	2	17	1			0	8			1	1	1									6.5	52	11	2	16	0			1	4			2	2	0									
25	8.0	25	18		19	0	7	5	0	2	4		1		1	0								7.0	44	13	0	16	2	4	10	1	2	1		0		0	1									
26	11.0	45	12	1	16	1	6	4		1	2		1	0	2			1				1		7.0	41	14	0	26	1	5	3		0	4		1	1	1		0								
29	8.0	28		2	22		2	0		2	1				1									8.0	28		0	22		3	2		3	1				0									1
39	8.0	6			13		3			1				0										8.0	22		0	8		2			7				2										
40	5.0	19	1	4	7		3	2		1		0	0		1	0								9.0	34	3	0	13		1	3		3		1	1		0	1									
41	13.0	25		0	12	0	2	0		4		0	1											9.5	37		6	4	1	1	3		3		1	0											
48	11.0	10		1	5		1			1					1									10.0	16		2	10		0			0					0									
49	12.0	9	1	2	14		1	0		4					1							0		9.0	12	0	3	17		0	1		3					2									3
50	9.5	10			17		1			3		0		1	1							1		10.0	18			9		2			6		1		0	1									
52	9.0	11	1		18	0	5	3		1		0		1	1									9.0	18	1		10	1	4	0		4		1		0	2									
51	7.5	11	1	1	9		1			2				1	0									8.0	20			10		0			8				0	4									
58	12.0	57	2	4	20		3			2		0	0									1		10.0	74	6	3	21		5			2		3	1			1									
59	14.0	49	4	4	26	1	6	2		2	1	1	0	3	0							1		11.0	101	6	3	19	2	7	0		4	1	7	1	0	3									2
60	12.0	98	6	1	23	0	5	8		2		3	1	0								1		10.0	96	1	2	21	1	5	0		1		1	1	1									1
61	10.5	75	4	2	19	0	4	2		0		4	1	0	0	0					0	3		10.5	116	2	0	27	3	2	4		2		4	1	1	1	2					1	7		
62	9.0	55	4	1	13		2	1		2		1										1		13.0	66	4	1	19		1	1		4		3		1									2
63	10.5	33	2	2	22		1	0	1	0		2			1	1						1		11.0	51	3	1	19		4	4	0	4		1			1	0								
70	10.0	40	2	2	23	1	2	4		4		0		1	1							2		10.0	56	4	2	20		3	1		4		2											2
71	6.0	19	1		17		2	0		0				0								0		8.0	47	2		10		2	2		5				1									2
72	11.0	42	9	0	19	0	4	4	1	3		1	0			0						3		8.0	36	5	4	20	1	4	3		1		1	2			2								2
74	9.0	45	14	2	20		5	7		2		6	2					1						8.5	40	16	1	16		3	11		6		6	1										
83	11.0	45	12	1	17		7	4	1			1			6							1		8.0	45	6	3	16		4	6	2			4			1									
84	9.0	30	8	1	18		3	2	0	1		5	1	1				1						9.0	45	8	2	17		6	7	2	3		5											
85	8.5	24	5	3	17		1	7		1		3	1		1									8.5	31	4		19		2			3		4											
86	8.5	44	5	3	21	2	5	3		3		2			0									7.0	47	6	2	16		1	1		0		4			2		1							
87	8.0	8	3	1	16		3	1				3	1		1									8.0	39	10	2	19		4	5				4	2		1									
96	9.5	38	4	3	9	0	2	5	2	3		5	0											8.5	22	8	1	43	1	4	5	1	1		2	1										
97	9.0	25	12	2	7			4		0	0	0	0	0	0									9.0	41	11	0	15			9		2	1	3	3	1	4									
98	10.0	36	6	5	23		7	10	0	2		4	2					2						10.0	36	7	2	18		5	8	1	2		7	0										
99	9.0	35	5	3	19		7	3	0	4		1	3	0										7.5	30	3	0	12		12	2	2	1		4	0	1									
100	14.0	47	9	2	15		4	5	0	2		8	1	0	1			1						9.0	41	8	3	17		13	3	1	2		6		1	1									
110	12.0	60	16	8	15	0	10	6		4		8		1	12									8.3	58	14	10	16	1	4	8		1		5											
111	8.5	33	10	2	16	1	6	3	0	2			0		2		1							8.0	48	6	3	11	0	5	5	1	4			1		3									
117	9.0	19	6		11																			7.0	41	12		13																		
118	11.0	31			16								1											11.0	46			16								1									
119	9.0	37	1		17								2		0			2						10.0	38	11		14								0		3			1				
128	8.0	39	19	5	11			2																7.0	50	8	3	17			11															
129	8.5	41	7	1	21			1																6.0	43	13	2	17			4															
131	7.0	43	9	1	17			2																6.0	44	6	3	18			0															
132	8.0	47	12	2	17			5																8.0	55	12	0	22			6															
140	7.0	14	1	1	1		0			2									1					6.0	25	1	0	5		5			5													
142	10.0	27	4		27		5	1		9														8.0	25	5		32		5	0		17													
143	9.0	27	2		18		9	1		7		1		0	3	1								8.5	43	3		16		4	1		15			1		2								
144	12.0	34	12		30		12	2		13		1			3									8.0	36	13		26		14	2		8		0			6								
145	10.0	38	7		35		14			1					1									8.0	42	4		28		11			6					1								
151	9.0	14	5		15		7			5			0	0	2	0								8.0	16	11		35		9			4			2	2	3	1							
152	10.0	29	9		22		7			13			1		5									8.0	25	9		20		15			11			0		6								
153	8.0	20	4		26		5			8					3									8.0	21	3		28		6			10					6								
154	9.0	36	6		27		6			5					1									8.0	31	6		21		6			4					1								
155	10.0	22	3		28		9	1		9				0	5									8.0	13	3		17		7	0		16				1	3								
156	11.0	37	4		25		13	0		18			0		4									9.0	34	8		37		21	2		6			1		2								
157	9.5	20	8		21		12	1		4					1									8.3	40	4		33		15	0		10					1					1			
164	9.0	30	8		32		10			10		2		1	2							1		6.5	20	5		43		9			4					2	1							2
166	10.0	22	6		13		7			7					4	0								9.0	26	6		17		3			4					4	1							
167	9.0	9	3		10		5			2					1									7.5	15	2		20		4			3					3								
168	11.0	10	4		21		4			3			1		6									9.0	16	2		14		4			5					1								
175	7.5	46	4	2	10		4			6			1		1									7.0	45	3		19		9			1			1		1								
176	10.5	41	2		21		7			4														7.0	34	6	1	15		3			8													
177	8.0	30	4		19		5			4														6.5	54	3		11	1	3			5													
179	10.0	58	12		17		5	0		4			0		1	0								8.5	73	4		21		8	3		8			2		2	1							
182	10.0	100	5	1	21	0	2	5		4	2													8.5	130	2	4	19	4	5	4		5	2												
183	8.0	108	8	3	13	0	3	3	0	3	1													4.0	139	9	2	18	2	2	7	2	2	2				2								
184	8.0	139	6	2	18	5	3	4		2														4.0	112	6	2	18	1	2	2		5													
185	10.0	115	7	3	24	2	1	6		3												1		6.0	95	5	3	19	5	3	3		3			1		1								
187	6.0	97	3	4	22	5	4	7		5					1									7.0	95	7		14	2	0	4		3													
196	10.0	37	4	4	21	3		0		4	5													8.5	54	3	3	21	1		3		5	2												
201	7.0	34	3	3	24	2	0	3		5	4													8.0	56	2	1	12	0	4	4		0	5												
210	6.0	31	2	1	13	0	0	2		0	9		0		0							1		8.0	54	2	2	19	2	2	2		4	11		1		1								
211	8.0	58	2	2	24	2	1	3		1	5				1									8.0	66	2	1	21	4	2	8		4	20				1								
212	11.0	73		1	19	2	0	4		9	0		1	0	0									10.0	83		3	23	4	4	5	1	4	9			3	2	1							
213	11.0	64	2	2	16	2	0	2		5	7				2							2		9.0	91	5	2	25	3	4	6	1	5	10				1								2
214	9.0	89	5	3	25	1	3	3	0	9	4											1		7.0	108	5	4	24	2	6	5	2	5	14												
221	8.0	40	1	1	11	2	0	1		1	8		1											8.0	52	5	0	7	0	2	5		3	14		0										
222	7.0	62	7	2	19	1	2	3		2	10											1		6.0	72	8	4	11	2	2	8		4	14				1								
223	6.0	46	3	3	11		0	1		3	3													6.0	44	3	5	15		2	0		4	5				1								
233	8.5	42	3	2	18	2		2																9.0	71	3	5	9	1		1															
234	12.0	87	7	2	18	0	3	1		8	2				1									9.0	156	11	4	23	2	1	0		5	4												
235	11.0	83	11	6	15	2	3	1		5	4								1					10.0	88	6	1	26	3	3	1		11	6												
237	8.0	45	3	4	18	1	0	1		5	3		1											8.0	48	5	1	10	2	1	3		3	5					1							
238	8.0	98	2	3	23	2	2	8		15	16				1									8.0	88	6	3	19	3	0	5		8	15												

Appendix Table 13. Catch Data Log F/V Westport 2006-1

	Experimental Dredge														Control Dredge													
	Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
1	38.0	14	2		33	1	13		9		4	10	4		33	15	2		30	0	14		9		4	9		1
2	25.0	12	7		24		9		3			2	0		14	9	7		13		16		4			1	1	
3	47.0	3	0		12		1					0	2	0	48	2	1		9		1					1	5	1
7	40.0	5	2	3	14	1	2		4	0		1	7		18	7	0	2	12	2	0		2	2		0	0	
13	32.0	4		1	18	0	1		1	0	0		5		46	11		4	36	3	8		5	2	0		1	
18	47.0	4	0		35	1	2		1				3	0	36	2	3		37	0	3		8				6	1
19	36.0	1	0	8	19	1	1		2			0	2		34	7	3	2	39	1	1		3			1	3	
20	44.0	6	1	3	24	1	1		2				0		48	2	1	1	21	3	3		0				3	
27	37.0	4	1	0	24	2	1	0	0	0			0	1	42	12	0	6	46	4	16	1	12	2			8	1
31	40.0	3		0	23	3	4	3	3	2			2		47	13		4	23	2	11	2	3	2			3	
36	42.0	4		0	22		2						2		40	3		1	19		9						4	

Appendix Table 14. Catch Data Log F/V Westport 2006-2

	Experimental Dredge																				Control Dredge																	
	Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Torpedo Ray	Am. Lobster	Spiny Dogfish		Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Torpedo Ray	Am. Lobster	Spiny Dogfish
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)		(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
2	7.00	14	1	3	12			3		1	0					0					9.00	41	1	4	11			23		2	5					1			
3	10.00	41	1	3	18			22		3	7				4	41		0			13.00	39	5	3	25			73		1	15				0	39		1	
4	4.50	20	8	4	25	0		4		5	6				9	1					12.50	67	6	6	32	1		61		1	0				0	0			
5	11.50	30	1	2	25			9		2	11			3	0	0					18.00	31	6	6	30			63		11	30			0	7	3			
6	9.00	46	4	8	31	2		27		2	12				2	2					9.50	97	1	17	19	3		62		6	20				0	0			
7	7.50	22	5	1	28	2		12		2	1			0	0						11.50	70	8	6	24	0		66		8	7			1	4				
8	11.00	67	5	5	13			13		1	3				0	0					13.00	76	1	4	15			56		8	10				1	1			
15	15.00	35	2	1	9	2		4		0	2								0		13.00	54	8	2	12	2		8		3	2							1
16	8.00	31	0	2	23			1		0											20.00	83	2	3	54			5		3								
17	13.50	61	0	5	32			1		0				0	0			0			18.00	59	1	1	38			7		3				1	2			1	
18	15.50	57	1	1	28			3	1	2											23.00	79	5	0	35			4	0	5					5				1
19	14.50	92	3	6	37	0		2	1	6			1	3	0				2		14.00	99	1	2	38	1		5	1	8			0	1	1				
20	20.00	NK	2	1	39			3	0	0				1	3				0		20.00	NK	4	5	47			16	1	5				0	4	1			2
21	12.50	64	4	6	27	1		7		3	0	0	0		0	1					20.00	111	5	4	34	0		15		5	3	1	1		3	0			
28	13.00	68	6	8	45			15		5					0	2	1				15.00	96	2	6	38			27		6					4	6			
29	18.00	67	2	9	59			11	1	3	0				6	0					20.00	118	5	7	41			34		9	1				1	3			
30	9.00	35	1	4	27			8	0	2	0				0						9.00	111	1	1	20			8	1	3	1				1		1		
31	15.00	61	2	1	29	0		4		1					0	0					19.00	99	0	2	43	2		14		7					9	1			1
32	15.50	53	1	3	41	1		4		3					1	1					20.00	104	4	0	38	0		7		5					4	0			
38	15.00	51	2	0	33			4		1					2	1			2		17.00	59	0	0	41			24		9					3	1			
39	13.00	50	2	4	28			2		2	0			0	0	0			1		17.00	76	3	3	30			22		4	2			1	4	2			1
41	5.00	30	1	2	24	1		21	0	0			1	19	1	1					20.00	35	6	3	40	0		96	2	4			4	54	14	7			
42	3.50	4	13	0	4			1		2				0							12.00	13	25	0	8			5		1				2					
43	6.00	1	0		3			1		0											13.00	4	7		6			4		4									
44	12.00	10	13		2		0	2		2											11.00	13	25		7		1	4		1									
50	11.00	17	0	1	20	0		1		0		0									15.00	43	1	1	32	1		11		8		1			4				
51	11.00	25	1		35			2		2					2				1		15.00	48	1		32			3		4					0				
52	10.00	22	2	1	10			1		0	1				1						7.50	13	1	1	8			0		1	0				0				
53	13.00	56	0	1	23			4		1											13.00	77	0	1	20			11		3									
54	10.00	39	0	1	12	0		5		0	3										9.00	67	0	3	12	1		7		1	4								
55	12.00	62	0	1	9	0		19		1	8				0				0		12.00	109	2	3	9	1		39		12	14				4				1
63	16.00	76	2	2	18	1		17		4	10				0	0					15.00	155	2	3	18	0		29		9	27				2	1			
64	18.00	19	1	1	17	1		10		3	9			0	0	1					19.00	153	0	2	22	2		49		16	11			2	7	8			
65	13.50	73	3	1	9	1		6		3	4			0	0	0			1		13.50	150	2	3	8	0		38		7	12			1	2	1			1
73	16.00	16	2	0	22			3		0	0				0	0					15.00	30	2	1	25			23		8	1				3	1			
74	16.00	31	0	0	9			2		2	2				0	1		1			17.00	92	2	4	12			23		2	1				1	2			
75	20.00	65	2	0	19	0		10		2	4				0	0					21.50	126	1	5	23	1		27		15	13				3	6			
76	21.00	70	3	1	22			16		11	0			1							21.00	142	4	4	31			61		16	11			2					
77	16.00	43	3	3	15	0		2		1	0					1					17.00	126	6	3	18	2		41		7	5					9			
84	19.00	72	0	2	15	0		4		5	0			0	0	0			0		19.00	119	1	3	12	1		20		7				2	2	1			1
85	12.00	25			15	1		0		0	0								0		18.00	42			11	0		9		1	3							2
86	21.00	78	1	3	19			12		5	1			1	0						19.00	115	3	7	19			19		10	9			0	2				
93	15.00	30	0	0	16			0		0	2										18.00	69	1	4	14			10		2	3								
94	15.00	29	1	0	13			1		0	1				0	0					17.00	79	1	1	19			22		2	2				3	1			
95	16.00	62	2	2	12	1		11		1			0		0						19.00	138	6	7	14	1		54		15			1		1				
96	12.00	61	2	1	16	0		7		1	0				0	0	1				17.00	191	8	1	12	2		49		9	6				2	3			
98	17.00	57	0	2	15			49		0					0				0		18.00	98	5	3	10			210		7					3				1
104	13.00	38	1	2	6	1		19		0					0	0					16.00	97	0	2	5	1		79		7					2	1			
106	14.00	36	0	2	8	0	1	39	0	1				0	0						14.50	75	0	4	10	4	0	117	1	3				1	1				
108	16.00	16	1	1	7		0	12	0	1			0	3	0	0					16.00	33	3	7	2		1	71	2	1			3	10	4	3			
109	14.50	19	1	0	8	1	0	31	0	1		2				1					14.50	38	5	3	4	0	2	112	1	2		0				0			
112	8.50	21	1	0	6	0		3		0	4							1			11.00	3	1	3	8	1		6		2	2								
113	8.50	21	2		12	2		2		0	1										8.00	28	1		5	3		8		2	1								
114	11.00	31	0	2	6			11		0					1						11.00	121	1	8	4			44		5					0				
115	12.00	57	0	2	6	0		24	0	1	1										12.00	138	1	2	16	1		60	1	3	0								
117	12.00	38	1	0	20	2		7	0		2				1						12.00	54	2	2	20	1		20	2		3				0				
118	8.00	24	1	0	9			9	0	0	2		1				0				11.00	41	3	1	7			17	2	1	4		0			1			
120	18.00	121	1	3	10			2	1	4					2						12.00	227	4	24	22			6	3	5					14				
121	29.00	19	4	0	43			4		1		0			0						23.00	55	5	7	36			4		6		3			11				
126	8.00	19	2	0	9		0	20	0	0	1		0		0						14.00	133	5	8	13		1	187	1	7	18		1		1				
129	7.00	50	0	0	6	1		7	1	2	1				0						13.00	157	2	6	9	0		73	0	1	2				3				
131	9.00	84	2	0	7	1		25		2	9				0	0		1	0		10.00	97	5	1	9	1		61		9	16				3	4		0	1
132	13.00	44	4	0	8	0		28		2	8										11.00	110	6	1	8	1		47		3	11								
138	15.00	40	0		6	2		3		0	2				2	0					16.00	72	5		13	0		19		5	3				3	1			
139	11.00	39	2	0	11	0		2		0	0				0						15.00	111	3	2	17	2		23		3	18				3	1			
140	11.00	51	1	1	7	1		14		5	6				0	0					15.00	124	4	0	6	2		68		13	23				2	2			
141	9.00	53	4	0	2	1		1	1	1	6			0	0						11.00	153	1	4	6	3		81	1	10	15			1	2				
149	14.00	13	0		9	0		1		1									0		16.00	50	8		7	3		4		3									1
150	12.00	30	0	0	12	1		2			1				0				0		14.00	51	8	2	8	1		11			1				1				1
153	13.00	44	2	0	5	0		3		0	0							2			13.00	86	10	4	15	1		14		6	9								
160	11.00	46	4	0	12	1		9		0											12.00	67	6	2	7	1		20		1									
161	10.00	32	1	1	14	0		4			2				0	0					12.00	63	4	0	12	2		13			4				2	1			
164	9.00	13	0		9	2		0		1	4										11.00	29	3		10	0		4		2	24								
165	13.00	26	0		20	0	0	1		0	6					0					14.00	42	4		19	2	2	3		4	3					1			
166	14.00	27	0		28			1		1											15.00	37	4		16			1		0							1		

Appendix Table 15. Catch Data Log F/V Celtic 2006-3

	Experimental Dredge																									Control Dredge																								
	Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Cod	Haddock	Torpedo Ray	Am. Lobster	Spiny Dogfish	Trash		Scallop	Skates	Barndoor Skate	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Am. Plaice	Sea Raven	Longhorn Sculpin	Red Hake	Silver Hake	Cod	Haddock	Torpedo Ray	Am. Lobster	Spiny Dogfish	Trash	
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)		(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)		
1	12.00	79	2	5	12	2		35		13	7				2					2		1		12.00	42	0	1	4	5		23							0								2		
2	12.00	88	3	5	4		2	77		6	0				3							1		10.00	103	4	5	2		2	99		11	4												1		
3	10.00	93	2	9	8	0		34		16	3			1	3							1		10.00	126	4	9	9	1		24		11	4			0	2							3		
4	12.25	67	0	1	7		0	34		10		8			0					0		2		11.00	94	1	2	3		1	41		8		3			4						1		1		
7	14.50	70		5	9	0		24	0	12	10			0	11			0				2		14.50	66		5	12	4		28	1	9	11			1	15		1					3		
10	12.00	72	3	23	14		4	51	0	11				1	6					0		5		9.00	107	0	24	12		4	76	2	9				1	9					1		3		
11	16.00	37	6	12	55			5		16				2	51	2				0	0	4		25.00	36	6	12	42			6		9				1	41	4	1			2		6		
12	30.00	43	4	18	63		1	8		4	7		2	2	72	5						5		16.50	31	4	7	34		0	1		5	7		2	0	24	6						7		
13	21.00	36	6	2	50			2		6				1	14							5		25.00	55	3	20	70			2		5					25							6		
14	20.00	50	7	15	65		0	4		6			0		37	2					0	7		20.00	33	3	3	37		1	4		1		1			37	1	1					10		
17	25.50	33	2	0	30			2	0	3			2		14	1						10		22.00	23	0	2	26			1	2	8			1		14	2		1				9		
18	26.00	28	0	2	35			2	0	2			1		26	2		0				6		30.00	26	1	7	40			1	1	5			1		28	1		2				8		
19	14.00	21	0	1	48			1		7			1	1	17			1		1		4		14.00	32	1	3	28			4		5			2	2	32		2			1		4		
20	27.00	17	0	4	57		0	1		4				1	36	1						5		27.00	41	1	1	62		1	0		2				0	38	0			1			10		
21	28.00	31	0	5	73			1					2		28	0		4			3	5		31.00	46	2	5	67			1		9			0		72	1	1	1			1	9		
22	21.00	31	5	10	67			3	1	2				0	38	0						4		21.00	33	1	3	49			1	1					1	18	2					1	6		
23	16.00	10		1	50			2	0	7				0	10			1				4		25.00	15		6	75			4	1	4				1	32		2					5		
24	11.00	18	0	2	42			1		24			2		61	0				1		9		29.00	37	2	8	76			2		6			1		52	3				2		5		
25	34.00	46	0	22	91			9	0				2		76	3		3		2		4		25.00	33	2	11	56			4	2	7			1		33	1		1		2		2		
26	NK	22	0	18	40			2		0			1		17	1						rk		NK	30	1	20	62			4					4		23	0						nk		
31	20.00	7	1	7	24			2	0	1			0	1	16	0						4		22.00	10	0	3	46			2	2	2			4	1	26	2						7		
32	22.00	21	1	3	43			0		4			0	0	45	5		0				4		21.00	18	0	2	44			1		2			1	1	23	3		1				5		
33	21.00	23		3	58			3		6			1		38	0		1				4		24.50	29		2	46			1		8			1								1	6		
34	23.00	33	0	2	49			2	1	5				0	84	1		1				7		24.00	24	3	4	45			1	1	8			1		65	13		4				4		
35	NK	28	2	5	43			0		5			0		43	2		1				7		NK	29	1	2	31			2		4			1		37	2		3				9		
46	16.00	79	10	10	11		5	29	1	3			4	3	4					2		1		12.00	86	1	13	8		4	65	0	13			2	0	6					3		2		
47	9.00	74	2	4	7		0	55						0								1		8.00	98	6	5	7		1	63		12				1								1		
48	9.00	98	0	3	10			31		7				2						3		1		8.50	74	6	4	10			41						1						3	1	1		
60	22.00	31		20	24			12		6				1	5	1				1		4		19.50	51		5	10			11		15				0	21	1						4		
62	19.00	32	1	6	7		0	6	0	0					4							3		22.00	53	1	30	16		3	25	1	18					17							4		
73	23.00	29	9	9	14		0	9	0	6				0	11					0		3		27.00	58	1	8	18	1	2	26	4	1				2	13					1		3		
75	17.50	18	0	4	7			10		4				1	15	0				1		4		17.50	18	3	2	8			15		7				0	18	1				3		4		
76	20.00	6		0	7			5	0	38				1								3		18.50	11		2	2			6	2	4												3		
92	24.00	48	6	1	9		1	21	1	20			0	1	46	2						8		21.50	59	4	6	9		0	32	0	30			2	4	61	4						10		
93	25.50	95	1	4	15		0	114		8			0	5	31	0				3		3		24.00	55	6	3	13		1	103		16			1	5	16	4				3		4		
94	15.00	69	0	3	16			133		0			0		7	0				2		4		20.00	55	3	3	18			159		23			1		12	1				3	1	4		
95	10.00	36	1	4	10			35		6					3	0				1		2		12.00	62	0	1	11			97		5					11	1				1		2		
96	16.00	43	1	4	18			64		9					5	0				0		2		15.00	56	1	5	15			124		17					1	6				2		2		
97	18.00	37	1	1	10			106		9				2	8							4		16.00	62	2	1	12			93		6				1	11						0	4		
98	12.50	18	2		8			19		5				1	6							rk		11.00	62	0		12			48		4				0	9							nk		
99	9.00	49	1	2	16			26		7			0	0	5					1		3		12.00	23	2	1	30			48		4			2	2	5					6		4		
101	11.00	45	0	0	10			34		0				1	4	1				1		2		11.00	63	1	1	11			52		10				2	5	1				0	1	4		
102	7.00	27	0	1	14			13		6					0							1		9.00	36	3	2	10			56		8					3							1		
103	11.00	54	1	2	12			79		8					0	2	0					2		12.00	76	3	5	16			207		16				3	8	1					0	2		
104	11.00	86	1	0	12	2		81		6	1			0	0	0						1		13.00	96	4	7	14	2		123		12	0			4	7	1						2		
105	13.00	87	4	4	6	0		13		4	11			0	1	0				0		4		15.00	134	3	4	10	2		38		12	11			1	8	1				2		3		
106	23.00	50	1	2	7			4		5	1			1	2	0						1		17.00	179	6	4	16			24		2	2			3	2	2						1		
110	17.00	18	1	2	4			0	0	3	0											rk		15.50	83	4	0	5			3	1	4	2											nk		
111	13.00	58		1	9			2		0	0											rk		16.00	33		1	15			6		8	5											nk		
113	11.00	51	1	2	23	1		0		9	1				0	1						3		14.00	81	2	4	11	0		5		11	23				1	0						3		
114	15.50	86	4	3	8	4		2		2	42			0	1							2		17.00	109	3	4	9	0		0		9	63			1	4							2		
115	15.00	61	0	2	5	1		3		10	17				0							1		19.00	96	1	1	6	0		3		4	21				1							5		
116	17.00	86	2	4	6	1		2		5	21				1	0				0		5		20.00	122	3	3	6	1		3		11	10				0	1				2	0	8		
117	18.50	86	3	5	8	2		5		4	28				1							1		19.00	107	6	9	14	2		10		7	31				0							2		
119	14.00	85	2		4	2		2		6	13		1	0	1							2		15.00	96	5		5	0		7		5	12		0	2	1						4		
120	15.00	78	4	4	4			14		7	19		0	0	0							4		15.00	87	6	3	4			27		22	28		1	3	2						8		
123	15.00	95	6	2	15	0		9		0	27			1	0	0				0		2		13.00	115	5	10	4	1		11		8	38			1	1	1				1		2		
126	8.00	37	1	1	5			3		5	9											1		10.00	94	0	0	2			7		10	54											4		
125	8.00	29	0	0	6	0		1		5	3									1		1		8.00	74	1	1	7	1		3		6	4									3	1	3		
124	15.00	87	3	1	5	2		3	0	6	14			0	0	0				0		1		17.00	101	5	5	5	0		14	1	8	22			2	1	1				2		4		
128	14.50	88	1	3	5		0	36		9	19				2							2		13.00	111	1	7	5		1	33		10	12				2						1	2		
127	12.00	84	2	1	3			9		12	6				0							1		14.00	95	1	4	3			12		18	17				3							2		
129	17.00	117	4	4	5			74		7	4		0	0	3							1		18.00	114	2	4	6			96		8	12		1	2	2						2		
131	17.50	89	3	2	12			3		6	13			2	4							1		14.00	123	2	5	9			2		6	10			0	4							1		
133	17.00	99	1	5	5			43		7				0	2	1						2		15.50	81	1	6	3			52		11				2	1	0						1		
134	14.00	79	3	5	4			41		13	2	2										1		13.00	93	0	7	4			74		6	1	1										2		
135	16.00	94	1	5	10		0	82	0	3	2			3	7							2		13.00	96	1	5	8		2	121	2	14	3			4	2							2		
136	14.00	96		2	11			38		5	2			1						0		rk		11.00	83		7	10			67	1	8	2			0						1		nk		
137	14.00	95	1	4	6	0	0	5		3	6			1	0							1		12.00	96	2	9	2	1	1	89		11	1			2	3							1		
138	16.50	98		9	6			46		2	6			0	1	0						1		17.50	156		4	9			83		9	8			1	3	1						1		
139	14.50	101	2	2	5		1	74	0	1				1								1		11.50	89	2	4	1		0	86	1	6				0								1		
143	9.00	39		3	2	0				3	0				1							rk		12.00	64		3	8	1				2	3				1							nk		
145	14.50	71		1	8			23		4	2		2							2		1		14.00	70		5	4			43		8	3		0							0		0		
146	14.00	101		1	4		0	54		5	3				2							2		14.00	91		0	6		2	68		15	2				1							2		
147	12.00	121	1	6	9	0		34	3	0	11				0							5		12.00	118	1	1	8	1		44	0	11	3				2							1		
148	12.00	169	1	8	9	0		38	0	8	10				5							2		12.00	127	1	0	9	1		38	1	21	7				2							4		
149	11.00	104	1	3	7			34		10	3				2							2		11.00	94	0	4	13			36		9	5				0							5		
150	12.00	139		3	9			17	0		5			0	0							1		12.00	111		1	9			31	1	9	7			2	3							4		

Appendix Table 16. Catch Data Log F/V Friendship 2007-1

	Port = Control Dredge						Starboard = Experimental Dredge					
	Scallop	Skates	Monk	Fluke	Witch	Fourspot	Scallop	Skates	Monk	Fluke	Witch	Fourspot
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)
3	2.0	18	1	0	1	0	3.0	36	0	0	0	4
4	9.0	52	4	0	1	4	6.5	50	0	0	0	10
5	5.0	40	1	1	4	4	6.0	57	6	1	3	5
6	9.0	50	2	0	5	1	9.0	75	4	0	1	7
8	6.0	28	2	0	0	1	6.0	50	3	0	0	0
9	6.0						6.5					
10	8.0	13	2	0	0	2	7.0	18	3	0	0	1
	45.0	201	12	1	11	12	44.0	286	16	1	4	27
	6.4	34	2	0	2	2	6.3	48	3	0	1	5

After rollers were taken off teeth:

	Port = Control Dredge						Starboard = Experimental Dredge					
	Scallop	Skates	Monk	Fluke	Witch	Fourspot	Scallop	Skates	Monk	Fluke	Witch	Fourspot
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)
13		4	1	0	0	0		2	1	0	0	0
14		11	3	0	0	1		10	2	0	0	0
15	4.0	56	3	0	0	0	4.0	40	1	0	0	1
16	4.5	33	4	0	0	3	4.0	19	5	0	0	0
17		122	14	0	12	3		95	5	0	8	8
18	7.5	34	1	0	1	1	8.0	33	1	0	0	1
19	3.3	16	2	0	0	0	6.0	16	2	1	0	0
20	4.5	27	7	0	0	0	3.0	21	7	0	0	0
21	3.0	13	2	0	0	0	3.0	18	4	1	1	0
22	2.0	3	2	0	0	0	2.0	2	1	0	1	0
23		23	0	0	0	0		21	3	0	0	0
24	5.0	8	5	0	1	2	6.0	11	4	0	0	0
25	5.5	11	3	1	0	3	4.0	7	3	1	0	0
26	5.0	24	1	0	0	0	5.0	26	6	0	0	0
27	6.0	67	3	0	3	1	5.5	77	6	0	5	1
28	11.5	79	7	0	2	1	11.0	94	8	1	1	7
29	6.5	80	10	0	4	5	7.0	81	10	0	2	2
30	11.0	39	7	0	1	2	12.5	49	4	1	3	3
31	7.0	29	6	0	1	0	8.0	40	8	0	2	2
32	9.0	69	14	0	0	2	9.0	144	9	0	0	5
33	6.5	32	5	0	0	0	4.0	49	6	0	0	3
34	9.0	95	5	0	0	2	7.0	115	5	0	0	2
35	4.0	22	3	0	0	1	4.0	26	7	0	0	0
36	7.0	22	3	0	0	0	6.5	60	13	0	0	4
37	7.5	86	12	0	1	2	6.5	151	12	1	1	8
38	12.0	64	2	0	0	2	11.0	120	2	0	0	2
39	4.0	81	3	0	1	0	7.0	113	6	0	2	12
40	7.5	75	7	0	6	7	6.0	83	5	0	4	6
41	6.5	30	2	0	0	1	5.5	66	4	1	1	2
42	5.0	34	11	0	0	0	5.5	25	1	0	0	0
43	4.5	13	3	0	0	0	3.0	17	3	0	0	0
44	8.0	50	6	1	0	2	7.5	45	8	0	0	0
45	8.0	39	7	0	0	3	5.0	40	7	0	0	1
46	8.0	39	7	0	0	1	7.0	45	7	0	0	0
47	6.0	51	14	0	0	2	4.5	62	7	0	0	2
48	5.0	20	4	0	0	0	5.5	20	3	0	0	0
49	6.0	71	4	1	0	9	11.0	63	3	0	0	12
50	3.0	31	6	0	0	0	4.0	40	2	0	0	0
51	5.0	37	4	0	0	1	6.0	42	1	0	0	3
52	7.5	23	1	0	0	1	6.0	46	9	0	0	1
53	7.0	48	5	0	0	1	7.0	56	4	0	0	0
54	7.5	57	9	0	0	1	7.0	55	9	0	0	4
55	3.5	32	2	0	1	1	5.5	27	3	0	0	0
56	5.0	25	4	0	1	1	5.5	40	5	0	0	1
57	7.0	28	0	1	0	1	6.0	31	1	0	0	0
58	8.0	28	1	0	0	1	7.0	36	1	0	0	2
59	6.5	14	0	0	0	0	7.0	22	1	0	1	2
60	5.0	23	0	0	0	1	5.0	25	0	0	0	3

Appendix Table 17. Catch Data Log F/V Friendship 2007-2

	Experimental Dredge													Control Dredge											
	Scallop	Skates	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Fourspot Fld.	Sea Robin	Red Hake	Silver Hake	Torpedo Ray	Am. Lobster	Scallop	Skates	Winter Skate	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Fourspot Fld.	Sea Robin	Red Hake	Silver Hake	Torpedo Ray	Am. Lobster
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
2	3.50	24			0			0	1		0			4.50	16			1			1	1		1		
4	4.00	50		2										3.50	54		1									
5	1.50	25		2			1							1.75	20		1			0						
6	3.50	40		1				1	1					4.00	29		1									
7	4.00	72		1				0			1			3.50	48		1				2					
8	3.50	21		1										4.00	28		2				1					
10	5.00	36		3		1	1	3	1		1			6.50	53		4			0	1	1				
20	6.00	44		6				3						4.00	43		2	1			1	1		1		
22	1.00	15		1										2.25	23		2									
23	5.50	62		2	2			1						5.00	48		2	1			1		1	2		
24	5.50	73							2					3.00	42		2									
25	4.00	47		3					1					1.50	33		3		1			1				
26	2.50	27		4										2.00	44		1				2					
27	1.50	115		5		4			1					3.50	59		3		4							
36	4.50	60	2	6				1						4.50	72		3				1					
38	4.00	72		4		1								5.50	58		2									
39	4.50	87		7										3.75	56		9				1					
40	4.50	63		2										4.75	74		4					1				
41	5.50	60		5				2	3	2				5.75	80		3				2	3	2	1		
42	5.50	79		8				1						5.00	60		7				1	2				
43	5.00	118		6				1	2					5.00	111		1				5	2				
44	5.00	107		12					2		1			6.00	105		2				3	1				
54	3.00	43		2				1						3.25	61		3					3	1			
55	5.00	50		3										5.00	71		1					1				
61	0.50	13												1.50	10		3				1					
62	4.00	52		3					1					3.00	45		3		1		1	1		1		
63	3.50	40		2					1					4.00	30							3				
64	2.50	31		3				1						1.50	17		2					1				
74	6.00	64		2		1			3					4.00	45		4							1		
75	10.00	12		2		1		1	2					6.00	8		3				1	2				
77	3.50	63		4		1		2	1				1	1.75	35		2					1				
78	1.00	31	1	9		1								0.75	36		8		1					1		
79	25.00	28		2					1					15.00	19		4					2				
82	3.00	68		3		2		1	1					3.50	43	1	7					1	1			
83	3.00	60		6		2			3					3.00	47		4									
84	4.00	77		7				1	1					3.50	49		6				1					
91	7.00	146	2	13		3		2	1	0				5.00	76		6		3		1	1	1			
94	4.00	101		6					2					3.00	52		4									
95	4.00	48												3.00	51		2									
96	4.00	49		2		2		1	1					1.00	25		5									
97	6.00	69		5							1			4.00	49		2									
98	3.00	45		4					1					3.00	42		4							1		
99	7.00	95		2				4	2					5.50	69	1	6				1	2				
100	5.00	77		8		2		1						4.50	46		5				1					
101	5.00	83		4				2	2	1				5.00	69		4				1	1				
108	5.00	81		5										5.00	36	1	11									
109	4.00	51		7										3.50	25		3									
110	5.00	47		10				1	1		2			4.50	27		1						2	1		
111	2.00	63		3				1						5.00	77		8				2					
112	4.50	123		9		1		1	1					5.00	98		11		1		1	2				
115	4.25	72		8		1		1	1					2.00	41		8		1		1					
119	4.50	161		10				1	1					4.00	71		5		5							
121	7.50	98		6							2			6.00	71		8		4		2	3		1		
127	5.00	72		4				1						5.00	31		8				1			1		
128	4.00	103		9		2								4.50	61		5									
132	3.00	98		8				1			1			3.00	62		6									
133	3.00	53		5										3.00	27		4									
135	2.00	104		11										2.00	73		8									
148	4.00	21		8										4.00	27		6									
149	3.50	23		2				1	1					4.00	63		6			1						
150	4.50	32		4			1	1						5.00	30	1	7									
154	2.50	36		5		1			1					1.50	11		0									
162	3.50	53		9		2		1			1			3.00	31		5				1					
163	3.50	81		10		1		2						2.50	37		8		1				1			
168	4.00	83		8		4		2	1	1	1			3.50	81		6		1		2	1	1	1		
169	5.00	146		6		2		2						6.00	138		8		2		1					
170	4.00	121		3				1						1.50	96		4		3		1					
182	2.00	52		2				2						2.00	51		1									
183	3.00	64		3				1						3.00	45		3				1					
184	3.00	84		5		2		3	2					3.00	63		4				2					
185	4.00	85	1	4					1					4.00	64		3				3					
186	4.50	102		8				2						4.00	66		8									
187	5.00	125		8		1		3						3.50	69		6		2		1					
188	1.50	67		2				1						1.50	41		6				1					
202	3.00	78		2				2	0					3.00	43		8				2	1				
203	1.50	45		0				0			1			1.50	38		4				1					
207	3.00	31		2				1						2.00	48		6				1					
208	2.00	17		2										2.00	30		2									
209	2.50	41		1					1					1.50	49		3					1				
211	3.00	22		4				0						3.00	24		1				1					
212	3.50	52		3										4.00	44		4									
213	5.50	61		8				2						5.50	72		10				0					
214	5.00	79		4		0		4	1					5.00	55		5		1		3	0				
225	3.00	81		8		1		1						3.00	79		3		2		0					
226	6.50	48		8				1				1		5.00	35		8				0				0	
227	4.50	36		5				1				0		5.00	28		5				1				1	
228	4.00	14		2				1						5.00	29		1				1					
243	4.00	47		3			1	1						4.00	44		5			0	1					
244	3.00	79		2				1	2					3.00	59		1				0	1				

Appendix Table 18. Catch Data Log F/V Friendship 2007-3

	Experimental Dredge								Control Dredge							
	Scallop	Skates	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Fourspot Fld.	Sand Dab	Scallop	Skates	Monk	Summer Fld.	Grey Sole	Yellowtail Fld.	Fourspot Fld.	Sand Dab
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
1	2.0	48	2						2.0	45	2					
2	5.0	110	3						5.0	83	2					
3	1.8	50					1		0.8	57					0	
4	3.0	65	4			0	1		4.0	45	3			1	1	
5	5.0	137	10			0	0		5.0	127	8			1	4	
6	6.0	142	11				1		5.5	165	5				2	
7	3.0	108	3						2.5	86	3					
8	4.0	139	5						3.0	114	8					
9	3.0	73	3		1		2		3.5	72	0		0		0	
10	1.0	38				0			1.0	24				1		
12	1.5	72	0		0				2.0	54	1		1			
13	4.0	76	2			1	1		4.5	62	2			0	0	
22	2.0	74	4	1	0	0			2.5	105	9		1	1		
23	2.0	87	1						2.5	102	4					
24	4.5	114	2				1		3.5	74	4				1	
25	3.0	65	2			1	2		3.0	58	3			0	0	
26	1.0	48	5		1		1		1.0	42	7		0		0	
27	1.0	23	1						1.0	14	0					
28	0.5	9	0						0.8	9	2					
29	0.5	5	2						0.5	12	0					
40	2.5	59	3				1		3.0	42	3				1	
41	2.5	37	1						2.5	30	0					
42	3.5	78	4			0	1		3.8	58	5			1	0	
43	4.0	103	5			1	2		4.5	66	3			0	0	
44	3.0	118	2			1			3.5	88	2			0		
50	7.0	61	5		0		2		5.0	42	4		1		0	
51	3.0	51	2		0		1		3.0	36	0		1		1	
60	2.5	23	3						2.5	21	2					
66	2.0	41	2		2		1		2.5	46	6		0		0	
68	2.5	81	4						3.0	61	3					
69	3.5	75	0						3.5	64	2					
70	4.0	86	4						3.5	72	2					
83	3.5	73	2				1		3.0	45	0				1	
84	3.0	95	2		0		0		3.5	57	2		1		1	
85	3.5	62	6			3	1		2.5	45	4			0	0	
86	3.0	69	3			2	0		2.5	39	2			0	1	
92	3.3	45	3						3.0	44	0					
93	3.0	61	1						3.0	86	4					
106	2.5	55	3				0		2.5	59	2				1	
107	3.5	41	1				1	0	3.0	36	1				0	1
108	2.5	34	1						2.0	26	0					
120	3.0	65	4						3.0	38	2					
121	2.8	60	2						2.5	54	1					

Appendix Table 19. Catch Data Log F/V Friendship 2007-4

	Experimental Dredge											Control Dredge										
	Scallop	Skates	Monk	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Sea Robin	Red Hake	Silver Hake	Scallop	Skates	Monk	Grey Sole	Yellowtail Fld.	Winter Fld.	Fourspot Fld.	Sand Dab	Sea Robin	Red Hake	Silver Hak
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)	(#)
2	4.50	29	0		1		1					5.50	22	0				0				
3	4.50	37	0									2.50	28	1								
4	1.50	13	1				0					1.50	11	0				1				
5	2.25	41	0				0	1				2.25	30	0				2	1		1	
6	2.50	11	0				3	0				2.50	30	2				1	0			
7	3.50	48	1		0		1		1			3.00	25	0		1		0		1		
8	2.50	13	0									2.00	10	1							1	
9	2.00	9	0									2.00	8	1								
10	4.50	35	1					1			1	3.75	38	2	1			1	1			
12	5.00	37	3									3.50	27	1								
13	4.00	32	6			1		1				3.50	9	5					1			
29	6.00	17	1				0		0	1		5.25	22	1				3		1	2	
32	4.00	41	1				3					3.00	33	1				0				
33	3.00	74	4				2					2.50	66	1				1				
34	3.50	26	4									3.00	30	0								
35	3.00	23	5				1					3.00	26	2				0				
36	3.00	19	1									2.50	16	4								
37	1.75	17	0									1.50	19	1								
38	3.25	17	2	1								2.00	32	4	0							
41	3.25	58	6	1			2				0	2.25	37	1	0			0				1
51	7.25	25	0		0					0		5.25	12	1		1					1	
52	3.00	38	1				1					1.50	28	1				0				
53	2.50	28	2									2.50	17	1								
56	3.00	9	0		1							2.00	7	0		0						
57	3.50	4	2	1			1					4.00	3	0	0			0				
64	3.50	4	0					0	1			4.50	3	0					0	0		
77	2.25	33	0				1		1			3.25	33	2				1		0		
78	2.25	65	0					1				3.00	48	1					1			
79	3.50	52	0				1	2		1		3.25	52	3				2	2		0	
81	3.25	43	0				0	0		1		3.00	33	2				1	0		2	
82	3.00	24	0				1	0				2.75	20	1				0	0			
83	3.25	23	0				0					3.50	22	3				1				
84	2.50	6	0				2	0				2.50	7	1				0	0			
85	3.25	34	1							0		3.50	48	1							1	
86	3.25	76	2				1				1	3.50	77	2				1				0
87	4.00	37	1									3.00	33	1								
88	4.00	25	0									4.25	41	3								
89	4.00	27	1	1				1				3.50	28	2	0				1			
108	2.50	38	0				4			1		1.75	33	1				0			0	
109	2.50	62	0				1					2.00	40	1				0				
110	4.00	55	4				2	2		2		3.00	47	1				0	2		1	
120	3.25	26	0									3.00	16	1								
124	3.00	17	1									3.00	16	1								
125	2.75	14	1									3.00	12	1								
142	2.75	6	0		0							2.75	15	2		1						
145	4.50	14	0					0				5.00	26	0					0			
146	2.50	6	1									2.50	1	0								
147	3.50	96	1				2	2				3.50	116	1				0	2			
149	2.00	46	0									2.00	21									
150	1.00	19	0									1.00	46	0								
151	3.00	56	1				1					3.00	62	1				0				
159	8.00	109	1				1					6.00	91	0				3				
121	8.00	168	1				1					7.00	148	2				0				
162	7.50	161	2									6.50	154	1								
163	7.00	148	1				0					7.00	173	2				1				

Appendix Table 20. Catch Data Log F/V Friendship 2007-5

	Experimental Dredge						Control Dredge					
	Scallop	Skates	Monk	Yellowtail Fld.	Fourspot Fld.	Sand Dab	Scallop	Skates	Monk	Yellowtail Fld.	Fourspot Fld.	Sand Dab
Tow	(bu)	(#)	(#)	(#)	(#)	(#)	(bu)	(#)	(#)	(#)	(#)	(#)
1	11.50	36	2				9.50	29	1			
2	14.00	24	1		1		16.00	30	0		1	
3	17.00	32	2		2		15.00	9	0		0	
4	25.00	59	1				35.00	49	1			
8	23.00	37	7		2		22.00	28	3		3	
9	62.00	21	2		2		65.00	35	1		1	
10	58.00	68	0				55.00	63	1			
11	70.00	45	1		2		58.00	40	1		1	
22	58.00	65	1		0		48.00	52	1		2	
27	85.00	28	3		4		75.00	17	2		0	
31	17.00	52					18.00	48				
33	25.00	30	1	0	0		22.00	21	0	1	1	
34	28.00	34					15.00	16				
37	13.00	31	1		2		6.00	22	3		0	
38	12.00		4				11.00		1			
39	14.00	56	1		1	1	9.00	37	1		0	0
41	40.00	101	3		0		35.00	87	1		1	
42	25.00	25	1		1		15.00	20	0		0	
43	55.00	91	2		1		40.00	77	0		1	

Appendix Table 21. Skate Length Data F/V Celtic 2006-1

TOW #	1	1	2	2	3	3	4	4	6	6	7	7	TOTAL #	TOTAL #	%	%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control
LENGTH (cm)																
16-20											1		1	0	1%	0%
21-25	4												4	0	2%	0%
26-30	2	1				1				1		2	2	5	1%	3%
31-35	4	1			1	1		3		2	1	2	6	9	3%	5%
36-40	11	9	7		5	5		5	1	6		5	24	30	14%	16%
41-45	19	24	20	13	17	23	12	5	11	15	10	11	89	91	51%	48%
46-50	9	8	10	12	6	10	8	7	7	5	4	8	44	50	25%	27%
51-55	1			1				1	1		2	1	4	3	2%	2%
TOTAL MEASURED	50	43	37	26	29	40	20	21	20	29	18	29	174	188		

Appendix Table 22. Monkfish Length Data F/V Celtic 2006-1

TOW #	1	1	2	2	3	3	4	4	6	6	7	7	TOTAL #	TOTAL #	%	%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control
LENGTH (cm)																
21-25												1	0	1	0%	1%
26-30		1						1				1	0	3	0%	3%
31-35		1				1	1	2	1	1	1		3	5	6%	6%
36-40		9	3		1		3	2			2	2	9	13	17%	15%
41-45		25	1	2	1	2	4	2			5	3	11	34	21%	40%
46-50	2		2	1	5	3		3	3	3	3	5	15	15	28%	17%
51-55	2				2	2		2	1	1	1	1	6	6	11%	7%
56-60	2					1			2		1	2	5	3	9%	3%
61-65	1		1									1	2	1	4%	1%
66-70											2	1	2	1	4%	1%
71-75													0	0	0%	0%
76-80				1									0	1	0%	1%
81-85						1							0	1	0%	1%
86-90						1				1			0	2	0%	2%
TOTAL MEASURED	4	36	6	3	9	9	8	12	7	5	13	17	53	86		

Appendix Table 23. Summer Flounder Length Data F/V Celtic 2006-1

TOW #	1	1	4	4	6	6	7	7	10	10	TOTAL #	TOTAL #	%	%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control
LENGTH (cm)														
31-35						1					0	1	0%	6%
36-40	1	1		2			6	1			7	4	54%	24%
41-45											0	0	0%	0%
46-50								3	1		1	3	8%	18%
TOTAL MEASURED	4	36	6	3	9	9	8	12	7	5	13	17		

Appendix Table 24. Yellowtail Flounder Length Data F/V Celtic 2006-1

TOW #	1	1	4	4	3	3	4	4	6	6	7	7	10	10	TOTAL #	TOTAL #	%	%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control
LENGTH (cm)																		
21-25													1		1	0	5%	0%
26-30	4		1	1	1	1		1		3	1	1			7	7	33%	78%
31-35	5							1							5	1	24%	11%
36-40	7														7	0	33%	0%
41-45								1					1		1	1	5%	11%
TOTAL MEASURED	16	0	1	1	1	1	0	3	0	3	1	1	2	0	21	9		

Appendix Table 25. Four Spot Flounder Length Data F/V Celtic 2006-1

TOW #	1	1	2	2	3	3	4	4	6	6	7	7	10	10	TOTAL	TOTAL	%	%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control
LENGTH (cm)																		
15-20								1						1	0	2	0%	6%
21-25	1							2			1			1	2	3	7%	10%
26-30	4	3	3	1		2		4	1	1	1		5	2	14	13	48%	42%
31-35	3	5	4			2				1	2		1	1	10	9	34%	29%
36-40	2	2	1			1		1							3	4	10%	13%
TOTAL MEASURED	10	10	8	1	0	5	0	8	1	2	4	0	6	5	29	31		

Appendix Table 26. Scallop Shell Height Data F/V Celtic 2006-1

TOW #	1	1	2	2	3	3	4	4	6	6	7	7	9	9	TOTAL #	TOTAL #	%	%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control
SHELL HEIGHT (mm)																		
70-74								1							0	1	0%	0%
75-79								0							0	0	0%	0%
80-84								1							0	1	0%	0%
85-89								0					1		1	0	0%	0%
90-94	1					1	3	4		1	1		2	1	7	7	1%	1%
95-99	0				3	0	4	9		0	0	2	7	7	14	18	2%	3%
100-104	0				1	5	11	32		4	6	9	10	8	28	58	5%	9%
105-109	0			2	5	10	31	57	5	9	16	20	20	20	77	118	13%	17%
110-114	0	1		0	16	18	17	37	15	19	17	8	13	17	78	100	13%	15%
115-119	1	0	4	9	17	25	18	13	20	15	24	25	11	7	95	94	16%	14%
120-124	1	2	10	7	16	9	4	2	13	23	24	28	9	2	77	73	13%	11%
125-129	4	1	4	6	14	15	3	1	14	9	8	13	4	3	51	48	8%	7%
130-134	1	1	6	6	17	12	1	7	11	12	10	7	2		48	45	8%	7%
135-139	0	2	13	12	16	12	1	1	10	9	8	3			48	39	8%	6%
140-144	3	4	15	18	5	3			4	5	7	1			34	31	6%	5%
145-149	7	7	12	12	5	2			1			1			25	22	4%	3%
150-154	4	8	5	6	2				1						12	14	2%	2%
155-159	11	4	3	2											14	6	2%	1%
TOTAL MEASURED	33	30	72	80	117	112	93	165	94	106	121	117	79	65	609	675		

Appendix Table 27. Skate Length Data F/V Celtic 2006-2

TOW #	1	1	2	2	3	3	4	4	6	6	49	49	70	70	TOTAL #	TOTAL #	%	%
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	Experimental	Control	Experimental	Control
LENGTH (cm)																		
16-20										1			1		1	1	0%	0%
21-25			1			1			1	1				1	2	3	1%	1%
26-30	2	7	8	7	3	4		1		3			1		14	22	6%	7%
31-35	2	1		3	3	6			1	2					6	12	3%	4%
36-40	2	1	3	2	2	3	2	1		4		1			9	12	4%	4%
41-45	5	12	10	13	9	14	6	4	7	7			3	7	40	57	17%	18%
46-50	2	27	38	38	28	43	16	22	17	15	2	11	26	40	129	196	56%	61%
51-55		1	6	6	2	1	3	1	2		6		9	8	28	17	12%	5%
56-60							1	1	1		1				3	1	1%	0%
TOTAL MEASURED	13	49	66	69	47	72	28	30	29	33	9	12	40	56	232	321		

Appendix Table 28. Barndoor Skate Length Data F/V Celtic 2006-2

E = Experimental Dredge C= Control Dredge

TOW #	1	1	2	2	4	4	5	5	6	6	14	14	15	15	16	16	17	17	19	19	24	24	25	25	40
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
LENGTH (cm)																									
16-20																									
21-25																									
26-30							1												1						
31-35			2	1						1							1	1		1	4	2	2		
36-40				2			3									1				3	1	1	2	3	
41-45					2		2	1	2		1		2	2			2	2		3	3	4	3	7	
46-50			1			1	1	3			3	3		2	1	1	2			3	4		3		
51-55			4	1	1		5	2		2	1		1	4	2			1	1	2	1	4	4	1	
56-60			2	2	1			1		1		1				1	2	1		3			3	2	
61-65								1					1	1											1
66-70			1					1				1		1	1		1				1		1		
71-75								1																	
76-80							1																		
81-85																									
86-90																									
91-95																									
96-100		1																							
101-105																									
106-110																					1				
111-115																									
116-120							1										1								
121-125								1																	
TOTAL MEASURED	0	1	10	6	4	1	14	11	2	4	5	5	4	10	4	3	9	5	2	15	15	11	18	13	1

TOW #	40	49	49	58	58	60	60	70	70	83	83	98	98	110	110	144	144	145	145	151	151	152	152	154	154
DREDGE	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																									
16-20																							1		
21-25												1													
26-30					2	2				2				1							1				
31-35					1	2						1	1	3	3		3			1		2	2	1	
36-40	1									4	2		2	2	3	1	3	4			1	3		1	
41-45	1	1			1	1	1		2	1	1	2		4	3	8	5		1	1	2	1	2	2	2
46-50					2	1		1	2	1	1			2	1	10	4	1		1	3	2	1		
51-55				1				1		3	1	2	1	2	1	4	5	2	2	2	1	1		2	3
56-60	1			1							1		2		1	5	3				1		1		1
61-65										1			1			1	3		1						
66-70															2						1		1		
71-75														2											
76-80																									
81-85																1									
86-90																									
91-95																									
96-100																							1		
101-105																									
106-110																									
111-115																					1				
116-120																									
121-125																									
TOTAL MEASURED	3	1	0	2	6	6	1	2	4	12	6	6	7	16	14	30	26	7	4	5	11	9	9	6	6

TOW #	156	156	164	164	166	166	175	175	182	182	183	183	187	187	196	196	201	201	222	222	234	234	237	237	TOTAL	TOTAL	% of CATCH MEASURED	% of CATCH MEASURED
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																												
16-20	1																								1	1	0%	0%
21-25																									1	0	0%	0%
26-30							1																		8	3	3%	1%
31-35	1	1			1				1			1							1	2					23	20	9%	9%
36-40	2		2								1					1				1		1	1	1	27	26	11%	12%
41-45			1	2	2	2	1		3		1	1	3	3	1				2	1	1				53	49	21%	23%
46-50				2	2						1	1					1		2	1		2		2	40	35	16%	17%
51-55		3				1	2	2		1	1	1									2	3		1	45	43	18%	20%
56-60		2			1	2					1	1		3	1		1	1		1	2	2	1		21	35	8%	17%
61-65		1	4												1	1				1	1				10	10	4%	5%
66-70												1										1			5	9	2%	4%
71-75																									2	1	1%	0%
76-80											1						1		1						4	0	2%	0%
81-85				1						1	1														2	2	1%	1%
86-90																									0	0	0%	0%
91-95																1									0	1	0%	0%
96-100						1						1													0	4	0%	2%
101-105								1				1													0	2	0%	1%
106-110											1												1		3	0	1%	0%
111-115		1												1				1				1		1	0	6	0%	3%
116-120			1																	1					3	1	1%	0%
121-125												1			1				1		1	1			3	3	1%	1%
TOTAL MEASURED	4	8	8	5	6	6	4	3	4	2	8	9	3	7	4	3	3	2	7	8	7	11	3	5	251	212		

Appendix Table 29. Summer Flounder Length Data F/V Celtic 2006-2

E = Experimental Dredge C= Control Dredge

TOW #	3	3	6	6	14	14	15	15	17	17	24	24	25	25	60	60	70	70	182	182	183	183	185	185	187	187	196	196	201	201	222	222	234	234	TOTAL	TOTAL	% of CATCH MEASURED	% of CATCH MEASURED
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																						
36-40																	1			1															1	1	7%	6%
41-45		1						1	1	1	1									1					2				1						5	4	33%	24%
46-50																1						1		1			1								1	3	7%	18%
51-55	1				1									1						1			2	2	2	1	1	1			1	2		1	8	9	53%	53%
56-60														1						1		1		2	1		1							1	2	6	13%	35%
61-65				1																						1									0	2	0%	12%
66-70																													1						1	0	7%	0%
TOTAL MEASURED	1	1	0	1	1	0	0	1	1	1	1	0	0	2	0	1	1	0	0	4	0	2	2	5	5	2	3	1	2	0	1	2	0	2	15	17		

Appendix Table 30. Monkfish Length Data F/V Celtic 2006-2

MONK LENGTHS CELTIC-2006-2				E = Experimental Dredge			C= Control Dredge														
TOW #	1	1	2	2	3	3	4	4	5	5	6	6	14	14	15	15	16	16	19	19	25	25
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																						
21-25																						
26-30		1	1	1		1																
31-35		2		1		1			2				4	1	3			1		1	1	
36-40	8	4	6	3	4	2	1			1	1		4	9	6	4	2	2	4	3	1	3
41-45	5	4	5	2	6	1	10	2		3	1	1	12	14	7	4	4	3	6	2	3	1
46-50	4	4	4	4	3	2	2				3	3	4	4	8	3	2	5	2	3	2	6
51-55	6	7	1	4	3	2	3	3	2	5	3	4	4	2	4	1	6		3	2	5	1
56-60	6	5	2	2	2		1	2	4	2	2		2		1	1	1	2	2	3	5	1
61-65		3	1	1					1	1		1		4	1				1		1	2
66-70	1	1				1									2	1			1		1	2
71-75	1	1												2								
76-80															1					1		
81-85			1																			
86-90																					1	
TOTAL MEASURED	31	32	21	18	18	10	17	7	9	12	10	9	30	36	33	14	15	13	19	15	20	16

TOW #	39	39	40	40	49	49	58	58	60	60	70	70	83	83	98	98	110	110	144	144	145	145	152	152	182	182	222	222	TOTAL	TOTAL	% of CATCH MEASURED	% of CATCH MEASURED
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																
21-25																													0	0	0%	0%
26-30	1						1		1	1		1				1				1									4	7	1%	2%
31-35		1	1	1			3		1	2		1	1	1	2	3	1	2		2		2	5	1					24	23	6%	7%
36-40	1			1	4	2	3	6	3		3	2	1		1		3	5	1	3	10	3	6	6	4	2	4	4	81	65	20%	18%
41-45	2	1	1	3	3	3	6	5	6	2	5	3	3	9	6	4	5	2	8	6	9	8	5	3	3	4	6	2	127	92	31%	26%
46-50	3	5	2	3	5	4	3	2	4	6	4	4	3		2	3	3	1		4	7	5	3	3	3	2	2	2	78	78	19%	22%
51-55	2		1	4	2	4	3	5	4	6	4	6	4	3	5	3	2	4	4	4	8	7	2	4	8	4	2	3	91	88	22%	25%
56-60	3	1	2			1	1	1	1	2	4	1	3	1	4	1	1	1	5	3		3	1	2	1	3	1		55	38	14%	11%
61-65				1		1		1	2	1	2	1	2		2	2		1	1	3					1	4	3		18	27	4%	8%
66-70	1					2				1				2							1				1				8	10	2%	3%
71-75									1						1									1					3	4	1%	1%
76-80												1				1													1	3	0%	1%
81-85																			1										2	0	0%	0%
86-90								1			1																		2	1	0%	0%
TOTAL MEASURED	13	8	7	13	14	17	20	21	23	21	23	20	17	16	23	18	15	16	20	26	35	28	22	20	21	19	18	11	405	353		

Appendix Table 31. Yellowtail Flounder Length Data F/V Celtic 2006-2

YELLOWTAIL LENGTHS CELTIC-2006-2							E = Experimental Dredge																														C= Control Dredge			
TOW #	1	1	2	2	14	14	15	15	16	16	17	17	19	19	25	25	40	40	49	49	60	60	70	70	83	83	98	98	110	110	182	182	187	187	222	222	TOTAL	TOTAL	%	%
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																								
21-25		1																																1			0	2	0%	3%
26-30				1			1	1				1	4	1		1		1			1		1	1		2	1	1	1	4	2	1	1		1	2	13	17	21%	25%
31-35		1				2		3		2	1		1	3	3	5	1				4		2		2	3	6	5	4	2	2	2	1	2	1	2	28	32	44%	46%
36-40			1			1									2	4	1				3		1		2	1	2	2	1	1	1	1	3	1		2	17	13	27%	19%
41-45							1											2									1			1			2		1	2	5	5	8%	7%
46-50																				1																	0	1	0%	1%
TOTAL MEASURED	0	2	1	1	0	3	2	4	0	2	1	1	5	4	5	10	2	3	0	0	8	0	4	1	4	6	10	8	6	8	5	4	7	4	3	8	63	69		

Appendix Table 32. Skate Length Data F/V Westport 2006-1

SKATE LENGTHS WESTPORT-2007-1	E = Experimental Dredge					C= Control Dredge										
TOW #	1	1	2	2	3	3	4	4	6	6	7	7	TOTAL	TOTAL	% of CATCH MEASURED	% of CATCH MEASURED
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																
16-20											1		1	0	1%	0%
21-25	4												4	0	2%	0%
26-30	2	1				1				1		2	2	5	1%	3%
31-35	4	1			1	1		3		2	1	2	6	9	4%	5%
36-40	11	9	7		5	5		5	1	6		5	24	30	14%	16%
41-45	19	24	20	13	17	23	12	5	11	15	10	11	89	91	52%	49%
46-50	9	8	10	12	6	10	8	7	7	5	4	8	44	50	26%	27%
TOTAL MEASURED	49	43	37	25	29	40	20	20	19	29	16	28	170	185		

Appendix Table 33. Monkfish Length Data F/V Westport 2006-1

MONK LENGTHS WESTPORT-2006-1	*E = Experimental Dredge*				*C= Control Dredge*																					
TOW #	**2**	**2**	**3**	**3**	**8**	**8**	**9**	**9**	**13**	**13**	**18**	**18**	**19**	**19**	**20**	**20**	**24**	**24**	**27**	**27**	**31**	**31**	**36**	**36**	**TOTAL**	**TOTAL**	**% of CATCH MEASURED**	**% of CATCH MEASURED**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																												
21-25																									**0**	**0**	0%	0%
26-30																									**0**	**0**	0%	0%
31-35											1	1		1						1					**1**	**3**	1%	1%
36-40	2			2		1	1	3		4	4		2	3		1		1	2	6	3	1	2	1	**16**	**23**	10%	11%
41-45	5	2	4	2	8	7	3	2	1	6	8	9	3	8	3	1	1	6	3	7	5		5	4	**49**	**54**	30%	25%
46-50	8		4		4	13		2	3	6	6	4	3	7	7	5	2	3	2	5	3	6	2	3	**44**	**54**	27%	25%
51-55	5	4	2	2	5	16	1	7	2	6	4	7	2	10	7	7	6	8	5	7	7	7	5	3	**51**	**84**	32%	39%
56-60	3	5	2	3	3	8	4	2	7	9	6	12	7	6	6	5	2	2	8	8	3	8	6	3	**57**	**71**	35%	33%
61-65		2			3	2		4	2	5	6	2	2	3	1	2	6	5	4	8	1	1	1	3	**26**	**37**	16%	17%
66-70	1					1	2		1	1		1		1			1	2		3				1	**5**	**10**	3%	5%
71-75					1		1										1			1			1		**4**	**1**	2%	0%
76-80									2												1			1	**3**	**1**	2%	0%
81-85												1						1							**0**	**2**	0%	1%
86-90																									**0**	**0**	0%	0%
TOTAL MEASURED	24	13	12	9	24	48	12	20	18	37	35	37	19	39	24	21	19	28	24	46	23	23	22	19	**161**	**218**		

Appendix Table 34. Barndoor Skate Length Data F/V Westport 2006-1

BARNDOOR SKATE LENGTHS WESTI	*E = Experimental Dredge*									*C= Control Dredge*								
TOW #	**2**	**2**	**7**	**7**	**8**	**8**	**18**	**18**	**19**	**19**	**20**	**20**	**27**	**27**	**TOTAL**	**TOTAL**	**% of CATCH MEASURED**	**% of CATCH MEASURED**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																		
16-20															**0**	**0**	0%	0%
21-25															**0**	**0**	0%	0%
26-30															**0**	**0**	0%	0%
31-35	3	2													**3**	**2**	25%	20%
36-40	1	1						1							**1**	**2**	8%	20%
41-45	2	1													**2**	**1**	17%	10%
46-50		2	1					1					1		**2**	**3**	17%	30%
51-55			1												**1**	**0**	8%	0%
56-60										1		1			**0**	**2**	0%	20%
61-65															**0**	**0**	0%	0%
66-70					1			1							**1**	**1**	8%	10%
71-75											1				**1**	**0**	8%	0%
76-80	1	1													**1**	**1**	8%	10%
81-85										1					**0**	**1**	0%	10%
86-90															**0**	**0**	0%	0%
91-95															**0**	**0**	0%	0%
96-100															**0**	**0**	0%	0%
101-105															**0**	**0**	0%	0%
106-110															**0**	**0**	0%	0%
111-115															**0**	**0**	0%	0%
116-120															**0**	**0**	0%	0%
121-125										1					**0**	**1**	0%	10%
TOTAL MEASURED	7	7	2	0	1	0	0	3	0	3	1	1	1	0	**12**	**10**		

Appendix Table 35. Yelllowtail Flounder Length Data F/V Westport 2006-1

YELLOWTAIL LENGTHS WESTPORT-2007-1									*E = Experimental Dredge*																	*C= Control Dredge*			
TOW #	**2**	**2**	**3**	**3**	**7**	**7**	**8**	**8**	**9**	**9**	**13**	**13**	**18**	**18**	**19**	**19**	**20**	**20**	**24**	**24**	**27**	**27**	**31**	**31**	**36**	**36**	**TOTAL**	**TOTAL**	%	%
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																														
																		1						2			**0**	**3**	0%	5%
16-20	1	2																									**1**	**2**	4%	3%
21-25	1																										**1**	**0**	4%	0%
26-30	1	1						1					1									2	1				**3**	**4**	12%	6%
31-35	6	11	1	1	1			1		1		4	1					1			1	6		2	1	3	**11**	**30**	44%	45%
36-40		1			1			1			1	4		1	1	1	1	1	2	1		8	3	7	1	5	**10**	**30**	40%	45%
41-45		1																								1	**0**	**2**	0%	3%
46-47														2													**0**	**2**	0%	3%
TOTAL MEASURED	9	16	1	1	2	0	0	3	0	1	1	8	2	3	1	1	1	3	2	1	1	16	4	11	2	9	**25**	**66**		

Appendix Table 36. Winter Skate Length Data F/V Westport 2006-1

WINTER SKATE LENGTHS WESTPO	*E = Experimental Dredge*									*C= Control Dredge*																					
TOW #	**1**	**1**	**2**	**2**	**3**	**3**	**4**	**4**	**6**	**6**	**7**	**7**	**8**	**8**	**9**	**9**	**13**	**13**	**18**	**18**	**19**	**19**	**20**	**20**	**24**	**24**	**27**	**27**	**31**	**31**	**36**	**36**	**TOTAL**	**TOTAL**	**%of CATCH MEASURED**	**%of CATCH MEASURED**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																																				
51-55	1			1				1	1		2	2									2	2	1		2	2		3					**9**	**11**	100%	100%
56-60													1	1		1				1	5		1		1				2				**8**	**5**	89%	45%
61-65											2	1		1		1	1	1					1					1					**4**	**5**	44%	45%
66-70														2				2		1	1							2				1	**1**	**8**	11%	73%
71-75														1		1		1		1				1									**0**	**5**	0%	45%
76-80											1																						**1**	**0**	11%	0%
81-85																																	**0**	**0**	0%	0%
86-90																																	**0**	**0**	0%	0%
TOTAL MEASURED	1	0	0	1	0	0	0	1	1	0	5	3	1	5	0	3	1	4	0	3	8	2	3	1	3	2	0	6	0	2	0	1	**9**	**11**		

Appendix Table 37. Monkfish Length Data F/V Westport 2006-2

MONK LENGTHS WESTPORT-2006-2					*E = Experimental Dredge*					*C= Control Dredge*																		
TOW #	**2**	**2**	**3**	**3**	**4**	**4**	**5**	**5**	**17**	**17**	**30**	**30**	**42**	**42**	**44**	**44**	**53**	**53**	**74**	**74**	**105**	**105**	**108**	**108**	**114**	**114**	**TOTAL**	**TOTAL**	**% of CATCH MEASURED**	**% of CATCH MEASURED**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																														
21-25								1																			**0**	**1**	0%	1%
26-30							1			1							1			2							**2**	**3**	2%	2%
31-35	1			1				2			1	1					2	1	1								**5**	**5**	4%	3%
36-40				1	1	2	1	1									3	1				1					**5**	**6**	4%	4%
41-45	3		4	3	5	5	6	6	4	7	3	1			1	2	1	2				2		1	1		**28**	**29**	22%	19%
46-50	1	3	2	8	4	11	6	6	12	13	7	4	1	1	1	1	6	3	3				2	1	1		**46**	**51**	36%	34%
51-55	3	5	2	2	7	6	6	5	7	12	7	5	2	4		1	6	5	1	4		3			1	3	**42**	**55**	33%	37%
56-60	1	1	6	5	5	6	2	4	7	4	2	5	1	1		2		5	2	3		2	3			1	**29**	**39**	23%	26%
61-65	3	2	2	5	1	2	2	3		1	4	3		2		1	1	1		1	1	1	1		2		**17**	**22**	13%	15%
66-70			2		1		1	2	1		2	1					3	2	1	2	2	1	1				**14**	**8**	11%	5%
71-75					1				1		1								1		1	1					**5**	**1**	4%	1%
76-80																											**0**	**0**	0%	0%
81-85																											**0**	**0**	0%	0%
86-90																											**0**	**0**	0%	0%
TOTAL MEASURED	12	11	18	25	25	32	25	30	32	38	27	20	4	8	2	7	23	20	9	12	4	11	7	2	5	4	**128**	**150**		

Appendix Table 38. Yellowtail Flounder Length Data F/V Westport 2006-2

YELLOWTAIL LENGTHS WESTPORT-2006-2 — *E = Experimental Dredge* — *C= Control Dredge*

TOW #	2	2	3	3	4	4	5	5	6	6	7	7	8	8	16	16	17	17	18	18	19	19	20	20	21	21	28	28	29	29	31	31	32	32	38	38	39	39	41	41	42	42	43	43	44	44	50	50	51	51	52	52	54	54	55	55	63	63	74	74	75	75	76	76	82	82	84	84	105	105	108	108	114	114	121	121	126	126	TOTAL	TOTAL	%	%
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																																																																			
15-20		1		1		1		2		1				2														4	2	2						1				2								1	1							1	1				1	2	1						1	1							1		8	22	3%	2%
21-25	1	7	1	2	1	6	1	12	1	7	1		2	13	1	1		3		3	1			8	1	5	9	13	5	21	2	7	1	2	1	16	1	9		11		2					1	3		1						4	5	4		5	2	4	2	11		4		3	1		1	2							42	189	13%	17%
26-30		1	11	2	1				1	1		1		1									1			1													5	7		1			1											1	1			2										1		1							21	20	7%	2%
31-35	1	2	6	23		22	5	24	12	26	5	7	5	17		1	1	3	3			2	1	3	4	5	2	5	1	6	1	1	3	4	1	2	1	8	12	64	1	1	1	4	1	3		7		1				5	9	17	3	8	1	4	1	13	5	21	1		3	8	7	16	6	17	2	14		1	6	10	111	375	35%	34%
36-40	1	9	4	20	1	27	2	19	7	20	4	2	3	13		3		1		1	1	3		5	1	4	4	5	2	3	1	6		1	2	5		5	4	10		1				1				1	1		5	1	7	13	4	14	1	9	5	7	5	22		2	1	9	11	29	2	10	6	18	4	1	8	7	97	307	31%	28%
41-45		2		5	1	4	1	6	6	6	1	22	2	10											1				1	1										1									1					1	3	3	3	3		2	1	1	2	5					1	16	2	12	3	8			4	13	33	121	10%	11%
46-50		1		8		1				1	1	23	1																											1																				1			1	2		1				4	1			4		2	1		5	49	2%	4%
51-55				2								9																																																																			0	11	0%	1%
56-60				5								1																																																																		0	6	0%	1%
61-65				5								1																		1																																																	0	7	0%	1%
TOTAL MEASURED	3	23	22	73	4	61	9	63	27	62	12	66	13	56	1	5	1	7	3	4	2	5	2	16	7	15	15	27	11	34	4	14	4	7	4	24	2	22	21	96	1	5	1	4	2	4	1	11	2	3	1	0	5	7	19	39	17	29	2	23	10	27	16	61	1	7	4	20	21	67	12	42	11	44	4	4	20	30	317	1107		

Appendix Table 39. Barndoor Skate Length Data F/V Westport 2006-2

BARNDOOR SKATE LENGTHS WESTI — *E = Experimental Dredge* — *C= Control Dredge*

TOW #	2	2	3	3	4	4	5	5	6	6	7	7	8	8	16	16	17	17	18	18	19	19	20	20	21	21	28	28	29	29	30	30	31	31	32	32	38	38	39	39	41	41	42	42	43	43	44	44	50	50	51	51	52	52	55	55	63	63	74	74	75	75	76	76	84	84	105	105	108	108	114	114	117	117	121	121	126	126	113	113	TOTAL	TOTAL	% of CATCH MEASURED	% of CATCH MEASURED
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																																																																						
16-20																																																																																	0	0	0%	0%
21-25																																																																																	0	0	0%	0%
26-30																														1							1										1																																		2	1	2%	1%
31-35													1	1																1										2		2						1		1	1												1																		3	8	3%	5%
36-40				1		2																		1		1				1																1	3	1								2					1																				4	10	4%	6%
41-45											2	3	2			1		1						1	1		1	1		1						1							1	7			2	3					1				1						1																		12	19	12%	12%
46-50				1			1				2	2	1											1	1	1	2				1	1	2									1	4	5		2	3	3																1								1									17	19	17%	12%
51-55		1		2	1																1															1						1	1	6			1	7										1				1																1			4	21	4%	13%
56-60	1				1			1		1		1	1			1				2	1		1													1			1			1	5	5		1	3	5						1										2																	14	22	14%	14%
61-65					1	1		4	1		1	1												1		2	1																2	1		3		2				1					1	1		1														1			1				8	19	8%	12%
66-70			1		1				1											2			1		1	1	1		1						1													3																		1		1						1	1	1					9	11	9%	7%
71-75					2	1															1	1			1			1		1						1					1	1																			1															1					6	7	6%	4%
76-80				1				1											1																		1			1													1															1							1						4	4	4%	3%
81-85					1	1														1																																																							1	1		1			2	4	2%	3%
86-90						1																																	1																																		1					2			2	3	2%	2%
91-95					1																																																																							1					1	1	1%	1%
96-100												1															1																																	1									1	1					1			1		1	3	5	3%	3%
101-105																																																																												1					0	1	0%	1%
106-110																																																																																	0	0	0%	0%
111-115									2																																																						1					1											1		4	1	4%	1%
116-120																													1																																						1												1		3	0	3%	0%
121-125																																																																1													1				1	1	1%	1%
TOTAL MEASURED	1	1	1	5	8	6	1	6	4	1	5	8	5	1	0	2	0	1	1	5	3	1	2	4	4	5	6	2	2	5	1	1	2	0	1	4	2	0	2	3	1	6	13	25	0	7	13	25	0	1	1	1	2	1	0	2	2	2	0	2	2	1	3	4	0	1	1	3	1	1	0	1	1	2	4	5	2	5	2	1	99	157		

Appendix Table 40. Summer Flounder Length Data F/V Westport 2006-2

FLUKE LENGTHS WESTPORT-2006-2	*E = Experimental Dredge*					*C= Control Dredge*																													
TOW #	**4**	**4**	**6**	**6**	**7**	**7**	**19**	**19**	**21**	**21**	**31**	**31**	**32**	**32**	**41**	**41**	**50**	**50**	**54**	**54**	**55**	**55**	**63**	**63**	**75**	**75**	**84**	**84**	**105**	**105**	**117**	**117**	**TOTAL**	**TOTAL**	%	%
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																																				
51-55		1	1	1									1									1											**2**	**3**	18%	23%
56-60			1	2					1																								**2**	**2**	18%	15%
61-65												1														1		1			1	1	**1**	**4**	9%	31%
66-70								1							1																1		**2**	**1**	18%	8%
71-75					2							1						1		1			1						1				**4**	**3**	36%	23%
TOTAL MEASURED	0	1	2	3	2	0	0	1	1	0	0	2	1	0	1	0	0	1	0	1	0	1	1	0	0	1	0	1	1	0	2	1	**11**	**13**		

Appendix Table 41. Winter Skate Length Data F/V Westport 2006-2

WINTER SKATE LENGTHS WESTPORT-200	*E = Experimental Dredge*					*C= Control Dredge*																	
TOW #	**3**	**3**	**4**	**4**	**5**	**5**	**7**	**7**	**8**	**8**	**16**	**16**	**17**	**17**	**18**	**18**	**19**	**19**	**20**	**20**	**21**	**21**	**28**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**
LENGTH (cm)																							
51-55			1	2	1	2		3	2	1		2											2
56-60	2		1	1	1	3	1	1	1	2	2	1	4				5		1	3	5	1	3
61-65	1	1	1	2		1		1		1				1	1		1	1		1		1	2
66-70		1	1	1				1	1				1								1	2	1
71-75									1														
76-80		1																					
81-85																		1					
86-90																							
TOTAL MEASURED	3	3	4	6	2	6	1	6	5	4	2	3	5	1	1	0	6	2	1	4	6	4	8

TOW #	**28**	**29**	**29**	**30**	**30**	**31**	**31**	**32**	**32**	**39**	**39**	**41**	**41**	**50**	**50**	**52**	**52**	**53**	**53**	**54**	**54**	**55**	**55**	**63**	**63**	**74**	**74**
DREDGE	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																											
51-55	2			2				1					1														2
56-60	2	4	4	1	1		1	2		3		1	1	1			1	1	1		1		2	1	2		1
61-65	1	3	2	1		1				1	1				1	1				1	1	1		1			
66-70			1				1				1	1	1										1		1		
71-75	1																				1						1
76-80		2																									
81-85											1																
86-90																											
TOTAL MEASURED	6	9	7	4	1	1	2	3	0	4	3	2	3	1	1	1	1	1	1	1	3	1	3	2	3	0	4

TOW #	**75**	**75**	**76**	**76**	**82**	**82**	**84**	**84**	**105**	**105**	**108**	**108**	**114**	**114**	**117**	**117**	**121**	**121**	**TOTAL**	**TOTAL**	**% of CATCH MEASURED**	**% of CATCH MEASURED**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																						
51-55				1	1			1						1					**10**	**18**	12%	15%
56-60		3	1	2		1	1	1	2	2	1	1		4		2			**45**	**45**	54%	38%
61-65		1				3	1	1	1	1		3	1	2				2	**19**	**29**	23%	24%
66-70		1										1		1				2	**6**	**16**	7%	13%
71-75													1					1	**2**	**4**	2%	3%
76-80				1															**2**	**2**	2%	2%
81-85																		2	**0**	**4**	0%	3%
86-90												2							**0**	**2**	0%	2%
TOTAL MEASURED	0	5		4	1	4	2	3	3	3	1	7							**84**	**120**		

Appendix Table 42. Monkfish Length Data F/V Celtic 2006-3

MONK LENGTHS CELTIC-2006-3					*E = Experimental Dredge*					*C= Control Dredge*																										
TOW #	1	1	2	2	4	4	7	7	10	10	11	11	18	18	19	19	20	20	23	23	31	31	75	75	94	94	98	98	104	104	114	114	137	137	150	150	TOTAL	TOTAL
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																						
16 - 20																																			1		**1**	**0**
21-25	1																													1					1	1	**2**	**2**
26-30	1						2		1	1							1	1							1				1	1						1	**7**	**4**
31-35																			1	1									3	1		2					**4**	**4**
36-40							1						1								1				2				1								**4**	**2**
41-45	1					1	2	2	1	3	1	1				1		4	2			1	1		2		1	1	1	1								**12**	**15**
46-50	1	1		1	2		1	2	2	3	2				2	1		3	1	1	3	1		2	4		1	2		2	1	2		1			**20**	**22**
51-55	4		1		2	2	1	2	1	1		1	3	2		1	8	4	3	4	5	2	3	2	1	7	2	3	1	2	2	1	2		3	1	**42**	**35**
56-60	3	1	1		2		1	4	7	2	2	3	2	2	5	2			5	4	6	9	1		3	3	2	3	1	4	4	2	1	1	2	2	**48**	**42**
61-65	1	1	1		1			2	1	1	2	2	5	2	3	3	3	6	2	4	2	2	1	3	2	1		1	2	1	1	1	1		1	2	**29**	**32**
66-70		1	1				1		1	1			1	2		2	1	1	2	3	1	1		1	1	5	2	2	2	1			2		1	1	**16**	**21**
71-75				1							3	2		1		1	1		1		1	1				2		1									**6**	**9**
76-80																																1				1	**0**	**2**
81-85																																					**0**	**0**
86-90																																					**0**	**0**
TOTAL MEASURED	12	4	4	2	7	3	9	12	14	12	10	9	11	10	10	11	14	19	16	17	19	18	6	8	16	18	8	13	12	14	8	9	6	2	8	9	**191**	**190**

Appendix Table 43. Yellowtail Flounder Length Data F/V Celtic 2006-3

YELLOWTAIL LENGTHS CELITC-2006-3							*E = Experimental Dredge*										*C= Control Dredge*			
TOW #	1	1	2	2	7	7	41	41	99	99	104	104	117	117	139	139	TOTAL	TOTAL	%	%
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																				
21-25	1	1	3	1	1	1	1			3	1	1	5			1	**12**	**8**	4%	3%
26-30	1	6	3				2	1		1		1	1		1		**8**	**9**	3%	3%
31-35	10	9	22	16	2	3	12	33	10	18	9	13	3		18	16	**86**	**108**	31%	35%
36-40	19	6	28	20	12	14	11	21	9	21	14	12	2		15	24	**110**	**118**	40%	38%
41-45	3	1	17	22	6	10	3	8		5	7	5	4		11	6	**51**	**57**	18%	19%
46-50	1		4	4	3			2							3	1	**11**	**7**	4%	2%
TOTAL MEASURED	35	23	77	63	24	28	29	65	19	48	31	32	15	0	48	48	**278**	**307**		

Appendix Table 44. Barndoor Skate Length Data F/V Celtic 2006-3

BARNDOOR SKATE LENGTHS CELTI(	*E = Experimental Dredge*					*C= Control Dredge*																												
TOW #	**1**	**1**	**2**	**2**	**4**	**4**	**10**	**10**	**11**	**11**	**12**	**12**	**14**	**14**	**19**	**19**	**20**	**20**	**21**	**21**	**22**	**22**	**46**	**46**	**92**	**92**	**104**	**104**	**137**	**137**	**TOTAL**	**TOTAL**	**% of CATCH MEASURED**	**% of CATCH MEASURED**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																																		
21-25																							1			1					**1**	**1**	2%	3%
26-30			1																							1					**1**	**1**	2%	3%
31-35																							2		1						**3**	**0**	6%	0%
36-40			1																				2	1							**3**	**1**	6%	3%
41-45						1	1																2		2		1		1		**7**	**1**	15%	3%
46-50																					1				1			1			**2**	**1**	4%	3%
51-55			1	1																1											**1**	**2**	2%	6%
56-60				1			1			1	1														1						**3**	**2**	6%	6%
61-65	1			3																	1					1		1			**2**	**5**	4%	14%
66-70										1											1		1							1	**2**	**2**	4%	6%
71-75	1								1		1			1							1		1			1		1		1	**5**	**4**	11%	11%
76-80										2		1	1	1						1											**1**	**5**	2%	14%
81-85									2																						**2**	**0**	4%	0%
86-90							1		2	1		2	1	1									1								**5**	**4**	11%	11%
91-95									1			1									1										**2**	**1**	4%	3%
96-100													1					1													**1**	**1**	2%	3%
101-105											1																				**1**	**0**	2%	0%
106-110													2									1									**2**	**1**	4%	3%
111-115										1			1			1															**1**	**2**	2%	6%
116-120											1														1						**2**	**0**	4%	0%
121-125																												1			**0**	**1**	0%	3%
TOTAL MEASURED	2	0	3	5	0	1	3	0	6	6	4	4	6	3	0	1	0	1	0	2	5	1	10	1	6	4	1	4	1	2	**47**	**35**		

Appendix Table 45. Scallop Shell Height Data F/V Celtic 2006-3

SCALLOP SHELL HEIGHTS CELTIC-2006-3					*E = Experimental Dredge*						*C = Control Dredge*																			
TOW #	**1**	**1**	**14**	**14**	**44**	**44**	**45**	**45**	**57**	**57**	**58**	**58**	**60**	**60**	**59**	**59**	**73**	**73**	**75**	**75**	**76**	**76**	**90**	**90**	**138**	**138**	**TOTAL**	**TOTAL**	**%**	**%**
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
SHELL HEIGHT (mm)																														
85-89												1															**0**	1	0%	0%
90-94					1		1									1											**2**	1	0%	0%
95-99				2	1	1		1		1						1											**1**	6	0%	1%
100-104	1	0	1	2	2	1		1		1			2	1		1				1							**6**	8	1%	1%
105-109	9	1	2	2	3	1		2	2	2		3	2	1		2				2	1		2				**21**	16	2%	1%
110-114	1	1	2	3	1	2	6	4	2	1	3	3	1	2	3	3	1	1		4	3	1	2		1	2	**26**	27	2%	3%
115-119	8	8	3	6	3	0	3	6	2	1	1		2	2	1	2	3	0	1	1	3	1		1	1	3	**31**	31	3%	3%
120-124	7	6	3	6	7	2	5	2	3	5	3		3	1	1	3	1	1	1	3	2	1	3	5	2	4	**41**	39	4%	4%
125-129	12	14	13	9	14	7	5	19	7	2	6	2	2	2	2	3	2	3	4	3	3	2	4	2	7	6	**81**	74	8%	7%
130-134	12	11	19	13	13	9	10	18	6	12	9	6	3	6	4	21	2	4	2	6	5	12	3	1	9	11	**97**	130	9%	12%
135-139	11	12	25	21	14	25	21	20	18	18	21	20	6	11	18	20	11	9	10	15	16	16	10	17	10	12	**191**	216	18%	20%
140-144	8	13	10	16	19	20	19	11	21	13	18	21	25	20	28	18	9	19	25	22	17	28	22	18	10	11	**231**	230	22%	21%
145-149	11	7	12	9	11	12	6	12	14	20	5	18	24	22	14	9	25	25	19	12	19	10	19	13	19	20	**198**	189	19%	18%
150-154	2	6	2	2	2		8	2	8	9	4	6	7	12	5	0	15	13	3	13	10	2	12	8	11	6	**89**	79	8%	7%
155-159	18	13	1	2	1			1		1		3	4		2	1	6	4	3		3	1		1	4	3	**42**	30	4%	3%
TOTAL PER TOW	100	92	93	93	92	80	84	99	83	86	70	83	81	80	78	85	75	79	68	82	82	74	77	66	74	78	**1057**	1077		

Appendix Table 46. Skate Length Data F/V Friendship 2007-1

SKATE LENGTHS FRIENDSHIP-2007-1

Tow #	3	3	4	4	6	6	10	10	14	14	16	16	19	19	21	21	23	23	25	25	27	27	31	31	33	33	35	35	37	37	39	39	41	41	43	43	45	45	47	47	49	49	53	53	55	55	57	57	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Skate Length (cm)																																																		
16-20		1							2										2	1																											1		4	2
21-25		1	1						1				1						1	2		2		1		1		1		1							1	1			1		2						6	10
26-30				1			1	1					1		4			2	4	2			1	2	1	4		1	2	2		3	1	2	1		1		2	1	3	2	1	4	4	1		1	22	23
31-35	1	1	1		2		3	1	2	1	1	1		2	2	1		1		3	2	3	2	1	3	1	2	1	1	2	3	2	4	1	3	3	3	2	1	2		4	1	2	2	1	1	2	36	33
36-40		1	1	1	5	1	6	1			1		2	2			1	3			3		2	2		1	1				2			1	1	2	1	1	1	2	1	1	1			3	1		28	19
41-45	8	4	5	6	3	5		3	4	4	5	7	5	5	3	5	7	2	3	2	5	4	4	3	6	3	6	4	6	2	3	4	4	5	4	3	3	4	4	5	3	3	4	3	4	4	5	6	91	83
46-50	1	2	2	2		4		4	1	5	3	2	1	1	1	4	2	2				1	1	1			1	3	1	3	1	1	1	1	1	2	1	2	2		2		1	1		1	2	1	22	40
51-55																															1																		1	0
Total Measured	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	210	210

Appendix Table 47. Monkfish Length Data F/V Friendship 2007-1

MONK LENGTHS FRIENDSHIP-2007-1

Tow #	3	3	4	4	5	5	6	6	8	8	9	9	10	10	13	13	14	14	15	15	16	16	17	17	18	18
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																										
16-20																										
21-25																										
26-30														1				1	1	1	1		4	1		
31-35			1			2		1		1				1	1		1		1		2	2	1			
36-40			1		1	1	1	1				1										2	2	1		
41-45							1		1				1	1			1	1			1	1	4	1		1
46-50			1					1		1							1								1	
51-55												1	1						1					1		
56-60			1			2										1							3	1		
61-65										1																
66-70						1		1																		
71-75	1								1																	
76-80																										
81-85																										
86-90																										
Total Measured	1	0	4	0	1	6	2	4	2	3	0	2	2	3	1	1	3	2	3	1	4	5	14	5	1	1

Tow #	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30	30	31	31	32	32
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																												
16-20																												
21-25																						1						
26-30	1	1								1			1			1							1			1		
31-35			1	3							1	1	2			2		1	1	2	2			2		1		2
36-40			2											1		1	1	2		1	2	3	1	1	1	1	2	2
41-45	1		1	2	1	2	1				3			1	1	1		2	3	1	2	1	3		1	2	6	3
46-50			3	1	1	1				1		1				1	1	1		3	2	3	1		3	1	2	
51-55						1					1	1								1				1	1	1	2	1
56-60				1			1	1				1					1		3		1	1	1			1	1	1
61-65														1														
66-70																					1							
71-75		1																										
76-80																						1						
81-85																												
86-90																												
Total Measured	2	2	7	7	2	4	2	1	0	2	5	4	3	3	1	6	3	6	7	8	10	10	7	4	6	8	13	9

Tow #	33	33	34	34	35	35	36	36	37	37	38	38	39	39	40	40	41	41	42	42	43	43	44	44	45	45	46	46
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																												
16-20																												
21-25																1					1							
26-30										2				1	2												1	
31-35	1	2	1			1	2	2	1	2			1	2	1	2		3	2			1		1	1			
36-40	1	3	3	1		1		2	3	1		1		1					1					3	2	2		2
41-45				3	2	3	1	5	4	3	1		1	1	1	1			3		1	2	5	2	3	1	3	2
46-50	3	1	1		1	2		1	1	3			1		2	1	1		2					1	1	2	3	1
51-55									2	1							1	1	2	1	1			1		1		1
56-60								1			1	1											1			1		
61-65				1				2											1									1
66-70																												
71-75									1																			
76-80														1	1													
81-85																												
86-90																												
Total Measured	5	6	5	5	3	7	3	13	12	12	2	2	3	6	7	5	2	4	11	1	3	3	6	8	7	7	7	7

Tow #	47	47	48	48	49	49	50	50	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																												
16-20																											0	0
21-25					1																					1	2	3
26-30	1			1				2				1			1	1				1		1					7	13
31-35			1		1	2	1		1			2	1		3	1		1									24	33
36-40	6	1	1				1					2	2						1				1				29	32
41-45	3	2	1	1	1		2		2	1	1	2		2	1	2			1	1				1			57	46
46-50	1				1	1			1			1		1	2	1	2			1							32	28
51-55	2	2										1	1	1		3											13	18
56-60		1					2						1					2	1	2							14	13
61-65																1			1								2	6
66-70		1	1	1											2												4	2
71-75	1																										2	0
76-80																											1	2
81-85																											0	0
86-90																											0	0
Total Measured	14	7	4	3	4	3	6	2	4	1	1	9	5	4	9	9	2	3	4	5	0	1	1	1	0	1	187	196

Appendix Table 48. Fluke Length Data F/V Friendship 2007-1

FLUKE LENGTHS FRIENDSHIP-2007-1

Tow #	5	5	19	19	21	21	25	25	28	28	30	30	37	37	41	41	44	44	49	49	57	57	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Fluke Length (cm)																								
31-35																							0	0
36-40							1																1	0
41-45						1																	0	1
46-50		1		1													1		1				2	2
51-55												1				1					1		1	2
56-60								1		1				1									0	3
61-65	1																						1	0
Total Measured	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	8

Appendix Table 49. Fourspot Length Data F/V Friendship 2007-1

FOUR SPOT LENGTHS FRIENDSHIP-2007-1

Tow #	3	3	4	4	5	5	6	6	8	8	9	9	10	10	14	14	15	15	16	16	17	17	18	18	24	24	25	25	27	27
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Fourspot Length (cm)																														
11-15																														
16-20				6									1									2			1				1	
21-25		2	1	1	2	3	1	7	1												1	3	1	1			2			
26-30		1	2	2		1									1				2		1	3			1		1			1
31-35		1	1	1	1	1												1	1		1									
36-40					1						1			1																
41-45													1																	
46-50																														
Total Measured	0	4	4	10	4	5	1	7	1	0	1	0	2	1	1	0	0	1	3	0	3	8	1	1	2	0	3	0	1	1

Tow #	28	28	29	29	30	30	31	31	32	32	33	33	34	34	35	35	36	36	37	37	38	38	39	39	40	40	41	41	44	44
Side	P	S	P	S	P	S	P	S	P	S																				
Fourspot Length (cm)																														
11-15																														
16-20		1	1	1		1		1	1	3		1	1					1		1				1	2	2	1			
21-25		4	4	1	2	1		1		1		1	1	1	1			2	1	5	1			5	3	3		1	1	
26-30	1	1				1			1	1		1		1				1	1	1	1	2		5	1	1			1	
31-35		1																		1				1	1			1		
36-40																														
41-45																														
46-50																														
Total Measured	1	7	5	2	2	3	0	2	2	5	0	3	2	2	1	0	0	4	2	8	2	2	0	12	7	6	1	2	2	0

Tow #	45	45	46	46	47	47	49	49	51	51	52	52	53	53	54	54	55	55	56	56	57	57	58	58	59	59	60	60	TOTAL	TOTAL
Side																													P	S
Fourspot Length (cm)																														
11-15																													0	0
16-20							4	4	1							1											1		15	29
21-25	2	1	1		1	1	1	6		3					1	1			1	1	1		1	2		2		1	32	62
26-30					1	1	4	2			1	1	1			2	1												22	30
31-35																												2	5	10
36-40	1																												3	1
41-45																													1	0
46-50																													0	0
Total Measured	3	1	1	0	2	2	9	12	1	3	1	1	1	0	1	4	1	0	1	1	1	0	1	2	0	2	1	3	78	132

Appendix Table 50. Yellowtail Flounder Length Data F/V Friendship 2007-1

YELLOWTAIL LENGTHS FRIENDSHIP-2007-3

Tow #	4	4	5	5	10	10	13	13	22	22	25	25	42	42	43	43	44	44	85	85	86	86	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
YT Length (cm)																								
21-25																							0	0
26-30																							0	0
31-35	1		1		1			1	1			1	1			1		1		3		2	5	9
36-40																							0	0
41-45																							0	0
Total Measured	1	0	1	0	1	0	0	1	1	0	0	1	1	0	0	1	0	1	0	3	0	2	5	9

Appendix Table 51. Grey Sole Length Data F/V Friendship 2007-1

WITCH (GREY SOLE) LENGTHS FRIENDSHIP-2007-1

Tow #	3	3	4	4	5	5	6	6	17	17	18	18	21	21	22	22	24	24	27	27	28	28
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S		
Witch Length (cm)																						
21-25																						
26-30							2		3	2	1			1					2	4		
31-35					2	1	2		7	4							1			1		1
36-40	1		1		2	2	1	1	1	1						1			1		2	
41-45									1	1												
46-50																						
Total Measured		0	1	0	4	3	5	1	12	8	1	0	0	1	0	1	1	0	3	5	2	1

Tow #	29	29	30	30	31	31	37	37	39	39	40	40	41	41	55	55	56	56	59	59
Side																				
Witch Length (cm)																				
21-25																				
26-30	2		1	3	1	2		1	1	1	5	3		1	1					
31-35		2					1			1	1	1								1
36-40	1																1			
41-45	1																			
46-50																				
Total Measured	4	2	1	3	1	2	1	1	1	2	6	4	0	1	1	0				

Appendix Table 52. Skate Length Data F/V Friendship 2007-2

SKATE LENGTHS FRIENDSHIP-2007-2			E = Experimental Dredge				C= Control Dredge																															
TOW #	2	2	4	4	5	5	6	6	7	7	8	8	10	10	20	20	22	22	24	24	25	25	36	36	41	41	62	62	63	63	78	78	128	128	150	150	TOTAL	TOTAL
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																																						
16-20														2									1		1	2											2	4
21-25						1		1		2			2	3	1	2		1		1		1	2	3	9	3				1				1	1		15	20
26-30	2		2	3			1		3	2	2	1	2	11	4	5		5		5	2	2	5	11	14	5	5	4	3	2			1	7	3	2	49	65
31-35	2	1	7	2	1	2	2	2	5	7	1	3	3	10	1	1	1	2	2	5	2	2	9	17	15	11	12	5	2	4	4	9	3	10	3	3	75	96
36-40	2	4	5	3	4		3	4	6	3	2	1		2		4			6	6	4	6	6	4	8	6	1	2	2	5	6		8	8	2	2	65	60
41-45	3	12	32	28	10	10	24	14	36	25	11	16	14	11	14	22	9	7	19	29	18	22	26	22	19	17	15	19	25	12	9	17	25	23	18	14	327	320
46-50	7	4	4	25	5	12	10	8	22	14	6	9	13	13	14	18	6	9	16	24	8	13	17	14	18	14	18	15	7	5	12	10	20	10	7	7	210	224
51-55															1						1																2	0
TOTAL MEASURED	16	21	50	61	20	25	40	29	72	53	22	30	34	52	35	52	16	24	43	70	35	46	66	71	84	58	51	45	39	29	31	36	57	59	34	28	745	789

Appendix Table 53. Monkfish Lengths F/V Friendship 2007-2

MONK LENGTHS FRIENDSHIP-2007-2 | *E = Experimental Dredge* | *C= Control Dredge*

TOW #	4	4	5	5	6	6	7	7	8	8	10	10	20	20	22	22	23	23
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																		
16-20																		
21-25																		
26-30													1					
31-35	1	1					1						1			1		1
36-40		1										2						1
41-45			1								1			1	1			
46-50					1				1	2		1		1			1	
51-55						1					1					1	1	
56-60			1								1	1	3					
61-65				1														
66-70								1					1					
71-75																		
76-80																		
81-85																		
86-90																		
91-95																		
TOTAL MEASURED	1	2	2	1	1	1	1	1	1	2	3	4	6	2	1	2	2	2

TOW #	24	24	25	25	26	26	27	27	36	36	38	38	40	40	41	41	42	42	44	44	55	55
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																						
16-20																			1			
21-25								1						1								
26-30					1	2								1			1	1	1			
31-35		1					1				1	1		1	1		2	1	1			
36-40				2			2			1	1	1			1	1	1		2			
41-45				1	1			1		1				1	2		2	1	2	1		
46-50			1		1		1	1	1				1				1	1	1			
51-55					1				1	1	1					1		1	1	1		
56-60			1						2		1	2	1					1	3		1	1
61-65		1					1		1									1				
66-70									1								1				1	
71-75			1												1	1						
76-80																					1	
81-85																						
86-90																						
91-95																						
TOTAL MEASURED	0	2	3	3	4	2	5	3	6	3	4	4	2	4	5	3	8	7	12	2	3	1

TOW #	62	62	63	63	74	74	77	77	78	78	82	82	83	83	91	91
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																
16-20						1										
21-25																
26-30					1		1					1		1		
31-35	1						2	1	1	2		1	1		2	1
36-40	2		1							1					1	
41-45			1			1			1	1		1	2		3	1
46-50		1							2	1	3			1	2	
51-55		1							1	2		1	2		1	1
56-60		1					1		2	1			1	1	2	1
61-65					1	1						2			1	1
66-70						1		1				1		1		
71-75																1
76-80									1							
81-85																
86-90																
91-95															1	
TOTAL MEASURED	3	3	2	0	2	4	4	2	8	8	3	7	6	4	13	6

TOW #	94	94	96	96	97	97	98	98	99	99	100	100	101	101	108	108	109	109	110	110	111	111	112	112
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																								
16-20																								
21-25																						1		
26-30			1	1						1	1				2	1	1					1		1
31-35					1		1		1			1				2	1	1	1				1	4
36-40				1	1		1		1				2			1	1		4				4	1
41-45	1				1							1					1	1			2	2	1	1
46-50		2		1	2			1			1		1		1	2	1		2			2		2
51-55	2			1				1			2		1						2		1	2	2	1
56-60	1	1	1	1		1	1	2		3		1		3		2	2							1
61-65	2					1	1			1	2	1			1	1		2					1	
66-70										1	1	1			1				1					
71-75														1		1				1				
76-80		1									1					1								
81-85																								
86-90																								
91-95																								
TOTAL MEASURED	6	4	2	5	5	2	4	4	2	6	8	5	4	4	5	11	7	4	10	1	3	8	9	11

TOW #	115	115	119	119	128	128	133	133	150	150	152	152	153	153	162	162	163	163	170	170	203	203	243	243	TOTAL	TOTAL
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
LENGTH (cm)																										
16-20								1																	1	2
21-25												2				1									0	6
26-30	1		1	2			1			1							1						1		15	14
31-35	2		1	1	4	1			2	2			1			1	5	2		2		1		2	39	32
36-40	1	1		2	1		1				1	1			1		1	1		1					32	19
41-45	2	1	3		2				1						1	1	2	1	1				2		37	19
46-50		2	3		1	1	2	1	1				1	1	1		1	1				2		1	37	28
51-55	1	3	1			1		2		2		1	2		4			2						1	23	28
56-60		1					1							1	1					1					26	27
61-65			1			1				1			1	1				1	1						13	17
66-70	1					1					1				1	1									8	9
71-75					1					1						1						1		1	3	9
76-80											1								1						4	2
81-85																									0	0
86-90																									0	0
91-95																									10	0
TOTAL MEASURED	8	8	10	5	9	5	5	4	4	7	3	4	5	3	9	5	10	8	3	4	0	4	3	5	248	212

Appendix Table 54. Scallop Shell Height Data F/V Friendship 2007-2

SCALLOP SHELL HEIGHTS FRIENDSHIP-2007-2 *E = Experimental Dredge* *C = Control Dredge*

TOW #	23	23	39	39	75	75	108	108	183	183	185	185	189	189	225	225	243	243	TOTAL	TOTAL
DREDGE	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
SHELL HEIGHT (mm)																				
40-44																	3		3	0
45-49																	2	6	2	6
50-54					1												3	2	4	2
55-59					3												5	1	3	0
60-64					4	4											2		4	4
65-69					7	5											1		7	5
70-74	2	1			10	14					1						1	1	13	15
75-79	8	9	3		25	16	2				1	2	9		2	4	5		48	29
80-84	13	27	4	1	61	39	12	1		1	1	7	4		3	8	42	9	98	84
85-89	25	55	8	5	102	93	12	3	4	6	12	7	3		10	12	36	38	176	181
90-94	22	19	16	9	76	72	20	25	4	19	14	16	10	5	17	19	54	58	179	184
95-99	16	21	30	33	36	22	29	26	18	23	16	19	28	7	19	17	46	47	192	168
100-104	35	34	57	45	5	3	60	40	31	29	19	20	59	23	26	25	24	26	292	219
105-109	24	36	36	47	1	1	38	43	42	39	35	29	31	53	36	32	13	16	243	280
110-114	14	12	35	31	2	2	34	28	41	37	48	50	16	58	27	41	15	20	217	259
115-119	7	3	14	13		1	12	19	39	25	31	31	2	11	20	26	3	5	125	129
120-124	2	3	6	5		1	2	5	5	8	5	6	1	1	8	8	2	1	29	37
125-129									2	1	3			2	5	3			10	6

Appendix Table 55. Skate Length Data F/V Friendship 2007-3

SKATE LENGTHS FRIENDSHIP-2007-3

Tow #	2	2	3	3	5	5	7	7	9	9	10	10	23	23	25	25	28	28	30	30	32	32	33	33	40	40	42	42	44	44	51	51	60	60	68	68	70	70	83	83	86	86	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Skate Length (cm)																																												
16-20											1	1																							1	3									1	3
21-25			1	2					1	1		2															1	1					1										3	7
26-30		1	2		1		1	2		1	1	1				1							1	1			1					5	1	2		1		2				8	17
31-35	2			1	3	3	3		2	1	5	3	1	1	1	1	1	2		1	3		1	2	1	4	4	3	1	2		1	2	2	2	1	1		3	2	1	1	37	31
36-40	1	1		1	3	4	2	4	3	4	2	2	2	3	1	4	4	1	2	2	2	4	2		5	2	2	1	4	2	5		1	1	4	2	2	5	5	2	3	2	55	47
41-45	6	5	12	2	9	7	12	10	13	7	8	8	14	12	15	11	4	2	8	9	13	9	8	9	11	11	9	12	13	9	7	11	10	6	11	12	12	9	17	17	11	11	223	189
46-50	1	3	3	5	4	6	2	4	1	6	3	3	3	4	3	3		4	10	8	2	7	8	8	4	4	3	3	2	7	8	8	7	5	2	2	5	4	5	7	5	6	81	107
51-55																																												0	0
Total Measured	10	10	18	11	20	20	20	20	20	20	20	20	20	20	20	20	9	9	20	20	20	20	20	20	21	21	20	20	20	20	20	20	20	20	20	20	20	20	30	30	20	20	408	401

Tow #	92	92	103	103	105	105	106	106	108	108	120	120	122	122	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Skate Length (cm)																
16-20										1					1	1
21-25						2				1					2	5
26-30	2	1	1		1	4					2	2		2	5	5
31-35	1	1	1		1	3	2		3	1	2	2	4	2	15	8
36-40	1		7	2	5	3	2	1	2	2	1	1	2	2	11	16
41-45	11	11	7	12	14	11	10	11	7	8	11	9	10	6	60	39
46-50	5	7	4	6	4	2	6	8	6	5	4	6	4	8	14	27
51-55															0	0
Total Measured	20	20	20	20	25	25	20	20	18	18	20	20	20	20	108	101

Appendix Table 56. Fourspot Flounder Length Data F/V Friendship 2007-3

FOUR SPOT LENGTHS FRIENDSHIP-2007-3																																																
Tow #	3	3	4	4	5	5	6	6	9	9	13	13	24	24	25	25	26	26	40	40	42	42	43	43	45	45	50	50	51	51	66	66	83	83	84	84	85	85	86	86	TOTAL	TOTAL	106	106	107	107	122	122
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Fourspot Length (cm)																																																
11-15																																			1						1	0						
16-20																						1								1											0	2						
21-25		1			1					1														1	1				1			1		1				1			3	6						1
26-30					1		1			1			1	1		1								1				1													3	5		1	1			
31-35				1	2			1				1						1		1													1								3	5						
36-40			1				1									1												1											1		3	2						
41-45																										2															0	2						
46-50																			1																						1	0						
Total Measured	0	1	1	1	4	0	2	1	0	2	0	1	1	1	0	2	0	1	1	1	0	1	0	2	1	2	0	2	1	1	0	1	1	1	1	0	0	1	1	0	14	22	0	1	1	0	0	1

Appendix Table 57. Monkfish Length Data F/V Friendship 2007-3

MONK LENGTHS FRIENDSHIP-2007-3																																										
Tow #	2	2	4	4	5	5	6	6	7	7	8	8	9	9	12	12	13	13	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	30	30	32	32	33	33	40	40
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																																										
16-20						1	1																																			
21-25																																										
26-30							1																				2															
31-35		2		1		2			1		1														1		3	4		1									1			
36-40					1	3	1	2	1	1									2		1			2			1				1						2		1	1	1	
41-45					3	2	1	3		1	1	2		1	1				3	4	3		1		1													1		2		
46-50				2	1		1	3	1		1	2										1					1	1			1										1	1
51-55		1			1			2		1	3							1	1				1		1									1		1	1					
56-60			1	1		1		1				1		2			1		2							1											1					
61-65	2		2															1					1			1								1								1
66-70					1	1											1						1												1							
71-75					1						2								1																						1	1
76-80																																										
81-85																																										
86-90																																										
Total Measured	2	3	3	4	8	10	5	11	3	3	8	5	0	3	1	0	2	2	9	4	4	1	4	2	3	2	7	5	0	1	2	0	0	2	1	1	4	1	2	3	3	3

MONK LENGTHS FRIENDSHIP-2007-3																																				
Tow #	41	41	42	42	43	43	44	44	45	45	50	50	51	51	60	60	61	61	66	66	68	68	69	69	70	70	83	83	84	84	85	85	86	86	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																																				
16-20																																			1	1
21-25																																			0	0
26-30						1						1			1											2									4	4
31-35						1			1		1	1					1				2	1						1			2	1			14	15
36-40			1					1		1	2	1					1		1				1						1		1	1	1		21	13
41-45			2	1		3				1		1		1		1	2		1			2			1							2			20	28
46-50		1					1			1					1	1			1	2								1	1	1	1			2	12	19
51-55			1	1	1			1		1		1				1		1	2		1				1	1						2			14	16
56-60							1												1				1							1			1		9	8
61-65			1	1	2					1	1											1				1									9	8
66-70				1						1																									4	3
71-75																																		1	5	2
76-80														1																					0	1
81-85																		1																	0	1
86-90																																			0	0
Total Measured	0	1	5	4	3	5	2	2	1	6	4	5	0	2	2	3	4	2	6	2	3	4	2	0	2	4	0	2	2	2	4	6	2	3	113	119

MONK LENGTHS FRIENDSHIP-2007-3																								
Tow #	91	91	92	92	93	93	103	103	105	105	106	106	107	107	108	108	120	120	121	121	122	122	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Monk Length (cm)																								
16-20																							0	0
21-25																							0	0
26-30								1															0	1
31-35			2			1		2	1		1		1						1			1	6	4
36-40		1					1													1		1	1	3
41-45	2				1	1	1					1		1			3	1					7	4
46-50		1						1		1									1				1	3
51-55							1	1							1								2	1
56-60		1	1						1	1	1	1						1					3	4
61-65	1					2					1												2	2
66-70																							0	0
71-75																							0	0
76-80	1																1						2	0
81-85																							0	0
86-90																							0	0
Total Measured	4	3	3	0	1	4	3	5	2	2	3	2	1	1	1	0	4	2	2	1	0	2	24	22

Appendix Table 58. Grey Sole Length Data F/V Friendship-3

WITCH LENGTHS FRIENDSHIP-2007-3

Tow #	9	9	12	12	22	22	26	26	30	30	33	33	50	50	51	51	66	66	84	84	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Witch Length (cm)																						
21-25																			1		1	0
26-30		1						1				1			1						1	3
31-35			1		1				1			1	1					1			4	2
36-40																					0	0
41-45																		1			0	1
46-50																					0	0
Total Measured		1	1	0	1	0	0	1	1	0	0	2	1	0	1	0	0	2	1	0	6	6

Appendix Table 59. Skate Length Data F/V Friendship-4

SKATE LENGTHS FRIENDSHIP-2007-4					*E = Experimental Dredge*					*C= Control Dredge*																										
TOW #	**2**	**2**	**3**	**3**	**4**	**4**	**5**	**5**	**6**	**6**	**7**	**7**	**8**	**8**	**9**	**9**	**10**	**10**	**12**	**12**	**29**	**29**	**32**	**32**	**34**	**34**	**36**	**36**	**51**	**51**	**52**	**52**	**78**	**78**	**108**	**108**	**TOTAL**	**TOTAL**	%	%
DREDGE	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**	**E**	**C**
LENGTH (cm)																																								
16-20	1		1											1	1		1	1	3														2		**9**	**2**	2%	0%
21-25	2	1	1	2	1		3	1	1	4	3	2	2			5	1	3	4		3	3	4	2	2	2	3		7		3	1	3		3		**46**	**26**	8%	6%
26-30	10		6	7	1	2	3	5	5	3	11	3	3	1	1	1	7	3	2	6	5	5	7	4	4	5	3	3	6	3	5	4	4	4	6	8	**89**	**67**	16%	15%
31-35	4	2	2	2	2		7	3	3	3	6	5		1	1	1	2	6	17	3	3	5	5	4	4	7	1	2	5	3	5	3	4	4	5	4	**76**	**58**	14%	13%
36-40	3	5	3		1		7	1	1	10	2	1	3	6	1		3	7	11	2	1		1	1	2	3	3	3	2	1	1	3	4	4	5	9	**54**	**56**	10%	13%
41-45	7	9	11	11	7	2	13	1	1	10	13	9	3	1	5	1	12	19		10	2	1	16	13	10	10	5	6	4	2	16	13	36	24	12	6	**173**	**148**	32%	34%
46-50	2	5	13	6	1	7	8				10	5	2				9			6	3	8	8	9	4	3	4	2	1	3	8	4	14	12	5	6	**92**	**76**	17%	18%
51-55											3																										**3**	**0**	1%	0%
TOTAL MEASURED	29	22	37	28	13	11	41	11	11	30	48	25	13	10	9	8	35	39	37	27	17	22	41	33	26	30	19	16	25	12	38	28	65	48	38	33	**542**	**433**		

Appendix Table 60. Monkfish Length Data F/V Friendship-4

SKATE LENGTHS FRIENDSHIP-2007-1

Tow #	3	3	4	4	6	6	10	10	14	14	16	16	19	19	21	21	23	23	25	25	27	27	31	31	33	33	35	35	37	37	39	39	41	41	43	43	45	45	47	47	49	49
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Skate Length (cm)																																										
16-20		1							2										2	1																								
21-25		1	1						1				1						1	2		2		1		1		1		1							1	1			1		
26-30				1			1	1					1					2	4	2			1	2	1	4		1	2	2		3	1	2	1		1		2	1	3	2
31-35	1	1	1	2		3	1	2	1	1	1			2	2	1		1		3	2	3	2	1	3	1	2	1	1	2	3	2	4	1	3	3	3	2	1	2		4
36-40		1	1	1	5	1	6	1			1		2	2			1	3			3		2	2		1	1			2			1	1	2	1	1	1	2	1	1
41-45	8	4	5	6	3	5		3	4	4	5	7	5	5	3	5	7	2	3	2	5	4	4	3	6	3	6	4	6	2	3	4	4	5	4	3	3	4	4	5	3	3
46-50	1	2	2	2		4		4	1	5	3	2	1	1	1	4	2	2			1	1	1				1	3	1	3	1	1	1	1	1	2	1	2	2		2		
51-55																															1											
Total Measured	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10

Appendix Table 61. Skate Length Data F/V Friendship-5

SKATE LENGTHS FRIENDSHIP-2007-1																																																		
Tow #	3	3	4	4	6	6	10	10	14	14	16	16	19	19	21	21	23	23	25	25	27	27	31	31	33	33	35	35	37	37	39	39	41	41	43	43	45	45	47	47	49	49	53	53	55	55	57	57	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S							P	S
Skate Length (cm)																																																		
16-20		1							2										2	1																											1		4	2
21-25		1	1						1				1						1	2		2		1		1		1		1							1	1			1		2						6	10
26-30				1			1	1					1		4			2	4	2			1	2	1	4		1	2	2		3	1	2	1		1		2	1	3	2	1	4	4	1		1	22	23
31-35	1	1	1		2		3	1	2	1	1	1		2	2	1		1		3	2	3	2	1	3	1	2	1	1	2	3	2	4	1	3	3	3	2	1	2		4	1	2	2	1	1	2	36	33
36-40		1	1	1	5	1	6	1			1		2	2			1	3			3		2	2		1	1				2			1	1	2	1	1	1	2	1	1	1			3	1		28	19
41-45	8	4	5	6	3	5		3	4	4	5	7	5	5	3	5	7	2	3	2	5	4	4	3	6	3	6	4	6	2	3	4	4	5	4	3	3	4	4	5	3	3	4	3	4	4	5	6	91	83
46-50	1	2	2	2		4		4	1	5	3	2	1	1	1	4	2	2				1	1	1			1	3	1	3	1	1	1	1	1	2	1	2	2		2		1	1		1	2	1	22	40
51-55																															1																		1	0
Total Measured	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	210	210

Appendix Table 62. Fourspot Flounder Length Data F/V Friendship-5

FOUR SPOT LENGTHS FRIENDSHIP-2007-5																														
Tow #	2	2	3	3	8	8	9	9	11	11	22	22	27	27	33	33	37	37	39	39	40	40	41	41	42	42	43	43	TOTAL	TOTAL
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Fourspot Length (cm)																														
11-15																													0	0
16-20					1						1			1						1									2	2
21-25	1			1					1		1			3	1						1						1	1	6	5
26-30				1	1			1																					1	2
31-35		1				1	1	1		1								1					1			1			2	6
36-40					1	1				1																			1	2
41-45																													0	0
46-50																		1											0	1
Total Measured	1	1	0	2	3	2	1	2	1	2	2	0	0	4	1	0	0	2	0	1	1	0	1	0	0	1	1	1	12	18

Appendix Table 63. Monkfish Length Data F/V Friendship-5

MONK LENGTHS FRIENDSHIP-2007-5																																			
Tow #	1	1	2	2	3	3	4	4	8	8	9	9	10	10	11	11	22	22	27	27	33	33	37	37	38	38	39	39	40	40	41	41	42	42	43
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P
Monk Length (cm)																																			
16-20																																			
21-25																													1						
26-30	1						1	1	1	1										2			2					1		1					
31-35		2		1					2	5	1	1	1				1	1	2	1			1	1		2				3		1		1	
36-40										1						1									1						1	2			
41-45															1											1									
46-50						2																1				1									
51-55																																			
56-60																											1								
61-65																																			
Total Measured	1	2	0	1	0	2	1	1	3	7	1	1	1	0	1	1	1	1	2	3	0	1	3	1	1	4	1	1	1	4	1	3	0	1	0

Appendix Table 64. Scallop Shell Height Data F/V Friendship-5

SCALLOP SHELL HEIGHTS FRIENDSHIP-2007-5																														
Tow #	1	1	2	2	3	3	4	4	8	8	9	9	10	10	11	11	22	22	27	27	33	33	37	37	41	41	42	42	Total	Total
Side	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S	P	S
Shell Height (mm)																														
60-64			2																										2	0
65-69			1																										1	0
70-74	2																												2	0
75-79		1	1	1											1														2	2
80-84	1											1		1		1			1										2	3
85-89	3	2	2	2		4			1		2	3	1	2		2		1											9	16
90-94	2	1	4	1	5	8	1	4	2	3	1			1	1	1	2	4	2	5		2		2		3	1		21	35
95-99	6	2	7	4	9	14	6	8	5	8	5	6	2	3	7	8	2	4	3	3	3	4	1	2		4		1	56	71
100-104	12	18	15	13	12	19	7	6	4	11	5	11	8	7	4	3	9	1	5	9	3	1		3	6	3	3	4	93	109
105-109	18	21	17	15	20	23	11	7	10	6	12	15	9	6	16	18	15	4	8	10	10	9	6	13	6	5	8	7	166	159
110-114	25	18	20	22	17	21	22	15	21	12	28	25	13	10	25	21	29	16	17	21	11	13	26	19	16	18	12	8	282	239
115-119	18	19	17	15	15	17	32	17	29	12	30	31	19	21	16	15	15	13	27	23	8	7	23	16	10	18	15	11	274	235
120-124	5	10	9	13	16	8	18	21	16	23	16	18	19	22	8	6	12	14	12	12	21	20	24	19	30	25	10	14	216	225
125-129	2	8	9	12	17	8	15	15	8	18	7	6	13	15	6	4	7	8	12	13	17	12	21	15	13	9	9	13	156	156
130-134	4	5	8	4	5	5	4	7	4	5	3		13	18	5	3	5	8	2		6	9	6	10	5	2	2	3	72	79
135-139	1	2		2	4	3	2	4	2	3	2	1	3	4	1	2	1	7		1	2	1	2	3			3	3	23	36
140-144		1		1	2				1		1		1	2		1	2	3				1	1	3				1	8	13
145-149						1																	1				1		2	1
150-154																													0	0
Total Measured	99	108	112	105	122	131	118	104	103	101	112	117	101	112	90	85	99	83	89	97	81	79	111	105	86	87	64	65	1387	1379

Appendix Table 65.

Celtic 2006-1
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 1

Species	**Scallops**		**Skate**		**Monk**		**Summer Flounder**		**Grey Sole**		**Yellowtail Flounder**		**Winter Fld.**		**Four Spot Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	62	53	1563	1463	113	118	8	1	5	4	14	12	0	1	35	27
% Difference in Count	**18%**		**7%**		**-4%**		**700%**		**25%**		**17%**		**-100%**		**30%**	
Fish Count/Scallop Bushel Catch Ratio			25.3	27.9	1.8	2.2	0.1	0.0	0.1	0.1	0.2	0.2	0.0	0.0	0.6	0.5
% Difference in Catch Ratio			**-9%**		**-19%**		**580%**		**6%**		**-1%**		**-100%**		**10%**	
Max	9.0		250.0		17.0		6.0		4.0		5.0		0.0		11.0	
Min	2	2	50	75	4	3	0	0	0	0	0	0	0	0	0	0
Median	6	4	125	125	9	12	0	0	0	0	1	1	0	0	1	0
Mode	#N/A	4	100	75	9	12	0	0	0	0	0	0	0	0	0	0
σ	2	2	69	61	4	6	2	0	1	1	2	1	0	0	4	4
Mean	5.6	4.8	142.1	133.0	10.3	10.7	0.7	0.1	0.5	0.4	1.3	1.1	0.0	0.1	3.2	2.5
Variance	4.0	2.6	4763.1	3754.0	17.4	31.2	3.2	0.1	1.5	0.9	3.0	1.3	0.0	0.1	14.4	12.5
Observations	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Pearson Correlation	0.31		0.82		0.64		-0.13		-0.16		-0.37		#DIV/0!		0.28	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	10		10		10		10		10		10		10		10	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	1.25		0.76		-0.35		1.14		0.18		0.25		-1.00		0.55	
P(T<=t) one-tail	0.12		0.23		0.37		0.14		0.43		0.40		0.17		0.30	
t Critical one-tail	1.81		1.81		1.81		1.81		1.81		1.81		1.81		1.81	
P(T<=t) two-tail	**0.240**		**0.463**		**0.736**		**0.283**		**0.858**		**0.807**		**0.341**		**0.594**	
t Critical two-tail	**2.23**		**2.23**		**2.23**		**2.23**		**2.23**		**2.23**		**2.23**		**2.23**	

Appendix Table 66.1.

Celtic 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 1

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Barndoor Skate**		**Winter Skate**		**Monk**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1998	1808	840	744	3954	4775	494	501	130	117	1665	1667
% Difference in Count	**11%**		**13%**		**-17%**		**-1%**		**11%**		**0%**	
Fish Count/Scallop Bushel Catch Ratio					4.71	6.4	0.59	0.7	0.15	0.2	1.98	2.2
% Difference in Catch Ratio					**-27%**		**-13%**		**-2%**		**-12%**	
Mean	9.2	8.3	9.1	8.1	43.0	51.9	5.4	5.4	1.4	1.3	18.1	18.1
Standard Error	0	0	0	0	3	3	0	0	0	0	1	1
Median	9	8	9	8	38	45	4	5	1	0	18	17
Mode	8	8	8	8	30	34	4	6	0	0	17	19
Standard Deviation	2	2	2	2	27	30	4	4	2	2	6	8
Sample Variance	4	3	4	3	722	875	19	16	3	3	42	62
Kurtosis	0	1	2	2	1	2	1	0	2	5	1	1
Skewness	0	0	0	-1	1	1	1	1	1	2	0	1
Range	13	10	13	11	133	144	19	16	8	10	35	43
Minimum	3	3	2	2	6	12	0	0	0	0	0	0
Maximum	16	13	14	13	139	156	19	16	8	10	35	43
Confidence Level(95.0%)	0.26	0.22	0.42	0.34	5.56	6.13	0.91	0.84	0.34	0.37	1.35	1.63
Observations	218	218	92	92	92	92	92	92	92	92	91	91
Pearson Correlation	0.67		0.58		0.87		0.66		0.54		0.47	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	217.00		91.00		91.00		91.00		91.00		90.00	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	8.69		5.90		-5.78		-0.21		0.83		-0.03	
P(T<=t) one-tail	0.00		0.00		0.00		0.42		0.21		0.49	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.000		0.000		0.000		0.836		0.411		0.977	
t Critical two-tail	1.97		1.99		1.99		1.99		1.99		1.99	

Celtic 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 1

Species	**Yellowtail Fld.**		**Winter Fld.**		**Four Spot Fld.**		**Sand Dab**		**American Plaice**		**Sea Raven**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	180	229	5	18	343	392	91	147	62	80	28	32
% Difference in Count	**-21%**		**-72%**		**-13%**		**-38%**		**-23%**		**-13%**	
Fish Count/Scallop Bushel Catch Ratio	0.21	0.3	0.01	0.0	0.41	0.5	0.11	0.2	0.07	0.1	0.03	0.0
% Difference in Catch Ratio	**-30%**		**-75%**		**-23%**		**-45%**		**-31%**		**-23%**	
Mean	2.0	2.5	0.1	0.2	3.7	4.3	1.0	1.6	0.7	0.9	0.3	0.3
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0
Median	1	2	0	0	3	4	0	0	0	0	0	0
Mode	0	0	0	0	2	4	0	0	0	0	0	0
Standard Deviation	2	3	0	1	4	4	3	4	2	2	1	1
Sample Variance	5	8	0	0	14	13	7	16	3	3	0	0
Kurtosis	1	1	33	6	3	2	14	8	9	3	5	3
Skewness	1	1	6	3	2	1	4	3	3	2	2	2
Range	10	11	2	2	18	17	16	20	8	7	3	3
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	10	11	2	2	18	17	16	20	8	7	3	3
Confidence Level(95.0%)	0.48	0.60	0.06	0.11	0.77	0.75	0.53	0.82	0.34	0.37	0.13	0.14
Observations	92	92	92	92	92	92	92	92	92	92	92	92
Pearson Correlation	0.56		0.24		0.58		0.84		0.76		0.03	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	91.00		91.00		91.00		91.00		91.00		91.00	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-2.05		-2.58		-1.51		-2.54		-1.58		-0.47	
P(T<=t) one-tail	0.02		0.01		0.07		0.01		0.06		0.32	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.044		0.012		0.134		0.013		0.118		0.640	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99	

Appendix Table 66.2.

Celtic 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 1

Species	**Longhorn Sculpin**		**Red Hake**		**Silver Hake**		**Cod**		**Haddock**		**Torpedo Ray**		**Ocean Pout**		**Lobster**		**Spiny Dogfish**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	12	21	95	119	4	15	1	1	8	2	2	0	0	1	2	2	23	26
% Difference in Count	**-43%**		**-20%**		**-73%**		**0%**		**300%**		**#DIV/0!**		**-100%**		**0%**		**-12%**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	0.11	0.2	0.00	0.0	0.00	0.0	0.01	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.03	0.0
% Difference in Catch Ratio	**-49%**		**-29%**		**-76%**		**-12%**		**254%**		**100%**		**-100%**		**-12%**		**-22%**	
Mean	0.1	0.2	1.0	1.3	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Sample Variance	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Kurtosis	23	8	15	2	19	8	92	92	19	43	43	#DIV/0!	#DIV/0!	92	43	43	9	29
Skewness	4	3	3	2	5	3	10	10	4	7	7	#DIV/0!	#DIV/0!	10	7	7	3	5
Range	3	3	12	7	1	2	1	1	2	1	1	0	0	1	1	1	3	7
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	3	3	12	7	1	2	1	1	2	1	1	0	0	1	1	1	3	7
Confidence Level(95.0%)	0.09	0.12	0.37	0.36	0.04	0.09	0.02	0.02	0.07	0.03	0.03	0.00	0.00	0.02	0.03	0.03	0.13	0.19
Observations	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92	92
Pearson Correlation	-0.03		0.32		0.16		-0.01		0.39		#DIV/0!		#DIV/0!		0.49		0.69	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0		0	
df	91.00		91.00		91.00		91.00		91.00		91.00		91.00		91.00		91.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-1.32		-1.21		-2.47		0.00		1.93		1.42		-1.00		0.00		-0.46	
P(T<=t) one-tail	0.10		0.12		0.01		0.50		0.03		0.08		0.16		0.50		0.32	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.191		0.231		0.016		1.000		0.057		0.158		0.320		1.000		0.650	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99		1.99		1.99		1.99	

Appendix Table 67.

Westport 2006-1
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 1

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Barndoor Skate**		**Winter Skate**		**Monk**		**Grey Sole**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	930	975	428	406	60	83	13	17	15	20	248	285	10	15
% Difference in Count	**-5%**		**5%**		**-28%**		**-24%**		**-25%**		**-13%**		**-33%**	
Fish Count/Scallop Bushel Catch Ratio					0.14	0.2	0.03	0.0	0.04	0.0	0.58	0.7	0.02	0.0
% Difference in Catch Ratio					**-31%**		**-27%**		**-29%**		**-17%**		**-37%**	
Mean	34.5	36.1	38.9	36.9	5.5	7.5	1.2	1.5	1.4	1.8	22.5	25.9	0.9	1.4
Standard Error	2	2	2	4	1	1	1	1	1	1	2	4	0	0
Median	37	39	40	40	4	7	0	1	0	1	23	23	1	1
Mode	38	48	47	48	4	2	0	0	0	0	24	#N/A	1	0
Standard Deviation	10	12	7	12	4	5	2	2	3	2	7	12	1	2
Sample Variance	106	148	42	137	16	23	4	5	6	4	49	154	1	2
Kurtosis	0	1	1	0	2	-2	7	4	5	0	0	-1	1	-1
Skewness	0	-1	-1	-1	2	0	3	2	2	1	0	0	1	1
Range	44	50	22	34	13	13	7	7	8	6	23	37	3	4
Minimum	11	2	25	14	1	2	0	0	0	0	12	9	0	0
Maximum	55	51	47	48	14	15	7	7	8	6	35	46	3	4
Confidence Level(95.0%)	930.25	974.50	4.37	7.87	2.66	3.24	1.40	1.45	1.68	1.37	4.70	8.34	0.63	1.01
Observations	27	27	11	11	11	11	11	11	11	11	11	11	11	11
Pearson Correlation	4.07	4.82	0.52		0.40		0.75		0.03		0.45		0.45	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	26.00		10.00		10.00		10.00		10.00		10.00		10.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-0.86		0.66		-1.42		-0.80		-0.48		-1.00		-1.10	
P(T<=t) one-tail	0.20		0.26		0.09		0.22		0.32		0.17		0.15	
t Critical one-tail	1.71		1.81		1.81		1.81		1.81		1.81		1.81	
P(T<=t) two-tail	0.396		0.523		0.185		0.441		0.645		0.342		0.296	
t Critical two-tail	2.06		2.23		2.23		2.23		2.23		2.23		2.23	

Westport 2006-1
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 1

Species	**Winter Fld.**		**Four Spot Fld.**		**American Plaice**		**Sea Raven**		**Longhorn Sculpin**		**Red Hake**		**Silver Hake**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	3	3	25	46	2	8	4	4	13	12	27	34	1	4
% Difference in Count	**0%**		**-46%**		**-75%**		**0%**		**8%**		**-21%**		**-75%**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	0.06	0.1	0.00	0.0	0.01	0.0	0.03	0.0	0.06	0.1	0.00	0.0
% Difference in Catch Ratio	**-5%**		**-48%**		**-76%**		**-5%**		**3%**		**-25%**		**-76%**	
Mean	0.3	0.3	2.3	4.2	0.2	0.7	0.4	0.4	1.2	1.1	2.5	3.1	0.1	0.4
Standard Error	0	0	1	1	0	0	0	0	1	1	1	1	0	0
Median	0	0	2	3	0	0	0	0	0	0	2	3	0	0
Mode	0	0	0	0	0	0	0	0	0	0	2	3	0	0
Standard Deviation	1	1	3	4	1	1	1	1	3	3	2	3	0	1
Sample Variance	1	0	7	16	0	1	1	1	9	7	5	6	0	0
Kurtosis	11	6	4	0	11	-2	11	11	10	10	0	0	11	-2
Skewness	3	2	2	1	3	1	3	3	3	3	1	1	3	1
Range	3	2	9	12	2	2	4	4	10	9	7	8	1	1
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	3	2	9	12	2	2	4	4	10	9	7	8	1	1
Confidence Level(95.0%)	0.61	0.43	1.75	2.68	0.41	0.68	0.81	0.81	2.01	1.79	1.48	1.71	0.20	0.34
Observations	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Pearson Correlation	0.89		0.23		0.42		1.00		0.98		-0.54		0.42	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	10.00		10.00		10.00		10.00		10.00		10.00		10.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	0.00		-1.50		-1.94		#DIV/0!		0.43		-0.51		-1.94	
P(T<=t) one-tail	0.50		0.08		0.04		#DIV/0!		0.34		0.31		0.04	
t Critical one-tail	1.81		1.81		1.81		#DIV/0!		1.81		1.81		1.81	
P(T<=t) two-tail	1.000		0.165		0.082		#DIV/0!		0.676		0.624		0.082	
t Critical two-tail	2.23		2.23		2.23		#DIV/0!		2.23		2.23		2.23	

Appendix Table 68.1.

Celtic 2006-3
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	Scallop Bushels (entire trip)		Scallop Bushels (obs tows)		Skate		Barndoor Skate		Winter Skate		Monk		Summer Fld.	
Dredge	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*
Total Count	1904	1939	1223	1248	4756	5539	134	149	358	374	1509	1371	17	24
% Difference in Count	**-2%**		**-2%**		**-14%**		**-10%**		**-4%**		**10%**		**-29%**	
Fish Count/Scallop Bushel Catch Ratio					3.89	4.5	0.11	0.1	0.29	0.3	1.23	1.2	0.01	0.0
% Difference in Catch Ratio					**-13%**		**-9%**		**-8%**		**5%**		**-28%**	
Mean	16.7	17.0	16.1	16.4	61.9	72.9	1.7	2.0	4.4	4.9	18.8	18.0	0.2	0.3
Standard Error	1	1	1	1	4	4	0	0	1	1	2	2	0	0
Median	16	16	15	15	60	74	1	1	3	4	10	10	0	0
Mode	16	12	12	12	18	96	0	0	2	1	7	9	0	0
Standard Deviation	6	6	6	6	34	37	2	2	5	5	20	19	1	1
Sample Variance	39	35	31	32	1156	1351	5	4	24	26	415	364	0	1
Kurtosis	2	0	1	0	0	0	3	0	5	10	2	2	14	16
Skewness	1	1	1	1	0	0	2	1	2	3	2	2	4	4
Range	32	30	27	23	163	169	10	6	23	30	89	75	4	5
Minimum	7	6	7	8	6	10	0	0	0	0	2	1	0	0
Maximum	39	36	34	31	169	179	10	6	23	30	91	76	4	5
Confidence Level(95.0%)	1.16	1.09	1.27	1.29	7.77	8.40	0.50	0.44	1.11	1.15	4.65	4.36	0.16	0.19
Observations	114	114	76	76	76	76	76	76	76	76	76	76	76	76
Pearson Correlation	0.78		0.77		0.73		0.31		0.42		0.87		0.31	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	113.00		75.00		75.00		75.00		75.00		75.00		75.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-0.81		-0.74		-3.64		-0.80		-0.84		0.61		-0.88	
P(T<=t) one-tail	0.21		0.23		0.00		0.21		0.20		0.27		0.19	
t Critical one-tail	1.66		1.67		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.419		0.462		0.000		0.426		0.405		0.541		0.381	
t Critical two-tail	1.98		1.99		1.99		1.99		1.99		1.99		1.99	

Celtic 2006-3
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	Grey Sole		Yellowtail Fld.		Winter Fld.		Four Spot Fld.		Sand Dab		American Plaice		Sea Raven	
Dredge	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*
Total Count	14	26	1899	2857	7	27	487	664	321	450	10	4	21	25
% Difference in Count	**-46%**		**-34%**		**-74%**		**-27%**		**-29%**		**150%**		**-16%**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	1.55	2.3	0.01	0.0	0.40	0.5	0.26	0.4	0.01	0.0	0.02	0.0
% Difference in Catch Ratio	**-45%**		**-32%**		**-74%**		**-26%**		**-27%**		**155%**		**-29%**	
Mean	0.2	0.3	25.0	37.6	0.1	0.4	6.3	8.7	4.2	5.9	0.1	0.1	0.3	0.3
Standard Error	0	0	3	5	0	0	1	1	1	1	0	0	0	0
Median	0	0	11	25	0	0	6	8	0	0	0	0	0	0
Mode	0	0	2	1	0	0	6	8	0	0	0	0	0	0
Standard Deviation	1	1	30	43	0	1	6	6	8	12	1	0	1	1
Sample Variance	1	1	902	1835	0	1	35	32	62	139	1	0	1	1
Kurtosis	27	9	2	3	36	7	11	2	8	10	67	62	10	9
Skewness	5	3	2	2	6	3	3	1	3	3	8	8	3	3
Range	5	4	133	207	3	4	38	30	42	63	8	3	4	4
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	5	4	133	207	3	4	38	30	42	63	8	3	4	4
Confidence Level(95.0%)	0.18	0.20	6.86	9.79	0.09	0.17	1.34	1.29	1.81	2.69	0.22	0.08	0.16	0.16
Observations	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Pearson Correlation	0.70		0.87		-0.02		0.05		0.83		1.00		0.40	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	75.00		75.00		75.00		75.00		75.00		75.00		75.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-2.17		-4.97		-2.69		-2.63		-2.15		1.18		-0.73	
P(T<=t) one-tail	0.02		0.00		0.00		0.01		0.02		0.12		0.23	
t Critical one-tail	1.67		1.67		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.033		0.000		0.009		0.010		0.035		0.242		0.469	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99		1.99	

Appendix Table 68.2.

Celtic 2006-3
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Longhorn Sculpin**		**Red Hake**		**Silver Hake**		**Cod**		**Haddock**		**Torpedo Ray**		**Lobster**		**Spiny Dogfish**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	38	61	902	872	31	67	0	3	12	15	0	1	24	45	3	6
% Difference in Count	**-38%**		**3%**		**-54%**		**-100%**		**-20%**		**-100%**		**-47%**		**-50%**	
Fish Count/Scallop Bushel Catch Ratio	0.03	0.0	0.74	0.7	0.03	0.1	0.00	0.0	0.01	0.0	0.00	0.0	0.02	0.0	0.00	0.0
% Difference in Catch Ratio	**-36%**		**-1%**		**-54%**		**-100%**		**-32%**		**-100%**		**-46%**		**-49%**	
Mean	0.5	0.8	11.1	11.5	0.4	0.9	0.0	0.0	0.1	0.2	0.0	0.0	0.3	0.6	0.0	0.1
Standard Error	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	1	1	19	16	1	2	0	0	1	1	0	0	1	1	0	0
Sample Variance	1	1	369	265	1	4	0	0	0	0	0	0	1	1	0	0
Kurtosis	8	2	5	4	13	21	#DIV/0!	22	28	19	#DIV/0!	76	5	6	76	8
Skewness	3	2	2	2	3	4	#DIV/0!	5	5	4	#DIV/0!	9	2	2	9	3
Range	5	5	84	72	5	13	0	1	4	4	0	1	3	6	3	1
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	5	5	84	72	5	13	0	1	4	4	0	1	3	6	3	1
Confidence Level(95.0%)	0.21	0.27	4.39	3.72	0.22	0.44	0.00	0.04	0.14	0.14	0.00	0.03	0.16	0.26	0.08	0.06
Observations	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Pearson Correlation	0.35		0.81		0.43		#DIV/0!		0.45		#DIV/0!		0.58		-0.03	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	75.00		75.00		75.00		75.00		75.00		75.00		75.00		75.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-2.18		-0.30		-2.55		-1.76		-0.70		-1.00		-2.58		-0.77	
P(T<=t) one-tail	0.02		0.38		0.01		0.04		0.24		0.16		0.01		0.22	
t Critical one-tail	1.67		1.67		1.67		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.033		0.764		0.013		0.083		0.483		0.321		0.012		0.442	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99		1.99		1.99	

Appendix Table 69.1

Westport 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Barndoor Skate**		**Winter Skate**		**Monk**		**Summer Fld.**		**Grey Sole**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	2191	2506	959	1116	3090	6108	140	285	116	238	1309	1421	30	51	1	7
% Difference in Count	**-13%**		**-14%**		**-49%**		**-51%**		**-51%**		**-8%**		**-41%**		**-86%**	
Fish Count/Scallop Bushel Catch Ratio					3.22	5.5	0.15	0.3	0.12	0.2	1.37	1.3	0.03	0.0	0.00	0.0
% Difference in Catch Ratio					**-41%**		**-43%**		**-43%**		**7%**		**-32%**		**-83%**	
Mean	13.6	15.6	12.8	14.9	41.8	82.5	1.9	3.8	1.5	3.2	17.5	18.9	0.4	0.7	0.0	0.1
Standard Error	0	0	0	0	3	5	0	0	0	0	1	1	0	0	0	0
Median	14	16	13	15	39	77	1	3	1	3	15	15	0	0	0	0
Mode	13	16	11	15	30	67	0	1	0	0	9	12	0	0	0	0
Standard Deviation	4	4	4	4	23	46	2	4	2	4	12	12	1	1	0	0
Kurtosis	1	1	2	-1	1	0	10	14	3	14	1	0	1	1	75	18
Skewness	0	0	1	0	1	1	3	3	2	3	1	1	1	1	9	4
Range	26	27	26	16	120	224	13	25	9	24	57	52	2	4	1	2
Minimum	3	4	4	8	1	3	0	0	0	0	2	2	0	0	0	0
Maximum	29	30	29	23	121	227	13	25	9	24	59	54	2	4	1	2
Confidence Level(95.0%)	1	1	1	1	5	11	1	1	0	1	3	3	0	0	0	0
Variance	16.99	14.37	18.25	13.58	513.94	2089.32	6.04	18.57	4.25	13.85	134.01	152.94	0.43	0.95	0.01	0.14
Observations	162	162	75	75	74	74	75	75	75	75	75	75	75	75	75	75
Pearson Correlation	0.68		0.64		0.72		0.70		0.41		0.83		0.20		-0.03	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	161.00		74.00		73.00		74.00		74.00		74.00		74.00		74.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-7.90		-5.32		-10.51		-5.33		-4.10		-1.87		-2.29		-1.76	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00		0.03		0.01		0.04	
t Critical one-tail	1.65		1.67		1.67		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.000		0.000		0.000		0.000		0.000		0.066		0.025		0.083	
t Critical two-tail	1.97		1.99		1.99		1.99		1.99		1.99		1.99		1.99	

Westport 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Grey Sole**		**Yellowtail Fld.**		**Winter Fld.**		**Four Spot Fld.**		**Sand Dab**		**American Plaice**		**Sea Raven**		**Longhorn Sculpin**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1	7	650	2637	6	19	114	388	143	375	2	5	3	10	31	79
% Difference in Count	**-86%**		**-75%**		**-68%**		**-71%**		**-62%**		**-60%**		**-70%**		**-61%**	
Fish Count/Scallop Bushel Catch Ratio	0.00	0.0	0.68	2.4	0.01	0.0	0.12	0.3	0.15	0.3	0.00	0.0	0.00	0.0	0.03	0.1
% Difference in Catch Ratio	**-83%**		**-71%**		**-63%**		**-66%**		**-56%**		**-53%**		**-65%**		**-54%**	
Mean	0.0	0.1	8.7	35.2	0.1	0.3	1.5	5.2	1.9	5.0	0.0	0.1	0.0	0.1	0.4	1.1
Standard Error	0	0	1	5	0	0	0	0	0	1	0	0	0	0	0	1
Median	0	0	4	22	0	0	1	4	0	1	0	0	0	0	0	0
Mode	0	0	1	4	0	0	0	1	0	0	0	0	0	0	0	0
Standard Deviation	0	0	10	39	0	1	2	4	3	7	0	0	0	1	2	6
Kurtosis	75	18	4	7	8	7	7	0	2	2	75	50	22	30	64	69
Skewness	9	4	2	2	3	3	2	1	2	2	9	7	5	5	8	8
Range	1	2	49	210	1	3	11	16	12	30	2	3	1	4	19	54
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	1	2	49	210	1	3	11	16	12	30	2	3	1	4	19	54
Confidence Level(95.0%)	0	0	2	9	0	0	0	1	1	2	0	0	0	0	1	1
Variance	0.01	0.14	94.09	1527.24	0.07	0.38	3.63	16.06	9.38	54.19	0.05	0.14	0.04	0.36	5.11	39.94
Observations	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Pearson Correlation	-0.03		0.80		0.28		0.45		0.75		-0.02		0.41		0.97	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	74.00		74.00		74.00		74.00		74.00		74.00		74.00		74.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-1.76		-7.20		-2.50		-8.82		-4.90		-0.77		-1.47		-1.33	
P(T<=t) one-tail	0.04		0.00		0.01		0.00		0.00		0.22		0.07		0.09	
t Critical one-tail	1.67		1.67		1.67		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.083		0.000		0.015		0.000		0.000		0.442		0.146		0.186	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99		1.99		1.99	

Appendix Table 69.2

Westport 2006-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 2

Species	**Red Hake**		**Silver Hake**		**Torpedo Ray**		**Lobster**		**Spiny Dogfish**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	37	158	54	112	2	2	5	3	7	15
% Difference in Count	**-77%**		**-52%**		**0%**		**67%**		**-53%**	
Fish Count/Scallop Bushel Catch Ratio	0.04	0.1	0.06	0.1	0.00	0.0	0.01	0.0	0.01	0.0
% Difference in Catch Ratio	**-73%**		**-44%**		**16%**		**94%**		**-46%**	
Mean	0.5	2.1	0.7	1.5	0.0	0.0	0.1	0.0	0.1	0.2
Standard Error	0	0	1	1	0	0	0	0	0	0
Median	0	1	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0
Standard Deviation	1	3	5	5	0	0	0	0	0	0
Kurtosis	20	6	74	52	35	35	26	22	18	5
Skewness	4	2	9	7	6	6	5	5	4	2
Range	9	14	41	39	1	1	2	1	2	2
Minimum	0	0	0	0	0	0	0	0	0	0
Maximum	9	14	41	39	1	1	2	1	2	2
Confidence Level(95.0%)	0	1	1	1	0	0	0	0	0	0
Variance	2.01	8.80	22.42	22.96	0.03	0.03	0.09	0.04	0.14	0.22
Observations	75	75	75	75	75	75	75	75	75	75
Pearson Correlation	-0.01		0.93		-0.03		-0.05		0.05	
Hypothesized Mean Difference	0		0		0		0		0	
df	74.00		74.00		74.00		74.00		74.00	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-4.24		-3.69		0.00		0.63		-1.58	
P(T<=t) one-tail	0.00		0.00		0.50		0.27		0.06	
t Critical one-tail	1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.000		0.000		1.000		0.531		0.117	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99	

Appendix Table 70.

Friendship 2007-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Winter Skate**		**Monk**		**Summer Fld.**		**Grey Sole**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	787	750	374	336	5674	4441	6	4	409	377	2	3	39	33
% Difference in Count	**5%**		**11%**		**28%**		**50%**		**8%**		**-33%**		**18%**	
Fish Count/Scallop Bushel Catch Ratio					15.18	13.2	0.02	0.0	1.09	1.1	0.01	0.0	0.10	0.1
% Difference in Catch Ratio					**15%**		**35%**		**-2%**		**-40%**		**6%**	
Mean	4.3	4.1	4.2	3.8	63.8	49.9	0.1	0.0	4.6	4.2	0.0	0.0	0.4	0.4
Standard Error	0	0	0	0	3	2	0	0	0	0	0	0	0	0
Median	4	4	4	4	61	47	0	0	4	4	0	0	0	0
Mode	4	5	4	5	72	48	0	0	2	4	0	0	0	0
Standard Deviation	3	3	3	2	32	23	0	0	3	3	0	0	1	1
Sample Variance	11	8	7	3	1052	548	0	0	9	7	0	0	1	1
Kurtosis	31	30	40	15	0	2	27	18	0	0	89	26	5	10
Skewness	5	4	5	3	1	1	5	4	1	1	9	5	2	3
Range	30	27	25	14	149	130	2	1	13	11	2	1	4	5
Minimum	1	1	1	1	12	8	0	0	0	0	0	0	0	0
Maximum	30	27	25	15	161	138	2	1	13	11	2	1	4	5
Confidence Level(95.0%)	0.48	0.41	0.57	0.38	6.83	4.93	0.07	0.04	0.64	0.56	0.04	0.04	0.19	0.20
Observations	184	184	89	89	89	89	89	89	89	89	89	89	89	89
Pearson Correlation	0.89		0.85		0.75		-0.04		0.46		0.57		0.35	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	183.00		88.00		88.00		88.00		88.00		88.00		88.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	1.84		2.66		6.09		0.53		1.13		-0.58		0.60	
P(T<=t) one-tail	0.03		0.00		0.00		0.30		0.13		0.28		0.27	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.067		0.009		0.000		0.596		0.261		0.567		0.547	
t Critical two-tail	1.97		1.99		1.99		1.99		1.99		1.99		1.99	

Friendship 2007-2
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Yellowtail Fld.**		**Four Spot Fld.**		**Sea Robin**		**Red Hake**		**Silver Hake**		**Torpedo Ray**		**Lobster**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	4	1	74	61	51	41	4	10	12	11	1	3	1	0
% Difference in Count	**300%**		**21%**		**24%**		**-60%**		**9%**		**-67%**		**#DIV/0!**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	0.20	0.2	0.14	0.1	0.01	0.0	0.03	0.0	0.00	0.0	0.00	0.0
% Difference in Catch Ratio	**260%**		**9%**		**12%**		**-64%**		**-2%**		**-70%**		**#DIV/0!**	
Mean	0.0	0.0	0.8	0.7	0.6	0.5	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Sample Variance	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Kurtosis	18	89	1	5	1	3	42	13	10	9	89	26	89	#DIV/0!
Skewness	4	9	1	2	1	2	6	4	3	3	9	5	9	#DIV/0!
Range	1	1	4	5	3	3	2	2	2	2	1	1	1	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	1	1	4	5	3	3	2	2	2	2	1	1	1	0
Confidence Level(95.0%)	0.04	0.02	0.20	0.19	0.17	0.17	0.05	0.08	0.09	0.08	0.02	0.04	0.02	0.00
Observations	89	89	89	89	89	89	89	89	89	89	89	89	89	89
Pearson Correlation	-0.02		0.29		0.34		0.53		0.27		-0.02		#DIV/0!	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	88.00		88.00		88.00		88.00		88.00		88.00		88.00	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	1.35		1.23		1.13		-1.93		0.23		-1.00		1.00	
P(T<=t) one-tail	0.09		0.11		0.13		0.03		0.41		0.16		0.16	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.181		0.223		0.260		0.057		0.820		0.320		0.320	
t Critical two-tail	1.99		1.99		1.99		1.99		1.99		1.99		1.99	

Appendix Table 71.

Friendship 2007-3
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	Scallop Bushels (entire trip)		Scallop Bushels(obs tows)		Skate		Monk		Summer Fld.	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	869	865	127	124	2956	2505	123	113	1	0
% Difference in Count	**0%**		**2%**		**18%**		**9%**		**#DIV/0!**	
Fish Count/Scallop Bushel Catch Ratio					23.23	20.2	0.97	0.9	0.01	0.0
% Difference in Catch Ratio					**15%**		**6%**		**#DIV/0!**	
Mean	5.4	5.4	3.0	2.9	68.7	58.3	2.9	2.6	0.0	0.0
Standard Error	1	1	0	0	5	5	0	0	0	0
Median	3	3	3	3	65	54	2	2	0	0
Mode	3	3	3	3	65	45	2	2	0	0
Standard Deviation	7	7	1	1	33	32	2	2	0	0
Kurtosis	20	9	1	0	0	2	4	1	43	#DIV/0!
Skewness	4	3	1	0	0	1	2	1	7	#DIV/0!
Range	60	40	7	5	137	156	11	9	1	0
Minimum	1	1	1	1	5	9	0	0	0	0
Maximum	60	40	7	6	142	165	11	9	1	0
Confidence Level(95.0%)	1	1	0	0	10	10	1	1	0	0
Variance	56.08	45.91	1.77	1.41	1065.48	992.58	5.31	5.52	0.02	0.00
Observations	161	161	43	43	43	43	43	43	43	43
Pearson Correlation	0.96		0.90		0.87		0.60		#DIV/0!	
Hypothesized Mean Difference	0		0		0		0		0	
df	160.00		42.00		42.00		42.00		42.00	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	0.14		0.81		4.22		0.73		1.00	
P(T<=t) one-tail	0.44		0.21		0.00		0.23		0.16	
t Critical one-tail	1.65		1.68		1.68		1.68		1.68	
P(T<=t) two-tail	0.886		0.425		0.000		0.467		0.323	
t Critical two-tail	1.97		2.02		2.02		2.02		2.02	

Friendship 2007-3
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	Grey Sole		Yellowtail Fld.		Four Spot Fld.		Sand Dab	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	4	5	9	5	21	14	0	1
% Difference in Count	**-20%**		**80%**		**50%**		**-100%**	
Fish Count/Scallop Bushel Catch Ratio	0.03	0.0	0.07	0.0	0.17	0.1	0.00	0.0
% Difference in Catch Ratio	**-22%**		**76%**		**46%**		**-100%**	
Mean	0.1	0.1	0.2	0.1	0.5	0.3	0.0	0.0
Standard Error	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0
Standard Deviation	0	0	1	0	1	1	0	0
Kurtosis	19	4	12	4	0	14	#DIV/0!	43
Skewness	4	2	3	2	1	3	#DIV/0!	7
Range	2	1	3	1	2	4	0	1
Minimum	0	0	0	0	0	0	0	0
Maximum	2	1	3	1	2	4	0	1
Confidence Level(95.0%)	0	0	0	0	0	0	0	0
Variance	0.13	0.11	0.36	0.11	0.45	0.56	0.00	0.02
Observations	43	43	43	43	43	43	43	43
Pearson Correlation	-0.09		-0.13		0.01		#DIV/0!	
Hypothesized Mean Difference	0		0		0		0	
df	42.00		42.00		42.00		42.00	
α	0.05		0.05		0.05		0.05	
t Stat	-0.30		0.85		1.07		-1.00	
P(T<=t) one-tail	0.38		0.20		0.15		0.16	
t Critical one-tail	1.68		1.68		1.68		1.68	
P(T<=t) two-tail	0.767		0.400		0.291		0.323	
t Critical two-tail	2.02		2.02		2.02		2.02	

Appendix Table 72.

Friendship 2007-4
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels(obs tows)**		**Skate**		**Monk**		**Grey Sole**		**Yellowtail Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	442	376	197	178	2191	2048	60	68	4	1	2	3
% Difference in Count	**18%**		**11%**		**7%**		**-12%**		**300%**		**-33%**	
Fish Count/Scallop Bushel Catch Ratio					11.15	11.5	0.31	0.4	0.02	0.0	0.01	0.0
% Difference in Catch Ratio					**-3%**		**-20%**		**262%**		**-40%**	
Mean	3.8	3.2	3.6	3.2	39.8	37.2	1.1	1.2	0.1	0.0	0.0	0.1
Standard Error	0	0	0	0	5	5	0	0	0	0	0	0
Median	4	3	3	3	29	28	1	1	0	0	0	0
Mode	3	3	3	3	17	33	0	1	0	0	0	0
Standard Deviation	1	1	2	1	37	36	2	1	0	0	0	0
Kurtosis	1	1	2	1	5	5	3	2	10	55	25	15
Skewness	1	1	1	1	2	2	2	1	3	7	5	4
Range	7	7	7	6	164	172	6	5	1	1	1	1
Minimum	1	1	1	1	4	1	0	0	0	0	0	0
Maximum	8	8	8	7	168	173	6	5	1	1	1	1
Confidence Level(95.0%)	0	0	0	0	10	10	0	0	0	0	0	0
Variance	2.17	2.04	2.40	1.84	1336.21	1330.00	2.34	1.22	0.07	0.02	0.04	0.05
Observations	116	116	55	55	55	55	55	55	55	55	55	55
Pearson Correlation	0.74		0.89		0.95		0.22		-0.04		-0.05	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	115.00		54.00		54.00		54.00		54.00		54.00	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	5.86		3.57		1.62		-0.64		1.35		-0.44	
P(T<=t) one-tail	0.00		0.00		0.06		0.26		0.09		0.33	
t Critical one-tail	1.66		1.67		1.67		1.67		1.67		1.67	
P(T<=t) two-tail	0.000		0.001		0.111		0.524		0.182		0.659	
t Critical two-tail	1.98		2.00		2.00		2.00		2.00		2.00	

Friendship 2007-4
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Winter Fld.**		**Four Spot Fld.**		**Sand Dab**		**Sea Robin**		**Red Hake**		**Silver Hake**	
Dredge			***Experimental***	***Control***			***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1	0	33	19	11	11	3	2	6	9	2	1
% Difference in Count			**74%**				**50%**		**-33%**		**100%**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	0.17	0.1	0.06	0.1	0.02	0.0	0.03	0.1	0.01	0.0
% Difference in Catch Ratio			**57%**				**36%**		**-40%**		**81%**	
Mean	0.0	0.0	0.6	0.3	0.2	0.2	0.1	0.0	0.1	0.2	0.0	0.0
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	1	1	1	1	0	0	0	0	0	0
Kurtosis	55	#DIV/0!	3	6	6	6	15	25	14	8	25	55
Skewness	7	#DIV/0!	2	2	3	3	4	5	4	3	5	7
Range	1	0	4	3	2	2	1	1	2	2	1	1
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	1	0	4	3	2	2	1	1	2	2	1	1
Confidence Level(95.0%)	0	0	0	0	0	0	0	0	0	0	0	0
Variance	0.02	0.00	0.87	0.53	0.27	0.27	0.05	0.04	0.14	0.21	0.04	0.02
Observations	55	55	55	55	55	55	55	55	55	55	55	55
Pearson Correlation	#DIV/0!		0.02		1.00		0.38		0.55		-0.03	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	54.00		54.00		54.00		54.00		54.00		54.00	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	1.00		1.61		#DIV/0!		0.57		-1.00		0.57	
P(T<=t) one-tail	0.16		0.06		#DIV/0!		0.28		0.16		0.28	
t Critical one-tail	1.67		1.67		#DIV/0!		1.67		1.67		1.67	
P(T<=t) two-tail	0.322		0.114		#DIV/0!		0.568		0.322		0.568	
t Critical two-tail	2.00		2.00		#DIV/0!		2.00		2.00		2.00	

Appendix Table 73.

Friendship 2007-5
Descriptive Statistics and t-Test: Paired Two Sample for Means
Experimental Dredge Design 3

Species	**Scallop Bushels (entire trip)**		**Scallop Bushels (obs tows)**		**Skate**		**Monk**		**Yellowtail Fld.**		**Four Spot Fld.**		**Sand Dab**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***		
Total Count	1605	1661	653	570	835	680	33	17	0	1	18	11	1	0
% Difference in Count	**-3%**		**15%**		**23%**		**94%**		**-100%**		**64%**			
Fish Count/Scallop Bushel Catch Ratio					1.28	1.2	0.05	0.0	0.00	0.0	0.03	0.0	0.00	0.0
% Difference in Catch Ratio					**7%**		**69%**		**-100%**		**43%**			
Mean	38.2	39.5	34.3	30.0	43.9	35.8	1.7	0.9	0.0	0.1	0.9	0.6	0.1	0.0
Standard Error	4	4	5	5	6	5	0	0	0	0	0	0	0	0
Median	36	34	25	22	36	30	1	1	0	0	1	0	0	0
Mode	15	25	25	15	#N/A	#N/A	1	1	0	0	0	0	0	0
Standard Deviation	25	24	23	21	25	23	2	1	0	0	1	1	0	0
Sample Variance	642	597	529	449	617	512	3	1	0	0	1	1	0	0
Kurtosis	-1	-1	-1	-1	1	0	5	1	#DIV/0!	19	1	3	19	#DIV/0!
Skewness	0	1	1	1	1	1	2	1	#DIV/0!	4	1	2	4	#DIV/0!
Range	94	93	74	69	101	87	7	3	0	1	4	3	1	0
Minimum	6	7	12	6	0	0	0	0	0	0	0	0	0	0
Maximum	100	100	85	75	101	87	7	3	0	1	4	3	1	0
Confidence Level(95.0%)	7.90	7.61	11.08	10.21	11.98	10.90	0.80	0.45	0.00	0.11	0.54	0.40	0.11	0.00
Observations	42	42	19	19	19	19	19	19	19	19	19	19	19	19
Pearson Correlation	0.93		0.96		0.94		0.55		#DIV/0!		0.09		#DIV/0!	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	41.00		18.00		18.00		18.00		18.00		18.00		18.00	
α	0.05		1.05		2.05		3.05		4.05		5.05		6.05	
t Stat	-0.95		3.02		4.11		2.65		-1.00		1.20		1.00	
P(T<=t) one-tail	0.17		0.00		0.00		0.01		0.17		0.12		0.17	
t Critical one-tail	1.68		1.73		1.73		1.73		1.73		1.73		1.73	
P(T<=t) two-tail	0.348		0.007		0.001		0.016		0.331		0.247		0.331	
t Critical two-tail	2.02		2.10		2.10		2.10		2.10		2.10		2.10	

Appendix Table 74.1.

Experimental Dredge Frame Design 1
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Scallop Bushels (all good tows)**		**Scallop Bushels(obs tows)**		**Skate**		**Barndoor Skate**		**Winter Skate**		**Monk**		**Summer Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	2949	2806	1330	1202	5577	6321	507	518	145	137	2026	2070	53	73
% Difference in Count	**5%**		**11%**		**-12%**		**-2%**		**6%**		**-2%**		**-27%**	
Fish Count/Scallop Bushel Catch Ratio					4.19	5.3	0.38	0.4	0.11	0.1	1.52	1.7	0.04	0.1
% Difference in Catch Ratio					**-20%**		**-12%**		**-4%**		**-12%**		**-34%**	
Mean	11.5	11.0	11.7	10.5	48.9	55.4	4.4	4.5	1.3	1.2	17.8	18.2	0.5	0.6
Standard Error	1	1	1	1	4	4	0	0	0	0	1	1	0	0
Median	9	8	9	8	38	45	4	4	1	0	18	17	0	0
Mode	8	8	9	8	30	34	0	0	0	0	17	19	0	0
Standard Deviation	9	9	9	10	45	43	4	4	2	2	7	9	1	1
Sample Variance	75	87	88	90	2062	1858	20	17	3	3	48	78	1	1
Kurtosis	8	8	6	8	6	4	1	0	3	5	0	1	11	3
Skewness	3	3	3	3	2	2	1	1	2	2	0	1	3	2
Range	53	49	46	46	249	223	19	16	8	10	35	46	6	5
Minimum	2	2	2	2	1	2	0	0	0	0	0	0	0	0
Maximum	55	51	47	48	250	225	19	16	8	10	35	46	6	5
Confidence Level(95.0%)	1.07	1.15	1.74	1.76	8.43	8.00	0.82	0.77	0.31	0.33	1.28	1.63	0.19	0.21
Observations	256	256	114	114	114	114	114	114	114	114	114	114	114	114
Pearson Correlation	0.94		0.93		0.91		0.73		0.48		0.57		0.50	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	255		113		113		113		113		113		113	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	2.84		3.50		-3.74		-0.32		0.43		-0.55		-1.73	
P(T<=t) one-tail	0.00		0.00		0.00		0.37		0.34		0.29		0.04	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.005		0.001		0.000		0.746		0.671		0.583		0.086	
t Critical two-tail	1.97		1.98		1.98		1.98		1.98		1.98		1.98	

Experimental Dredge Frame Design 1
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Summer Fld.**		**Grey Sole**		**Yellowtail Fld.**		**Winter Fld.**		**Four Spot Fld.**		**Sand Dab**		**American Plaice**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	53	73	374	400	231	323	8	22	403	465	91	147	64	88
% Difference in Count	**-27%**		**-6%**		**-28%**		**-64%**		**-13%**				**-27%**	
Fish Count/Scallop Bushel Catch Ratio	0.04	0.1	0.28	0.3	0.17	0.3	0.01	0.0	0.30	0.4	0.07	0.1	0.05	0.1
% Difference in Catch Ratio	**-34%**		**-15%**		**-35%**		**-67%**		**-22%**		**-44%**		**-34%**	
Mean	0.5	0.6	3.3	3.5	2.0	2.8	0.1	0.2	3.5	4.1	0.8	1.3	0.6	0.8
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	2	3	1	2	0	0	2	4	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	1	1	4	4	3	4	0	1	4	4	2	4	2	2
Sample Variance	1	1	13	15	6	13	0	0	13	13	6	13	2	3
Kurtosis	11	3	2	4	3	3	42	6	3	2	18	11	11	4
Skewness	3	2	1	2	2	2	6	3	2	1	4	3	3	2
Range	6	5	17	21	13	16	3	2	18	17	16	20	8	7
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	6	5	17	21	13	16	3	2	18	17	16	20	8	7
Confidence Level(95.0%)	0.19	0.21	0.66	0.72	0.47	0.66	0.07	0.10	0.68	0.68	0.44	0.67	0.28	0.31
Observations	114	114	114	114	114	114	114	114	114	114	114	114	114	114
Pearson Correlation	0.50		0.72		0.56		0.39		0.52		0.84		0.76	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	113		113		113		113		113		113		113	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-1.73		-0.87		-2.89		-2.62		-1.62		-2.53		-2.03	
P(T<=t) one-tail	0.04		0.19		0.00		0.00		0.05		0.01		0.02	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.086		0.384		0.005		0.010		0.108		0.013		0.045	
t Critical two-tail	1.98		1.98		1.98		1.98		1.98		1.98		1.98	

Appendix Table 74.2.

Experimental Dredge Frame Design 1

Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Sea Raven**		**Longhorn Sculpin**		**Red Hake**		**Silver Hake**		**Lobster**		**Spiny Dogfish**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	32	36	25	33	122	153	5	19	2	2	23	26
% Difference in Count	**-11%**		**-24%**		**-20%**		**-74%**		**0%**		**-12%**	
Fish Count/Scallop Bushel Catch Ratio	0.02	0.0	0.02	0.0	0.09	0.1	0.00	0.0	0.00	0.0	0.02	0.0
% Difference in Catch Ratio	**-20%**		**-32%**		**-28%**		**-76%**		**-10%**		**-20%**	
Mean	0.3	0.3	0.2	0.3	1.1	1.3	0.0	0.2	0.0	0.0	0.2	0.3
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	1	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	1	1	1	1	2	2	0	0	0	0	1	1
Sample Variance	0	1	1	1	3	4	0	0	0	0	0	1
Kurtosis	11	8	77	57	12	2	19	7	54	43	12	29
Skewness	3	3	8	7	3	2	5	3	7	7	3	5
Range	4	4	10	9	12	8	1	2	1	1	3	7
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	4	4	10	9	12	8	1	2	1	1	3	7
Confidence Level(95.0%)	0.12	0.13	0.19	0.18	0.34	0.35	0.04	0.08	0.02	0.03	0.10	0.19
Observations	114	114	114	114	114	114	114	114	114	114	114	114
Pearson Correlation	0.32		0.77		0.27		0.21		0.49		0.69	
Hypothesized Mean Difference	0		0		0		0		0		0	
df	113		113		113		113		113		113	
α	0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-0.47		-1.11		-1.29		-2.95		0.00		-0.46	
P(T<=t) one-tail	0.32		0.13		0.10		0.00		0.50		0.32	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.639		0.269		0.198		0.004		1.000		0.649	
t Critical two-tail	1.98		1.98		1.98		1.98		1.98		1.98	

Appendix Table 75.1.

Experimental Dredge Frame Design 2
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	Scallop Bushels (all good tows)		Scallop Bushels(obs tows)		Skate		Barndoor Skate		Winter Skate		Monk		Summer Fld.	
Dredge	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*
Total Count	4109	4462	2162	2344	7796	11647	274	434	450	607	2818	2792	47	75
% Difference in Count	**-8%**		**-8%**		**-33%**		**-37%**		**-26%**		**1%**		**-37%**	
Fish Count/Scallop Bushel Catch Ratio					3.61	5.0	0.13	0.2	0.21	0.3	1.30	1.2	0.02	0.0
% Difference in Catch Ratio					**-27%**		**-32%**		**-20%**		**9%**		**-32%**	
Mean	14.9	16.2	14.4	15.6	52.0	77.6	1.8	2.9	3.0	4.0	18.0	18.3	0.3	0.5
Standard Error	0	0	0	0	2	3	0	0	0	0	1	1	0	0
Median	14	16	14	15	46	76	1	2	2	3	12	12	0	0
Mode	16	12	12	12	31	96	0	1	0	3	9	8	0	0
Standard Deviation	5	5	5	5	31	42	2	3	4	5	17	16	1	1
Sample Variance	28	23	27	23	936	1727	5	12	16	20	273	254	0	1
Kurtosis	3	2	1	0	1	0	7	21	10	12	3	2	6	6
Skewness	1	1	1	1	1	1	2	4	3	3	2	2	2	2
Range	36	33	31	24	168	224	13	25	23	30	89	75	4	5
Minimum	3	4	4	8	1	3	0	0	0	0	2	1	0	0
Maximum	39	36	34	31	169	227	13	25	23	30	91	76	4	5
Confidence Level(95.0%)	0.63	0.57	0.84	0.78	4.94	6.70	0.38	0.56	0.65	0.73	2.66	2.57	0.11	0.15
Observations	276	276	150	150	150	150	150	150	150	150	150	150	150	150
Pearson Correlation	0.75		0.72		0.61		0.54		0.44		0.85		0.27	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	275		149		149		149		149		149		149	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-5.82		-3.97		-9.41		-4.45		-2.83		-0.45		-2.30	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00		0.33		0.01	
t Critical one-tail	1.65		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.000		0.000		0.000		0.000		0.005		0.651		0.023	
t Critical two-tail	1.97		1.98		1.98		1.98		1.98		1.98		1.98	

Experimental Dredge Frame Design 2
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	Grey Sole		Yellowtail Fld.		Winter Fld.		Four Spot Fld.		Sand Dab		Am. Plaice		Sea Raven	
Dredge	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*	*Experimental*	*Control*
Total Count	15	33	2546	5478	13	45	596	1047	464	825	12	9	23	35
% Difference in Count	**-55%**		**-54%**		**-71%**		**-43%**		**-44%**		**33%**		**-34%**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	1.18	2.3	0.01	0.0	0.28	0.4	0.21	0.4	0.01	0.0	0.01	0.0
% Difference in Catch Ratio	**-51%**		**-50%**		**-69%**		**-38%**		**-39%**		**45%**		**-29%**	
Mean	0.1	0.2	17.0	36.5	0.1	0.3	4.0	7.0	3.1	5.5	0.1	0.1	0.2	0.2
Standard Error	0	0	2	3	0	0	0	0	0	1	0	0	0	0
Median	0	0	7	23	0	0	3	6	0	1	0	0	0	0
Mode	0	0	2	4	0	0	0	8	0	0	0	0	0	0
Standard Deviation	1	1	24	41	0	1	5	5	6	10	1	0	1	1
Sample Variance	0	0	567	1681	0	0	25	27	37	97	0	0	0	0
Kurtosis	54	15	6	4	35	8	15	2	14	11	119	53	21	15
Skewness	7	4	2	2	5	3	3	1	3	3	11	7	4	4
Range	5	4	133	210	3	4	38	30	42	63	8	3	4	4
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	5	4	133	210	3	4	38	30	42	63	8	3	4	4
Confidence Level(95.0%)	0.09	0.11	3.84	6.61	0.06	0.11	0.81	0.84	0.99	1.59	0.11	0.06	0.09	0.11
Observations	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Pearson Correlation	0.65		0.74		0.09		0.26		0.79		0.66		0.38	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	149		149		149		149		149		149		149	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-2.77		-8.47		-3.54		-5.94		-4.71		0.47		-1.44	
P(T<=t) one-tail	0.00		0.00		0.00		0.00		0.00		0.32		0.08	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.006		0.000		0.001		0.000		0.000		0.641		0.152	
t Critical two-tail	1.98		1.98		1.98		1.98		1.98		1.98		1.98	

Appendix Table 75.2.

Experimental Dredge Frame Design 2

Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Longhorn Sculpin**		**Red Hake**		**Cod**		**Haddock**		**Silver Hake**		**Torpedo Ray**		**Lobster**		**Spiny Dogfish**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	68	140	876	1026	0	3	11	15	82	178	2	3	29	48	10	19
% Difference in Count	**-51%**		**-15%**		**-100%**		**-27%**		**-54%**		**-33%**		**-40%**		**-47%**	
Fish Count/Scallop Bushel Catch Ratio	0.03	0.1	0.41	0.4	0.00	0.0	0.01	0.0	0.04	0.1	0.00	0.0	0.01	0.0	0.00	0.0
% Difference in Catch Ratio	**-47%**		**-7%**		**-100%**		**-20%**		**-50%**		**-28%**		**-34%**		**-43%**	
Mean	0.5	0.9	5.8	6.8	0.0	0.0	0.1	0.1	0.5	1.2	0.0	0.0	0.2	0.3	0.1	0.1
Standard Error	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	2	5	15	13	0	0	0	0	3	4	0	0	1	1	0	0
Sample Variance	3	21	215	160	0	0	0	0	12	13	0	0	0	1	0	0
Kurtosis	93	128	12	10	#DIV/0!	47	58	40	135	78	72	47	10	14	40	7
Skewness	9	11	3	3	#DIV/0!	7	7	6	11	8	9	7	3	3	6	3
Range	19	54	84	72	0	1	4	4	41	39	1	1	3	6	3	2
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	19	54	84	72	0	1	4	4	41	39	1	1	3	6	3	2
Confidence Level(95.0%)	0.28	0.73	2.37	2.04	0.00	0.02	0.07	0.07	0.55	0.59	0.02	0.02	0.09	0.14	0.06	0.06
Observations	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Pearson Correlation	0.91		0.82		#DIV/0!		0.47		0.87		-0.02		0.56		0.04	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0	
df	149		149		149		149		149		149		149		149	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	-1.93		-1.45		-1.74		-0.71		-4.38		-0.45		-2.14		-1.49	
P(T<=t) one-tail	0.03		0.07		0.04		0.24		0.00		0.33		0.02		0.07	
t Critical one-tail	1.66		1.66		1.66		1.66		1.66		1.66		1.66		1.66	
P(T<=t) two-tail	0.056		0.149		0.083		0.481		0.000		0.656		0.034		0.140	
t Critical two-tail	1.98		1.98		1.98		1.98		1.98		1.98		1.98		1.98	

Appendix Table 76.

Experimental Dredge Frame Design 3
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	Scallop Bushels (entire trip)		Scallop Bushels(obs tows)		Skate		Winter Skate		Monk		Summer Fld.		Grey Sole		Yellowtail Fld.		Four Spot Fld.	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	3680	3514	1347	1211	11205	10125	12	4	625	575	2	4	48	38	11	14	139	112
% Difference in Count	**5%**		**11%**		**11%**		**200%**		**9%**		**-50%**		**26%**		**-21%**		**24%**	
Fish Count/Scallop Bushel Catch Ratio					8.32	8.4	0.01	0.0	0.46	0.5	0.00	0.0	0.04	0.0	0.01	0.0	0.10	0.1
% Difference in Catch Ratio					**-1%**		**170%**		**-2%**		**-55%**		**14%**		**-29%**		**12%**	
Mean	7.7	7.3	6.5	5.9	54.4	49.2	0.1	0.0	3.0	2.8	0.0	0.0	0.2	0.2	0.1	0.1	0.7	0.5
Standard Error	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Median	4	4	4	4	48	44	0	0	2	2	0	0	0	0	0	0	0	0
Mode	3	3	3	3	45	48	0	0	0	1	0	0	0	0	0	0	0	0
Standard Deviation	13	13	11	10	34	31	0	0	3	3	0	0	1	1	0	0	1	1
Sample Variance	172	166	130	101	1169	984	0	0	8	6	0	0	0	0	0	0	1	1
Kurtosis	17	17	22	24	1	2	28	48	1	1	206	48	14	24	14	42	2	5
Skewness	4	4	5	5	1	1	5	7	1	1	14	7	3	5	4	6	2	2
Range	100	100	85	75	168	173	2	1	13	11	2	1	4	5	1	3	4	5
Minimum	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	100	100	85	75	168	173	2	1	13	11	2	1	4	5	1	3	4	5
Confidence Level(95.0%)	1.18	1.15	1.56	1.38	4.70	4.31	0.04	0.02	0.39	0.35	0.02	0.02	0.09	0.09	0.03	0.04	0.13	0.11
Observations	481	481	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Pearson Correlation	0.97		0.98		0.83		-0.03		0.61		0.50		0.36		-0.05		0.18	
Hypothesized Mean Difference	0		0		0		0		0		0		0		0		0	
df	480		205		205		205		205		205		205		205		205	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	2.43		3.85		3.85		1.80		0.87		-1.00		0.94		-0.52		1.65	
P(T<=t) one-tail	0.01		0.00		0.00		0.04		0.19		0.16		0.18		0.30		0.05	
t Critical one-tail	1.65		1.65		1.65		1.65		1.65		1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.016		0.000		0.000		0.074		0.386		0.318		0.350		0.603		0.100	
t Critical two-tail	1.96		1.97		1.97		1.97		1.97		1.97		1.97		1.97		1.97	

Experimental Dredge Frame Design 3
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	Winter Fld.		Sand Dab		Sea Robin		Red Hake		Silver Hake		Torpedo Ray		Lobster	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1	0	13	11	54	43	10	19	14	12	1	3	1	0
% Difference in Count	**#DIV/0!**		**18%**		**26%**		**-47%**		**17%**		**-67%**		**#DIV/0!**	
Fish Count/Scallop Bushel Catch Ratio	0.00	0.0	0.01	0.0	0.04	0.0	0.01	0.0	0.01	0.0	0.00	0.0	0.00	0.0
% Difference in Catch Ratio	**#DIV/0!**		**6%**		**13%**		**-53%**		**5%**		**-70%**		**#DIV/0!**	
Mean	0.0	0.0	0.1	0.1	0.3	0.2	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Standard Error	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Sample Variance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kurtosis	206	#DIV/0!	27	34	6	10	36	17	23	23	206	65	206	#DIV/0!
Skewness	14	#DIV/0!	5	6	3	3	6	4	5	5	14	8	14	#DIV/0!
Range	1	0	2	2	3	3	2	2	2	2	1	1	1	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum	1	0	2	2	3	3	2	2	2	2	1	1	1	0
Confidence Level(95.0%)	0.01	0.00	0.04	0.04	0.08	0.08	0.04	0.05	0.04	0.03	0.01	0.02	0.01	0.00
Observations	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Pearson Correlation	#DIV/0!		0.94		0.45		0.55		0.28		-0.01		#DIV/0!	
Hypothesized Mean Difference	0		0		0		0		0		0		0	
df	205		205		205		205		205		205		205	
α	0.05		0.05		0.05		0.05		0.05		0.05		0.05	
t Stat	1.00		1.42		1.22		-2.08		0.43		-1.00		1.00	
P(T<=t) one-tail	0.16		0.08		0.11		0.02		0.34		0.16		0.16	
t Critical one-tail	1.65		1.65		1.65		1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.318		0.158		0.222		0.039		0.671		0.318		0.318	
t Critical two-tail	1.97		1.97		1.97		1.97		1.97		1.97		1.97	

Appendix Table 77.

BARNDOOR SKATE LENGTHS - DREDGE 1									
TRIP	Celtic-2006-2		Westport-2006-1		Dredge-1 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)									
16-20	1	1	0	0	1	1	0%	0%	0%
21-25	1	0	0	0	1	0	0%	0%	0%
26-30	8	3	0	0	8	3	3%	1%	2%
31-35	23	20	3	2	26	22	10%	8%	2%
36-40	27	26	1	2	28	28	11%	11%	0%
41-45	53	49	2	1	55	50	21%	19%	2%
46-50	40	35	2	3	42	38	16%	14%	2%
51-55	45	43	1	0	46	43	17%	16%	1%
56-60	21	35	0	2	21	37	8%	14%	-6%
61-65	10	10	0	0	10	10	4%	4%	0%
66-70	5	9	1	1	6	10	2%	4%	-1%
71-75	2	1	1	0	3	1	1%	0%	1%
76-80	4	0	1	1	5	1	2%	0%	2%
81-85	2	2	0	1	2	3	1%	1%	0%
86-90	0	0	0	0	0	0	0%	0%	0%
91-95	0	1	0	0	0	1	0%	0%	0%
96-100	0	4	0	0	0	4	0%	2%	-2%
101-105	0	2	0	0	0	2	0%	1%	-1%
106-110	3	0	0	0	3	0	1%	0%	1%
111-115	0	6	0	0	0	6	0%	2%	-2%
116-120	3	1	0	0	3	1	1%	0%	1%
121-125	3	3	0	1	3	4	1%	2%	0%
TOTAL MEASURED	251	251	12	14	263	265			
Total Caught:	494	501	13	17	507	518			
% Measured:	51%	50%	92%	82%	52%	51%			

Appendix Table 78.

BARNDOOR SKATE LENGTHS - DREDGE 2									
TRIP	Westport-2006-2		Celtic-2006-3		Dredge-2 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)									
16-20	0	0	0	0	0	0	0%	0%	0%
21-25	0	0	1	1	1	1	1%	1%	0%
26-30	2	1	1	1	3	2	2%	1%	1%
31-35	3	8	3	0	6	8	4%	4%	0%
36-40	4	10	3	1	7	11	5%	6%	-1%
41-45	12	19	7	1	19	20	13%	10%	3%
46-50	17	19	2	1	19	20	13%	10%	3%
51-55	4	21	1	2	5	23	3%	12%	-9%
56-60	14	22	3	2	17	24	12%	13%	-1%
61-65	8	19	2	5	10	24	7%	13%	-6%
66-70	9	11	2	2	11	13	8%	7%	1%
71-75	6	7	5	4	11	11	8%	6%	2%
76-80	4	4	1	5	5	9	3%	5%	-1%
81-85	2	4	2	0	4	4	3%	2%	1%
86-90	2	3	5	4	7	7	5%	4%	1%
91-95	1	1	2	1	3	2	2%	1%	1%
96-100	3	5	1	1	4	6	3%	3%	0%
101-105	0	1	1	0	1	1	1%	1%	0%
106-110	0	0	2	1	2	1	1%	1%	1%
111-115	4	1	1	2	5	3	3%	2%	2%
116-120	3	0	2	0	5	0	3%	0%	3%
121-125	1	1	0	1	1	2	1%	1%	0%
TOTAL MEASURED	99	157	47	35	146	192			
Total Caught:	140	285	134	149	274	434			
% Measured:	71%	55%	35%	23%	53%	44%			

Appendix Table 79.

Monkfish Lengths - Dredge 1											
TRIP	Celtic-2006-1		Celtic-2006-2		Westport-2006-1		Dredge-1 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)											
16-20	0	0	0	0	0	0	0	0	0%	0%	0%
21-25	0	1	0	0	0	0	0	1	0%	0%	0%
26-30	0	3	4	7	0	0	4	10	1%	1%	-1%
31-35	3	5	24	23	1	3	28	31	4%	4%	0%
36-40	9	13	81	65	15	18	105	96	14%	13%	2%
41-45	11	34	127	92	37	39	175	165	23%	22%	2%
46-50	15	15	78	78	38	36	131	129	18%	17%	1%
51-55	6	6	91	88	39	53	136	147	18%	19%	-1%
56-60	5	3	55	38	48	59	108	100	14%	13%	1%
61-65	2	1	18	27	17	26	37	54	5%	7%	-2%
66-70	2	1	8	10	2	7	12	18	2%	2%	-1%
71-75	0	0	3	4	1	1	4	5	1%	1%	0%
76-80	0	1	1	3	3	1	4	5	1%	1%	0%
81-85	0	1	2	0	0	1	2	2	0%	0%	0%
86-90	0	2	2	1	0	0	2	3	0%	0%	0%
91-95	0	0	0	0	0	0	0	0	0%	0%	0%
TOTAL MEASURED	53	86	494	436	201	244	748	766			
Total Caught:	113	118	1665	1667	248	285	2026	2070			
% Measured:	47%	73%	30%	26%	81%	86%	37%	37%			

Appendix Table 80.

Monkfish Lengths - Dredge 2									
TRIP	Westport-2006-2		Celtic-2006-3		Dredge-2 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)									
16-20	0	0	1	0	1	0	0%	0%	0%
21-25	0	1	2	2	2	3	1%	1%	0%
26-30	2	3	7	4	9	7	2%	2%	1%
31-35	5	5	4	4	9	9	2%	2%	0%
36-40	5	6	4	2	9	8	2%	2%	0%
41-45	28	29	12	15	40	44	10%	11%	0%
46-50	46	51	20	22	66	73	17%	18%	-1%
51-55	42	55	42	35	84	90	22%	22%	0%
56-60	29	39	48	42	77	81	20%	20%	0%
61-65	17	22	29	32	46	54	12%	13%	-1%
66-70	14	8	16	21	30	29	8%	7%	1%
71-75	5	1	6	9	11	10	3%	2%	0%
76-80	0	0	0	2	0	2	0%	0%	0%
81-85	0	0	0	0	0	0	0%	0%	0%
86-90	0	0	0	0	0	0	0%	0%	0%
91-95	0	0	0	0	0	0	0%	0%	0%
TOTAL MEASURED	193	220	191	190	384	410			
Total Caught:	1309	1421	1509	1371	2818	2792			
% Measured:	15%	15%	13%	14%	14%	15%			

Appendix Table 81.

Monkfish Lengths - Dredge 3											
TRIP	Friendship-2006-2		Friendship-2006-4		Friendship-2006-5		Dredge-3 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)											
16-20	1	3	1	0	0	0	2	3	1%	1%	0%
21-25	0	5	3	1	0	0	3	6	1%	2%	-1%
26-30	15	16	3	5	5	5	23	26	7%	9%	-2%
31-35	39	29	12	8	17	8	68	45	21%	16%	5%
36-40	32	20	3	6	5	2	40	28	12%	10%	2%
41-45	37	17	7	4	1	1	45	22	14%	8%	6%
46-50	37	26	3	8	4	0	44	34	14%	12%	1%
51-55	23	28	4	5	0	0	27	33	8%	12%	-3%
56-60	26	29	6	6	0	1	32	36	10%	13%	-3%
61-65	13	18	1	4	0	0	14	22	4%	8%	-4%
66-70	8	9	1	0	0	0	9	9	3%	3%	0%
71-75	3	7	1	2	0	0	4	9	1%	3%	-2%
76-80	4	2	0	0	0	0	4	2	1%	1%	1%
81-85	0	0	0	0	0	0	0	0	0%	0%	0%
86-90	0	0	0	1	0	0	0	1	0%	0%	0%
91-95	10	5	0	0	0	0	10	5	3%	2%	1%
TOTAL MEASURED	248	214	45	50	32	17	325	281			
Total Caught:	409	377	60	68	33	17	502	462			
% Measured:	61%	57%	75%	74%	97%	100%	65%	61%			

Appendix Table 82.

YELLOWTAIL LENGTHS - DREDGE 1											
TRIP	Celtic-2006-1		Celtic-2006-2		Westport-2006-1		Dredge-1 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)											
16-20	0	0	0	0	1	5	1	5	1%	3%	-2%
21-25	1	0	0	2	1	0	2	2	2%	1%	1%
26-30	7	6	13	17	3	4	23	27	23%	18%	6%
31-35	0	2	28	32	11	30	39	64	39%	42%	-2%
36-40	1	1	17	13	10	30	28	44	28%	29%	0%
41-45	0	1	5	5	0	2	5	8	5%	5%	0%
46-50	1	0	0	1	0	2	1	3	1%	2%	-1%
56-60	0	0	0	0	0	0	0	0	0%	0%	0%
61-65	0	0	0	0	0	0	0	0	0%	0%	0%
TOTAL MEASURED	10	10	63	70	26	73	99	153			
Total Caught:	14	12	180	229	37	82	231	323			
% Measured:	71%	83%	35%	31%	70%	89%	43%	47%			

Appendix Table 83.

YELLOWTAIL LENGTHS - DREDGE 2									
TRIP	Westport-2006-2		Celtic-2006-3		Dredge-2 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)									
16-20	8	22	0	0	8	22	1%	2%	0%
21-25	42	189	12	8	54	197	9%	14%	-5%
26-30	21	20	8	9	29	29	5%	2%	3%
31-35	111	375	86	108	197	483	33%	34%	-1%
36-40	97	307	110	118	207	425	35%	30%	5%
41-45	33	121	51	57	84	178	14%	13%	2%
46-50	5	49	11	7	16	56	3%	4%	-1%
51-55	0	11	0	0	0	11	0%	1%	-1%
56-60	0	6	0	0	0	6	0%	0%	0%
61-65	0	7	0	0	0	7	0%	0%	0%
TOTAL MEASURED	317	1107	278	307	595	1414			
Total Caught:	647	2621	1899	2857	2546	5478			
% Measured:	49%	42%	15%	11%	23%	26%			

Appendix Table 84.

Fluke Lengths - Dredge 1									
TRIP	Celtic-2006-1		Celtic-2006-2		Dredge-1 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)									
31-35	0	1			0	1	0%	3%	-3%
36-40	7	4	1	1	8	5	31%	15%	16%
41-45	0	0	5	4	5	4	19%	12%	7%
46-50	1	3	1	3	2	6	8%	18%	-10%
51-55			8	9	8	9	31%	27%	3%
56-60			2	6	2	6	8%	18%	-10%
61-65			0	2	0	2	0%	6%	-6%
66-70			1	0	1	0	4%	0%	4%
TOTAL MEASURED	8	8	18	25	26	33			
Total Caught:	8	11	45	62	53	73			
% Measured:	100%	73%	40%	40%	49%	45%			

Appendix Table 85.

Fluke Lengths - Dredge 2									
TRIP	Westport-2006-2		Celtic-2006-3		Dredge-2 Total		% of measured		%
DREDGE	Experimental	Control	Experimental	Control	Experimental	Control	Experimental	Control	Difference
LENGTH (cm)									
16-20					0	0	0%	0%	0%
21-25					0	0	0%	0%	0%
26-30					0	0	0%	0%	0%
31-35					0	0	0%	0%	0%
36-40			0	2	0	2	0%	7%	7%
41-45			0	1	0	1	0%	3%	3%
46-50			0	5	0	5	0%	17%	17%
51-55	2	3	3	1	5	4	29%	13%	-16%
56-60	2	2	2	2	4	4	24%	13%	-10%
61-65	1	4	0	3	1	7	6%	23%	17%
66-70	2	1	0	1	2	2	12%	7%	-5%
71-75	4	3	1	2	5	5	29%	17%	-13%
76-80					0	0	0%	0%	0%
81-85					0	0	0%	0%	0%
86-90					0	0	0%	0%	0%
91-95					0	0	0%	0%	0%
TOTAL MEASURED	11	13	6	17	17	30			
Total Caught:	30	51	17	24	47	75			
% Measured:	37%	25%	35%	71%	36%	40%			

Appendix Table 86.

Scallop Bushels from Good Tows

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
	Scallop Bushels (all good tows)		**Scallop Bushels (all good tows)**		**Scallop Bushels (all good tows)**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	2949	2806	4109	4462	3680	3514
% Difference in Count	**5%**		**-8%**		**5%**	
Mean	11.52	11.0	14.89	16.2	7.65	7.3
Standard Error	1	*1*	0	*0*	1	*1*
Median	9.0	8.1	14.0	16.0	3.5	3.5
Mode	8	8	16	12	3	3
Standard Deviation	9	9	5	5	13	13
Sample Variance	75	87	28	23	172	166
Kurtosis	8	8	3	2	17	17
Skewness	3	3	1	1	4	4
Range	53	49	36	33	100	100
Minimum	2	2	3	4	1	1
Maximum	55	51	39	36	100	100
Confidence Level(95.0%)	1	1	1	1	1	1
Observations	256	256	276	276	481	481
Pearson Correlation	0.94		0.75		0.97	
Hypothesized Mean Difference	0		0		0	
df	255.00		275.00		480.00	
a	0.05		0.05		0.05	
t Stat	3		-6		2	
P(T<=t) one-tail	0.002		0.000		0.008	
t Critical one-tail	1.65		1.65		1.65	
P(T<=t) two-tail	0.00		0.00		0.02	
t Critical two-tail	1.97		1.97		1.96	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 87.

Scallop Bushels from Observed Tows

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
	Scallop Bushels (obs tows)		**Scallop Bushels (obs tows)**		**Scallop Bushels (obs tows)**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1330	1202	2162	2344	1347	1211
% Difference in Count	**11%**		**-8%**		**11%**	
Mean	11.67	10.5	14.41	15.6	6.54	5.9
Standard Error	1	*1*	0	*0*	1	*1*
Median	9.0	8.0	14.0	15.0	3.5	3.5
Mode	9	8	12	12	3	3
Standard Deviation	9	10	5	5	11	10
Sample Variance	88	90	27	23	130	101
Kurtosis	6	8	1	0	22	24
Skewness	3	3	1	1	5	5
Range	46	46	31	24	85	75
Minimum	2	2	4	8	1	1
Maximum	47	48	34	31	85	75
Confidence Level(95.0%)	2	2	1	1	2	1
Observations	114	114	150	150	206	206
Pearson Correlation	0.93		0.72		0.98	
Hypothesized Mean Difference	0		0		0	
df	113.00		149.00		205.00	
a	0.05		0.05		0.05	
t Stat	3		-4		4	
P(T<=t) one-tail	0.000		0.000		0.000	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.00		0.00		0.00	
t Critical two-tail	1.98		1.98		1.97	

Appendix Table 88.

Skates

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Skates**		**Skates**		**Skates**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	5577	6321	7796	11647	11205	10125
% Difference in Count	**-12%**		**-33%**		**11%**	
Fish Count/Scallop Bushel Catch	4.19	5.3	3.61	5.0	8.32	8.4
% Difference in Catch Ratio	**-20%**		**-27%**		**-1%**	
Mean	48.9	55.4	52.0	77.6	54.4	49.2
Standard Error	4	4	2	3	2	2
Median	38	45	46	76	48	44
Mode	30	34	31	96	45	48
Standard Deviation	45	43	31	42	34	31
Sample Variance	2062	1858	936	1727	1169	984
Kurtosis	6	4	1	0	1	2
Skewness	2	2	1	1	1	1
Range	249	223	168	224	168	173
Minimum	1	2	1	3	0	0
Maximum	250	225	169	227	168	173
Confidence Level(95.0%)	8.43	8.00	4.94	6.70	4.70	4.31
Observations	114	114	150	150	206	206
Pearson Correlation	0.91		0.61		0.83	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-3.74		-9.41		3.85	
P(T<=t) one-tail	0.00		0.00		0.00	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.000		0.000		0.000	
t Critical two-tail	1.98		1.98		1.97	

Appendix Table 89.

Barndoor Skates

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**			
Species	**Barndoor Skates**		**Barndoor Skates**			
Dredge	***Experimental***	***Control***	***Experimental***	***Control***		
Total Count	507	518	270	430		
% Difference in Count	**-2%**		**-37%**			
Fish Count/Scallop Bushel Catch	0.38	0.4	0.12	0.2		
% Difference in Catch Ratio	**-12%**		**-32%**			
Mean	4.4	4.5	1.8	2.9		
Standard Error	0	0	0	0		
Median	4	4	1	2		
Mode	0	0	0	1		
Standard Deviation	4	4	2	3		
Sample Variance	20	17	5	12		
Kurtosis	1	0	7	21		
Skewness	1	1	2	4		
Range	19	16	13	25		
Minimum	0	0	0	0		
Maximum	19	16	13	25		
Confidence Level(95.0%)	0.82	0.77	0.38	0.56		
Observations	114	114	150	150		
Pearson Correlation	0.73		0.54			
Hypothesized Mean Difference	0		0			
df	113		149			
α	0.05		0.05			
t Stat	-0.32		-4.45			
P(T<=t) one-tail	0.37		0.00			
t Critical one-tail	1.66		1.66			
P(T<=t) two-tail	0.746		0.000			
t Critical two-tail	1.98		1.98			

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Appendix Table 90.

Winter Skate

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Winter Skate**		**Winter Skate**		**Winter Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	145	137	450	607	12	4
% Difference in Count	**6%**		**-26%**		**200%**	
Fish Count/Scallop Bushel Catch Ratio	0.11	0.1	0.21	0.3	0.01	0.0
% Difference in Catch Ratio	**-4%**		**-20%**		**170%**	
Mean	1.3	1.2	3.0	4.0	0.1	0.0
Standard Error	0	0	0	0	0	0
Median	1	0	2	3	0	0
Mode	0	0	0	3	0	0
Standard Deviation	2	2	4	5	0	0
Sample Variance	3	3	16	20	0	0
Kurtosis	3	5	10	12	28	48
Skewness	2	2	3	3	5	7
Range	8	10	23	30	2	1
Minimum	0	0	0	0	0	0
Maximum	8	10	23	30	2	1
Confidence Level(95.0%)	0.31	0.33	0.65	0.73	0.04	0.02
Observations	114	114	150	150	206	206
Pearson Correlation	0.48		0.44		-0.03	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	0.43		-2.83		1.80	
P(T<=t) one-tail	0.34		0.00		0.04	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.671		0.005		0.074	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 91.

Yellowtail Flounder

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Yellowtail Flounder**		**Yellowtail Flounder**		**Yellowtail Flounder**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	231	323	2546	5478	11	14
% Difference in Count	**-28%**		**-54%**		**-21%**	
Fish Count/Scallop Bushel Catch Ratio	0.17	0.3	1.18	2.3	0.01	0.0
% Difference in Catch Ratio	**-35%**		**-50%**		**-29%**	
Mean	2.0	2.8	17.0	36.5	0.1	0.1
Standard Error	0	0	2	3	0	0
Median	1	2	7	23	0	0
Mode	0	0	2	4	0	0
Standard Deviation	3	4	24	41	0	0
Sample Variance	6	13	567	1681	0	0
Kurtosis	3	3	6	4	14	42
Skewness	2	2	2	2	4	6
Range	13	16	133	210	1	3
Minimum	0	0	0	0	0	0
Maximum	13	16	133	210	1	3
Confidence Level(95.0%)	0.47	0.66	3.84	6.61	0.03	0.04
Observations	114	114	150	150	206	206
Pearson Correlation	0.56		0.74		-0.05	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-2.89		-8.47		-0.52	
P(T<=t) one-tail	0.00		0.00		0.30	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.005		0.000		0.603	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 92.

Monkfish

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Monkfish**		**Monkfish**		**Monkfish**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	2026	2070	2696	2745	615	585
% Difference in Count	**-2%**		**-2%**		**5%**	
Fish Count/Scallop Bushel Catch Ratio	1.52	1.7	1.25	1.2	0.46	0.5
% Difference in Catch Ratio	**-12%**		**6%**		**-6%**	
Mean	17.8	18.2	18.0	18.3	3.0	2.8
Standard Error	1	1	1	1	0	0
Median	18	17	12	12	2	2
Mode	17	19	9	8	0	1
Standard Deviation	7	9	17	16	3	3
Sample Variance	48	78	273	254	8	6
Kurtosis	0	1	3	2	1	1
Skewness	0	1	2	2	1	1
Range	35	46	89	75	13	11
Minimum	0	0	2	1	0	0
Maximum	35	46	91	76	13	11
Confidence Level(95.0%)	1.28	1.63	2.66	2.57	0.39	0.35
Observations	114	114	150	150	206	206
Pearson Correlation	0.57		0.85		0.61	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-0.55		-0.45		0.87	
P(T<=t) one-tail	0.29		0.33		0.19	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.583		0.651		0.386	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 93.

Winter Flounder

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Winter Flounder**		**Winter Flounder**		**Winter Flounder**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	8	22	13	45	1	0
% Difference in Count	**-64%**		**-71%**		**#DIV/0!**	
Fish Count/Scallop Bushel Catch Ratio	0.01	0.0	0.01	0.0	0.00	0.0
% Difference in Catch Ratio	**-67%**		**-69%**		**#DIV/0!**	
Mean	0.1	0.2	0.1	0.3	0.0	0.0
Standard Error	0	0	0	0	0	0
Median	0	0	0	0	0	0
Mode	0	0	0	0	0	0
Standard Deviation	0	1	0	1	0	0
Sample Variance	0	0	0	0	0	0
Kurtosis	42	6	35	8	206	null
Skewness	6	3	5	3	14	null
Range	3	2	3	4	1	0
Minimum	0	0	0	0	0	0
Maximum	3	2	3	4	1	0
Confidence Level(95.0%)	0.07	0.10	0.06	0.11	0.01	0.00
Observations	114	114	150	150	206	206
Pearson Correlation	0.39		0.09		#DIV/0!	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-2.62		-3.54		1.00	
P(T<=t) one-tail	0.00		0.00		0.16	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.010		0.001		0.318	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 94.

Summer Flounder

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Summer Fld.**		**Summer Fld.**		**Summer Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	53	73	47	75	2	4
% Difference in Count	**-27%**		**-37%**		**-50%**	
Fish Count/Scallop Bushel Catch Ratio	0.04	0.1	0.02	0.0	0.00	0.0
% Difference in Catch Ratio	**-34%**		**-32%**		**-55%**	
Mean	0.5	0.6	0.3	0.5	0.0	0.0
Standard Error	0	0	0	0	0	0
Median	0	0	0	0	0	0
Mode	0	0	0	0	0	0
Standard Deviation	1	1	1	1	0	0
Sample Variance	1	1	0	1	0	0
Kurtosis	11	3	6	6	206	48
Skewness	3	2	2	2	14	7
Range	6	5	4	5	2	1
Minimum	0	0	0	0	0	0
Maximum	6	5	4	5	2	1
Confidence Level(95.0%)	0.19	0.21	0.11	0.15	0.02	0.02
Observations	114	114	150	150	206	206
Pearson Correlation	0.50		0.27		0.50	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-1.73		-2.30		-1.00	
P(T<=t) one-tail	0.04		0.01		0.16	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.086		0.023		0.318	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 95.

Fourspot Flounder

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Fourspot Flounder**		**Fourspot Flounder**		**Fourspot Flounder**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	403	465	596	1047	139	112
% Difference in Count	**-13%**		**-43%**		**24%**	
Fish Count/Scallop Bushel Catch Ratio	0.30	0.4	0.28	0.4	0.10	0.1
% Difference in Catch Ratio	**-22%**		**-38%**		**12%**	
Mean	3.5	4.1	4.0	7.0	0.7	0.5
Standard Error	0	0	0	0	0	0
Median	2	4	3	6	0	0
Mode	0	0	0	8	0	0
Standard Deviation	4	4	5	5	1	1
Sample Variance	13	13	25	27	1	1
Kurtosis	3	2	15	2	2	5
Skewness	2	1	3	1	2	2
Range	18	17	38	30	4	5
Minimum	0	0	0	0	0	0
Maximum	18	17	38	30	4	5
Confidence Level(95.0%)	0.68	0.68	0.81	0.84	0.13	0.11
Observations	114	114	150	150	206	206
Pearson Correlation	0.52		0.26		0.18	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-1.62		-5.94		1.65	
P(T<=t) one-tail	0.05		0.00		0.05	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.108		0.000		0.100	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 96.

Grey Sole

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Grey Sole**		**Grey Sole**		**Grey Sole**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	374	400	15	33	48	38
% Difference in Count	**-6%**		**-55%**		**26%**	
Fish Count/Scallop Bushel Catch Ratio	0.28	0.3	0.01	0.0	0.04	0.0
% Difference in Catch Ratio	**-15%**		**-51%**		**14%**	
Mean	3.3	3.5	0.1	0.2	0.2	0.2
Standard Error	0	0	0	0	0	0
Median	2	3	0	0	0	0
Mode	0	0	0	0	0	0
Standard Deviation	4	4	1	1	1	1
Sample Variance	13	15	0	0	0	0
Kurtosis	2	4	54	15	14	24
Skewness	1	2	7	4	3	5
Range	17	21	5	4	4	5
Minimum	0	0	0	0	0	0
Maximum	17	21	5	4	4	5
Confidence Level(95.0%)	0.66	0.72	0.09	0.11	0.09	0.09
Observations	114	114	150	150	206	206
Pearson Correlation	0.72		0.65		0.36	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-0.87		-2.77		0.94	
P(T<=t) one-tail	0.19		0.00		0.18	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.384		0.006		0.350	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 97.

American Plaice

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**	
Species	**American Plaice**		**American Plaice**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	64	88	12	9
% Difference in Count	**-27%**		**33%**	
Fish Count/Scallop Bushel Catch Ratio	0.05	0.1	0.01	0.0
% Difference in Catch Ratio	**-34%**		**45%**	
Mean	0.6	0.8	0.1	0.1
Standard Error	0	0	0	0
Median	0	0	0	0
Mode	0	0	0	0
Standard Deviation	2	2	1	0
Sample Variance	2	3	0	0
Kurtosis	11	4	119	53
Skewness	3	2	11	7
Range	8	7	8	3
Minimum	0	0	0	0
Maximum	8	7	8	3
Confidence Level(95.0%)	0.28	0.31	0.11	0.06
Observations	114	114	150	150
Pearson Correlation	0.76		0.66	
Hypothesized Mean Difference	0		0	
df	113		149	
α	0.05		0.05	
t Stat	-2.03		0.47	
P(T<=t) one-tail	0.02		0.32	
t Critical one-tail	1.66		1.66	
P(T<=t) two-tail	0.045		0.641	
t Critical two-tail	1.98		1.98	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Appendix Table 98.

Sand Dab

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Sand Dab**		**Sand Dab**		**Sand Dab**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	91	147	464	825	13	11
% Difference in Count			**-44%**		**18%**	
Fish Count/Scallop Bushel Catch Ratio	0.07	0.1	0.21	0.4	0.01	0.0
% Difference in Catch Ratio	**-44%**		**-39%**		**6%**	
Mean	0.8	1.3	3.1	5.5	0.1	0.1
Standard Error	0	0	0	1	0	0
Median	0	0	0	1	0	0
Mode	0	0	0	0	0	0
Standard Deviation	2	4	6	10	0	0
Sample Variance	6	13	37	97	0	0
Kurtosis	18	11	14	11	27	34
Skewness	4	3	3	3	5	6
Range	16	20	42	63	2	2
Minimum	0	0	0	0	0	0
Maximum	16	20	42	63	2	2
Confidence Level(95.0%)	0.44	0.67	0.99	1.59	0.04	0.04
Observations	114	114	150	150	206	206
Pearson Correlation	0.84		0.79		0.94	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-2.53		-4.71		1.42	
P(T<=t) one-tail	0.01		0.00		0.08	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.013		0.000		0.158	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 99.

Red Hake

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Red Hake**		**Red Hake**		**Red Hake**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	122	153	876	1026	10	19
% Difference in Count	**-20%**		**-15%**		**-47%**	
Fish Count/Scallop Bushel Catch Ratio	0.09	0.1	0.41	0.4	0.01	0.0
% Difference in Catch Ratio	**-28%**		**-7%**		**-53%**	
Mean	1.1	1.3	5.8	6.8	0.0	0.1
Standard Error	0	0	1	1	0	0
Median	0	1	0	2	0	0
Mode	0	0	0	0	0	0
Standard Deviation	2	2	15	13	0	0
Sample Variance	3	4	215	160	0	0
Kurtosis	12	2	12	10	36	17
Skewness	3	2	3	3	6	4
Range	12	8	84	72	2	2
Minimum	0	0	0	0	0	0
Maximum	12	8	84	72	2	2
Confidence Level(95.0%)	0.34	0.35	2.37	2.04	0.04	0.05
Observations	114	114	150	150	206	206
Pearson Correlation	0.27		0.82		0.55	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-1.29		-1.45		-2.08	
P(T<=t) one-tail	0.10		0.07		0.02	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.198		0.149		0.039	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 100.

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Silver Hake**		**Silver Hake**		**Silver Hake**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	5	19	82	178	14	12
% Difference in Count	**-74%**		**-54%**		**17%**	
Fish Count/Scallop Bushel Catch Ratio	0.00	0.0	0.04	0.1	0.01	0.0
% Difference in Catch Ratio	**-76%**		**-50%**		**5%**	
Mean	0.0	0.2	0.5	1.2	0.1	0.1
Standard Error	0	0	0	0	0	0
Median	0	0	0	0	0	0
Mode	0	0	0	0	0	0
Standard Deviation	0	0	3	4	0	0
Sample Variance	0	0	12	13	0	0
Kurtosis	19	7	135	78	23	23
Skewness	5	3	11	8	5	5
Range	1	2	41	39	2	2
Minimum	0	0	0	0	0	0
Maximum	1	2	41	39	2	2
Confidence Level(95.0%)	0.04	0.08	0.55	0.59	0.04	0.03
Observations	114	114	150	150	206	206
Pearson Correlation	0.21		0.87		0.28	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	-2.95		-4.38		0.43	
P(T<=t) one-tail	0.00		0.00		0.34	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	0.004		0.000		0.671	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 101.
Sea Raven
Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**	
Species	**Sea Raven**		**Sea Raven**	
Dredge	***Experimental***	***Control***	***xperimenta***	***Control***
Total Count	32	36	23	35
% Difference in Count	**-11%**		**-34%**	
Fish Count/Scallop Bushel Catch Ratio	0.02	0.0	0.01	0.0
% Difference in Catch Ratio	**-20%**		**-29%**	
Mean	0.3	0.3	0.2	0.2
Standard Error	0	0	0	0
Median	0	0	0	0
Mode	0	0	0	0
Standard Deviation	1	1	1	1
Sample Variance	0	1	0	0
Kurtosis	11	8	21	15
Skewness	3	3	4	4
Range	4	4	4	4
Minimum	0	0	0	0
Maximum	4	4	4	4
Confidence Level(95.0%)	0.12	0.13	0.09	0.11
Observations	114	114	150	150
Pearson Correlation	0.32		0.38	
Hypothesized Mean Difference	0		0	
df	113		149	
α	0.05		0.05	
t Stat	-0.47		-1.44	
P(T<=t) one-tail	0.32		0.08	
t Critical one-tail	1.66		1.66	
P(T<=t) two-tail	0.639		0.152	
t Critical two-tail	1.98		1.98	

Dredge and Trips
Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1
Dredge 2: Westport-2006-2, Celtic-2006-3

Appendix Table 102.
Longhorn Sculpin
Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**	
Species	**Longhorn Sculpin**		**Longhorn Sculpin**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	25	33	68	140
% Difference in Count	**-24%**		**-51%**	
Fish Count/Scallop Bushel Catch Ratio	0.02	0.0	0.03	0.1
% Difference in Catch Ratio	**-32%**		**-47%**	
Mean	0.2	0.3	0.5	0.9
Standard Error	0	0	0	0
Median	0	0	0	0
Mode	0	0	0	0
Standard Deviation	1	1	2	5
Sample Variance	1	1	3	21
Kurtosis	77	57	93	128
Skewness	8	7	9	11
Range	10	9	19	54
Minimum	0	0	0	0
Maximum	10	9	19	54
Confidence Level(95.0%)	0.19	0.18	0.28	0.73
Observations	114	114	150	150
Pearson Correlation	0.77		0.91	
Hypothesized Mean Difference	0		0	
df	113		149	
α	0.05		0.05	
t Stat	-1.11		-1.93	
P(T<=t) one-tail	0.13		0.03	
t Critical one-tail	1.66		1.66	
P(T<=t) two-tail	0.269		0.056	
t Critical two-tail	1.98		1.98	

Dredge and Trips
Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1
Dredge 2: Westport-2006-2, Celtic-2006-3
Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 103.

Sea Robin

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**3**	
Species	**Sea Robin**	
Dredge	***Experimental***	***Control***
Total Count	54	43
% Difference in Count	**26%**	
Fish Count/Scallop Bushel Catch Ratio	0.04	0.0
% Difference in Catch Ratio	**13%**	
Mean	0.3	0.2
Standard Error	0	0
Median	0	0
Mode	0	0
Standard Deviation	1	1
Sample Variance	0	0
Kurtosis	6	10
Skewness	3	3
Range	3	3
Minimum	0	0
Maximum	3	3
Confidence Level(95.0%)	0.08	0.08
Observations	206	206
Pearson Correlation	0.45	
Hypothesized Mean Difference	0	
df	205	
α	0.05	
t Stat	1.22	
P(T<=t) one-tail	0.11	
t Critical one-tail	1.65	
P(T<=t) two-tail	0.222	
t Critical two-tail	1.97	

Dredge and Trips

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4,

Appendix Table 104.

Lobster

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Lobster**		**Lobster**		**Lobster**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	2	2	29	48	1	0
% Difference in Count	**0%**		**-40%**		**#DIV/0!**	
Fish Count/Scallop Bushel Catch Ratio	0.00	0.0	0.01	0.0	0.00	0.0
% Difference in Catch Ratio	**-10%**		**-34%**		**#DIV/0!**	
Mean	0.0	0.0	0.2	0.3	0.0	0.0
Standard Error	0	0	0	0	0	0
Median	0	0	0	0	0	0
Mode	0	0	0	0	0	0
Standard Deviation	0	0	1	1	0	0
Sample Variance	0	0	0	1	0	0
Kurtosis	54	43	10	14	206	null
Skewness	7	7	3	3	14	null
Range	1	1	3	6	1	0
Minimum	0	0	0	0	0	0
Maximum	1	1	3	6	1	0
Confidence Level(95.0%)	0.02	0.03	0.09	0.14	0.01	0.00
Observations	114	114	150	150	206	206
Pearson Correlation	0.49		0.56		null	
Hypothesized Mean Difference	0		0		0	
df	113		149		205	
α	0.05		0.05		0.05	
t Stat	0.00		-2.14		1.00	
P(T<=t) one-tail	0.50		0.02		0.16	
t Critical one-tail	1.66		1.66		1.65	
P(T<=t) two-tail	1.000		0.034		0.318	
t Critical two-tail	1.98		1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

Appendix Table 105.

Torpedo Ray

Descriptive Statistics and t-Test: Paired Two Sample for Means

Experimental Dredge Number	**1**		**2**		**3**	
Species	**Torpedo Ray**		**Torpedo Ray**		**Torpedo Ray**	
Dredge			***Experimental***	***Control***	***Experimental***	***Control***
Total Count			2	3	1	3
% Difference in Count			**-33%**		**-67%**	
Fish Count/Scallop Bushel Catch Ratio			0.00	0.0	0.00	0.0
% Difference in Catch Ratio			**-28%**		**-70%**	
Mean			0.0	0.0	0.0	0.0
Standard Error			0	0	0	0
Median			0	0	0	0
Mode			0	0	0	0
Standard Deviation			0	0	0	0
Sample Variance			0	0	0	0
Kurtosis			72	47	206	65
Skewness			9	7	14	8
Range			1	1	1	1
Minimum			0	0	0	0
Maximum			1	1	1	1
Confidence Level(95.0%)			0.02	0.02	0.01	0.02
Observations			150	150	206	206
Pearson Correlation			-0.02		-0.01	
Hypothesized Mean Difference			0		0	
df			149		205	
α			0.05		0.05	
t Stat			-0.45		-1.00	
P(T<=t) one-tail			0.33		0.16	
t Critical one-tail			1.66		1.65	
P(T<=t) two-tail			0.656		0.318	
t Critical two-tail			1.98		1.97	

Dredge and Trips

Dredge 1: Celtic-2006-1, Celtic-2006-2, Westport-2006-1

Dredge 2: Westport-2006-2, Celtic-2006-3

Dredge 3: Friendship-2007-2, Friendship-2007-3, Friendship-2007-4, Friendship-2007-5

All Dredges
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**allop Bushels (all good to**		**Scallop Bushels(obs tows)**		**Skates**		**Barndoor Skate**		**Winter Skate**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	11184	11213	5150	5067	27513	29601	777	948	601	754
% Difference in Count	**-0.3%**		**1.6%**		**-7.1%**		**-18.0%**		**-20.3%**	
Fish Count/Scallop Bushel Catch Ratio					5.34	5.84	0.15	0.19	0.12	0.15
% Difference in Catch Ratio					**-9%**		**-19%**		**-22%**	
Mean	10.3	10.3	9.9	9.7	52.9	56.9	1.5	1.8	1.2	1.5
Standard Error	0	0	0	0	2	2	0	0	0	0
Median	8	7	8	8	45	48	0	0	0	0
Mode	3	3	3	3	31	33	0	0	0	0
Standard Deviation	11	11	10	9	36	39	3	3	3	3
Sample Variance	112	116	91	84	1318	1500	9	11	7	10
Kurtosis	16	14	16	12	3	2	9	11	27	28
Skewness	3	3	3	3	1	1	3	3	4	4
Range	100	100	85	75	250	227	19	25	23	30
Minimum	1	1	1	1	0	0	0	0	0	0
Maximum	100	100	85	75	250	227	19	25	23	30
Confidence Level(95.0%)	0.63	0.64	0.82	0.79	3.13	3.34	0.26	0.28	0.23	0.27
Observations	1087	1087	520	520	520	520	520	520	520	520
Pearson Correlation	0.95		0.94		0.72		0.75		0.59	
Hypothesized Mean Difference	0		0		0		0		0	
df	1086		519		519		519		519	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-0.26		1.14		-3.27		-3.39		-2.57	
P(T<=t) one-tail	0.40		0.13		0.00		0.00		0.01	
t Critical one-tail	1.65		1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.791		0.254		0.001		0.001		0.011	
t Critical two-tail	1.96		1.96		1.96		1.96		1.96	

Appendix Table 106.
All Dredges
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Monk**		**Summer Fld.**		**Grey Sole**		**Yellowtail Fld.**		**Winter Fld.**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	5577	5609	111	161	464	493	2792	5811	22	67
% Difference in Count	**-0.6%**		**-31.1%**		**-5.9%**		**-52.0%**		**-67.2%**	
Fish Count/Scallop Bushel Catch Ratio	1.08	1.11	0.02	0.03	0.09	0.10	0.54	1.15	0.00	0.01
% Difference in Catch Ratio	**-2%**		**-32%**		**-7%**		**-53%**		**-68%**	
Mean	10.7	10.8	0.2	0.3	0.9	0.9	5.4	11.2	0.0	0.1
Standard Error	1	1	0	0	0	0	1	1	0	0
Median	7	7	0	0	0	0	0	0	0	0
Mode	1	1	0	0	0	0	0	0	0	0
Standard Deviation	12	12	1	1	2	2	15	27	0	0
Sample Variance	146	151	0	1	5	6	220	747	0	0
Kurtosis	8	6	26	11	15	20	26	17	74	20
Skewness	2	2	4	3	3	4	5	4	8	4
Range	91	76	6	5	17	21	133	210	3	4
Minimum	0	0	0	0	0	0	0	0	0	0
Maximum	91	76	6	5	17	21	133	210	3	4
Confidence Level(95.0%)	1.04	1.06	0.06	0.07	0.19	0.20	1.28	2.36	0.02	0.04
Observations	520	520	520	520	520	520	520	520	520	520
Pearson Correlation	0.87		0.35		0.80		0.81		0.23	
Hypothesized Mean Difference	0		0		0		0		0	
df	519		519		519		519		519	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-0.23		-2.62		-0.88		-7.54		-4.19	
P(T<=t) one-tail	0.41		0.00		0.19		0.00		0.00	
t Critical one-tail	1.65		1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.820		0.009		0.380		0.000		0.000	
t Critical two-tail	1.96		1.96		1.96		1.96		1.96	

Appendix Table 107.

All Dredges
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Fourspot Fld.**		**Sand Dab**		**Am. Plaice**		**Sea Raven**		**Longhorn Sculpin**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1264	1690	567	984	76	97	55	71	93	173
% Difference in Count	**-25.2%**		**-42.4%**		**-21.6%**		**-22.5%**		**-46.2%**	
Fish Count/Scallop Bushel Catch Ratio	0.25	0.33	0.11	0.19	0.01	0.02	0.01	0.01	0.02	0.03
% Difference in Catch Ratio	**-26%**		**-43%**		**-23%**		**-24%**		**-47%**	
Mean	2.4	3.3	1.1	1.9	0.1	0.2	0.1	0.1	0.2	0.3
Standard Error	0	0	0	0	0	0	0	0	0	0
Median	1	1	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0
Standard Deviation	4	4	4	6	1	1	0	1	1	3
Sample Variance	13	19	14	36	1	1	0	0	1	6
Kurtosis	21	5	43	37	56	31	33	25	212	409
Skewness	3	2	6	5	7	5	5	5	13	19
Range	38	30	42	63	8	7	4	4	19	54
Minimum	0	0	0	0	0	0	0	0	0	0
Maximum	38	30	42	63	8	7	4	4	19	54
Confidence Level(95.0%)	0.32	0.37	0.32	0.52	0.07	0.07	0.04	0.04	0.09	0.22
Observations	520	520	520	520	520	520	520	520	520	520
Pearson Correlation	0.47		0.82		0.75		0.40		0.86	
Hypothesized Mean Difference	0		0		0		0		0	
df	519		519		519		519		519	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-4.51		-5.02		-1.55		-1.34		-2.09	
P(T<=t) one-tail	0.00		0.00		0.06		0.09		0.02	
t Critical one-tail	1.65		1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.000		0.000		0.123		0.180		0.037	
t Critical two-tail	1.96		1.96		1.96		1.96		1.96	

Appendix Table 108.

All Dredges
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Red Hake**		**Silver Hake**		**Cod**		**Haddock**		**Torpedo Ray**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	1008	1198	101	209	1	4	19	17	5	6
% Difference in Count	**-15.9%**		**-51.7%**		**-75.0%**		**11.8%**		**-16.7%**	
Fish Count/Scallop Bushel Catch Ratio	0.20	0.24	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00
% Difference in Catch Ratio	**-17%**		**-52%**		**-75%**		**10%**		**-18%**	
Mean	1.9	2.3	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Standard Error	0	0	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0	0	0
Standard Deviation	8	7	2	2	0	0	0	0	0	0
Sample Variance	69	55	3	4	0	0	0	0	0	0
Kurtosis	51	39	455	252	520	126	113	129	100	82
Skewness	7	6	21	14	23	11	10	10	10	9
Range	84	72	41	39	1	1	4	4	1	1
Minimum	0	0	0	0	0	0	0	0	0	0
Maximum	84	72	41	39	1	1	4	4	1	1
Confidence Level(95.0%)	0.71	0.64	0.16	0.18	0.00	0.01	0.02	0.02	0.01	0.01
Observations	520	520	520	520	520	520	520	520	520	520
Pearson Correlation	0.83		0.86		0.00		0.44		-0.01	
Hypothesized Mean Difference	0		0		0		0		0	
df	519		519		519		519		519	
α	0.05		0.05		0.05		0.05		0.05	
t Stat	-1.79		-4.55		-1.34		0.31		-0.30	
P(T<=t) one-tail	0.04		0.00		0.09		0.38		0.38	
t Critical one-tail	1.65		1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.075		0.000		0.180		0.758		0.763	
t Critical two-tail	1.96		1.96		1.96		1.96		1.96	

Appendix Table 109.

All Dredges
Descriptive Statistics and t-Test: Paired Two Sample for Means

Species	**Ocean Pout**		**American Lobster**		**Spiny Dogfish**		**Sea Robin**	
Dredge	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***	***Experimental***	***Control***
Total Count	0	1	32	50	33	45	54	43
% Difference in Count	**-100.0%**		**-36.0%**		**-26.7%**		**25.6%**	
Fish Count/Scallop Bushel Catch Ratio	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
% Difference in Catch Ratio	**-100%**		**-37%**		**-28%**		**24%**	
Mean	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Standard Error	0	0	0	0	0	0	0	0
Median	0	0	0	0	0	0	0	0
Mode	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0
Sample Variance	0	0	0	0	0	0	0	0
Kurtosis	#DIV/0!	520	41	55	44	115	22	32
Skewness	#DIV/0!	23	6	7	6	9	5	5
Range	0	1	3	6	3	7	3	3
Minimum	0	0	0	0	0	0	0	0
Maximum	0	1	3	6	3	7	3	3
Confidence Level(95.0%)	0.00	0.00	0.03	0.04	0.03	0.04	0.03	0.03
Observations	520	520	520	520	520	520	520	520
Pearson Correlation	#DIV/0!		0.58		0.53		0.50	
Hypothesized Mean Difference	0		0		0		0	
df	519		519		519		519	
α								
t Stat	-1.00		-1.97		-1.34		1.22	
P(T<=t) one-tail	0.16		0.02		0.09		0.11	
t Critical one-tail	1.65		1.65		1.65		1.65	
P(T<=t) two-tail	0.318		0.049		0.180		0.222	
t Critical two-tail	1.96		1.96		1.96		1.96	

Appendix Table 110.

Appendix 111.

Notes on Friendship-2007-2 turtle interaction:

Crew member Joe P. first witnessed and reported the incidental take of a loggerhead turtle in the frame of the control dredge during the haul back of tow 111. Joe was standing at the rail along side the gallows on the port side ready to hook the control dredge up for retrieval and dumping. The scientist was in the wheel house recording tow data when the dredge came up. Both the experimental and New Bedford dredges had turtle chains on as required by NMFS. A permit to fish without turtle chains had not been issued for this trip. No tags were seen on the animal, nor were any placed on the animal by the crew. Seas were calm with sunny skies.

Joe initially mistook the turtle as rock caught between the bail bars. The dredge came up to the vessel backwards with pressure plate hard against the rail. When the dredge came up alongside, the turtle was positioned in the control dredge's frame so that its head was towards the boat. The turtle was wedged between the 2nd and 3rd bail bars and hard against the pressure plate. Joe witnessed the turtle come out of the water briefly as the dredge came up to the gallows alongside the boat approximately2 ft. and back down just below the water line. The turtle was wedged into the frame right along its midsection (the thickest part of the animal). The turtle remained in the same position in the dredge until it was lodged out by the action of hitting it's head against the side of the boat and the up and down motion of the dredge as the bullring hit the block. The turtle was freed from the dredge immediately as it was being submerged back into the water. Once freed from the dredge, the turtle began to slowly swim at the surface, away from the boat. The boat was also drifting away from the animal. Joe realized it was a turtle at this point and called for the scientist. The scientist witnessed and took photos of the turtle as it moved away from the vessel.

The scientist and crew witnessed the turtle bleeding profusely from the top of its head. The turtle was conscious and moving both it's head and flippers during the entire time that it was within sight. No cracks were observed in the turtle's carapace. There were barnacles down the mid line of the turtle's orange/brown carapace. The crew member estimated the animal's length to be approximately 4 feet long. The turtle appeared to be moving its head up to breath, but was never observed diving. During this time, both dredges were brought onboard and dumped of its catch as normal. The turtle was never boated or observed to be in the bag of the dredge.

After the dredges were brought onboard, the vessel steamed by the turtle once. More photos and video were taken as we passed by. The dredges were then set out again once the turtle had moved out of sight. Once the turtle was out of sight it was not seen again. It was last seen swimming at the surface. The turtle was active during the 7 minutes of time that it was observed after leaving the dredge. The catch was sampled and fishing resumed as normal.

GPS data (position, speed and, heading) was collected every 2 seconds by the NEFSC's electronic logbook during the tow. Unfortunately no temperature loggers were deployed on the dredges during this trip. The vessel had been towing east with one turn during the tow. The tow occurred in close proximity to the northeast boundary corner of the Elephant Trunk Area. There were approximately 11 other scallop vessels were seen on the radar fishing within 12 nautical miles of our boat during the time of the take. Five of those vessels were within the Elephant Trunk area. Photos and additional information are available upon request.

Appendix 112.

F/V Celtic's Gear Configuration:

Diamonds: 14x14
Bag: 10x40
Apron: 7x40
Sides: 6x17
Skirt: 3x40
10" twine top: 8.5x60, 2:1
Sweep: 125
Two links for each ring
Dumping chain: 98 links
Belly: 12x40
Chaffing gear used on belly between every space

F/V Westport's Gear Configuration:

Diamonds: 14x14
Bag: 9x40
Apron: 13x40
Sides: 5x17,17,15,14,13
Skirt: 2x30
10" twine top: 8.5x60, 2:1
Sweep: 121

Appendix 113.

Description of materials used in experimental dredge design

Cutting bar:	2” x 3” solid steel bar at 45 degree angle place in front of the pressure plate
Struts	5/8” x 3” steel plate cut 24” long with cut-outs at each end to fit and a tapered leading edge. The angle of the struts is 45 degrees.
Main frame	5/8” x 3” steel plate
Turtle chain plate	5/8” x 3” w/1” holes on 12” centers; plate welded to rear of cutting bar
Pressure plate	3/8” x 8” steel plate
Skirt attachment bar	3/4” round stock; passes through holes in struts
Main bale bar	2 1/2” round bar
Heel plate of shoe	1/2” x 3” x 11”; welded to shoe; also covers the 2 1/2 “ ears at rear
Bullring:	1 1/2” round bar formed to circle of 6” I.D.
Center bar:	2” x 3” steel bar
Lifting bar:	1 1/4” round bar; attached to top of center bar