Testing of a Low Profile Excluder Dredge For Winter Flounder Bycatch Reduction

FINAL REPORT

October, 2010

"Challenge Grant Program for Conservation Engineering Projects -
Winter Flounder Bycatch Reduction"
NOAA Award Number NA09NMF4720414
Part I: Proof of Concept Program

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Abstract

A four day research trip onboard the F/V Tradition was conducted using dredge mounted video cameras to ascertain how winter flounder can be encouraged to avoid capture in a scallop dredge or to escape once caught. Two dredges were utilized; a standard New Bedford dredge and a new low-profile dredge. The resulting information will be used to improve scallop dredge frame design. In addition the catches from 32 paired tows by the two dredges were compared. The dredges caught similar amounts of scallops but the low profile dredge significantly reduced the bycatch of winter flounder, *Pseudopleuronectes americanus,* (122%), little skate, *Leucoraja erinacea,* (88%), summer flounder, *Paralichthys dentatus,* (55%), and sand dab, *Scophthalmus aquosus,* (116%). On a commercial fishing trip conducted by the F/V Celtic the new low-profile dredge fished about the same as the Cfarm turtle excluder dredge.

Introduction

A new concept for construction of a New Bedford style sea scallop (*Placopecten magellanicus*) dredge frame has recently been designed and tested with the goal of keeping loggerhead sea turtles (*Carretta carreta*) from snagging on top of the dredge frame and becoming trapped under the dredge bale while the gear is towed (Milliken et al, 2007: Smolowitz et al, 2010). The dredge frame was designed to smoothly guide turtles over the top of the dredge primarily by moving the cutting bar forward and eliminating most of the bale bars.

From May 2006 until November 2009 a total of thirty-three trips were made on thirteen different commercial scallop vessels to test dredge modifications for impacts on scallop catch, fish bycatch, and frame durability. Five general design modifications were tested by conducting paired tows using the modified dredge design along side a standard New Bedford dredge as a control. Both the modified dredge and control dredges were fished using identical tow parameters. A total of 4,059 paired tows were conducted in which tow data and scallop catch were recorded; total catch was quantified from 40% of these tows. In addition, flume tank testing was utilized for flow characterization to determine if there were any significant differences in cutting bar and frame hydrodynamics between the various design options (Smolowitz and Weeks, 2008).

The final dredge frame design, the Cfarm turtle excluder dredge, tested in the study held up to the rigors of commercial fishing on most scallop grounds, 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.

Overall the experimental dredge design concept (cutting bar forward of depressor plate, 45° cutting bar and strut angle, doubled outer bale, and reduced number of bale bars) increased the catch of scallops while decreasing the retention of important bycatch species. Of the 1,632 observed tows analyzed (student's t test for paired means a=0.05) relative to the standard New Bedford dredge, the experimental dredges increased scallop catch by 3% (P = 0.0000) while

having significant decreases in summer flounder(-11%, P= 0.003), yellowtail flounder (-46%, P_t=0.0000), winter flounder (-69%, P=0.0000), barndoor skate (-18%, P= 0.0000), winter skate (-20%, P_t = 0.005), sand dab (-47%, P=0.0000), and fourspot flounder (-20%, P=0.0000). Interestingly there were no significant difference in the catch of little skate (-0.3%, P_t = 0.404) and monkfish (1%, P= 0.309).

Flume tank tests and video observations suggest some advantages to widening the pressure plate in the forward cutting bar design in that increased lift is created behind the cutting bar. A wider cutting bar may also decrease the amount of fish entering the dredge above the cutting bar. There is a continuing need to further develop the dredge frame design, especially design efforts focused on the relationship of the cutting bar to the depressor plate in developing a strong lifting stream to improve efficiency on scallop capture. An analogy would be the relationship of a jib and main sail on a sailing vessel. There is also great room for other improvements in the hydrodynamic characteristics of the dredge frame. The depressor plate is of poor hydrodynamic design with lift to drag ratio of approximately one. This ratio can easily be increased by changing the angle, for example, changing the 45 degree angle of attack to 22.5 degrees gives a lift to drag ratio of 2.4 which should save fuel.

This project was to test the hypothesis that the excluder dredge reduces flatfish bycatch in that the forward cutting bar design encourages the fish to swim upwards and over the dredge. The newer idea, the low-profile excluder dredge, is to lower the profile of the Cfarm turtle excluder dredge to make it easier for fish to swim over the oncoming frame. This was accomplished by changing the frame angle, on a 15-foot wide dredge, from 45° to 22.5° and lowering the dredge frame height by four inches. The resulting low profile dredge frame has a shoe 22 inches long compared to the existing standard dredge show of 15 inches. We maintained the Cfarm turtle excluder dredge strut spacing of 9 inches, the reduced number of bale bars, the doubled outer bale, and the 45° cutting bar angle.

Additionally, the scallop bag was slightly modified to accompany the reduced height of the frame. Interestingly, the lower height of the frame and bag might aid in the escapement of fish that enter the dredge. To prevent a loss of scallops we may have to have the apron rings overhang the sweep which is still a common practice in the fleet.

Methods

The low-profile dredge was designed by Ronald Smolowitz and constructed by Peter Anthony in May 2010. Design drawings are still in the process of being completed by Hans Bendiksen. The completed dredge was then taken to sea on the F/V Celtic (Paul Desmarais, Captain) on June 3, 2010 to the Nantucket Lightship scallop access area and compared to a standard dredge for scallop catch rate and operational difficulties. This purpose of the test was to determine if there were any major deficiencies in the design.

The new dredge was then taken to sea on September 23, 2010 for four days on a research trip onboard the F/V Tradition (Ronnie Schrader, Captain) with Matt Weeks as Chief Scientist. The dredge operation was extensively video taped using gear mounted cameras in an area with concentrations of winter flounder. The dredge was also pair towed with a standard dredge during the research trip and on a commercial trip by a volunteer vessel.

Results

Commercial Trial

The F/V Celtic volunteered to take the newly built low-profile dredge to sea for initial testing on June 3, 2010 on a commercial trip to the Nantucket Lightship Scallop Access Area (NLSA). The low-profile dredge was towed simultaneously with a Cfarm turtle excluder dredge for a total of 73 paired tows. The crew kept a record of scallop catch, skate catch, and flatfish catch (Table 1). It was the opinion of the captain that the two dredges fished and handled about the same.

Research Trial

Video observations: The area chosen for the video tests was based on fishermen's reports of winter flounder catches. Tow details can be found in Appendix A. The area was along the 25 fathom curve south of Rhode Island and Massachusetts. This is a sandy and silty bottom and visibility was very poor at the sea floor. Even under these poor conditions several winter flounder were viewed escaping in front of the cutting bar by going up and over the dredge. Examples of this behavior can be found following this link:

http://www.youtube.com/watch?v=VArwarsh7yA

Catch Comparison: A total of 32 paired tows were conducted by the F/V Tradition in waters of southern New England (Table 2). A standard New Bedford dredge was compared to the new low-profile dredge in an area chosen for the presence of winter flounder though a small amount of scallops were also present. The low scallop catches were estimated in fractions of a bushel and did not indicate any significant difference in catch rates between the two dredge designs.

The fish and skates were individually counted and did indicate major differences between the two dredges for key commercial species (Table 3). For winter flounder, the low-profile dredge caught significantly less ($p=0.01$), 67 fish versus 149 fish in the standard dredge; a 122% reduction in bycatch. Major reductions in little skate were also observed. The low profile dredge caught 3672 versus 6917; an 88% reduction ($p=0.00$). The low profile dredge caught less summer flounder, 109 versus 169 (55% reduction, $p=0.00$) and less sand dab, 183 versus 395 (116% reduction, $p=0.00$). While there were reductions in other bycatch species, the low catch rates and limited amount of tows did not provide for significant analysis.

Discussion and Conclusion

This preliminary trial of the new low-profile dredge indicates that it may be equally as effective as catching scallops as the existing commercial dredge designs. There is also a strong indication that the new design's fish and skate bycatch reductions might even greatly exceed those that have occurred with the Cfarm turtle excluder dredge.

There is a definite need for extensive testing of the low profile dredge throughout the fishing season and in a number of different areas and bottom types. Several aspects of the design need to be investigated further such as the optimum width of the depressor plate. Trials need to be conducted at different towing speeds as well. Video work needs to continue under better viewing conditions.

References:

Milliken, Henry, Lisa Belskis, William DuPaul, Jeff Gearhart, Heather Haas, John Mitchell, Ron Smolowitz, Wendy Teas. 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

Smolowitz, R., H. Haas, H.O. Milliken, M. Weeks, and E. Matzen. 2010. Using Sea Turtle Carcasses to Assess the Conservation Potential of a Turtle Excluder Dredge. N. Amer. J. Fish. Manag. 30:993-1000.

Smolowitz, R. J. and M. Weeks. 2008. Field Testing of a New Dredge for the Sea Scallop Fishery. Final Report NOAA Award NA07NMF4540029. Coonamessett Farm, East Falmouth, MA 02536

Figure 1: Low-profile dredge showing the placement of cameras during video trials.

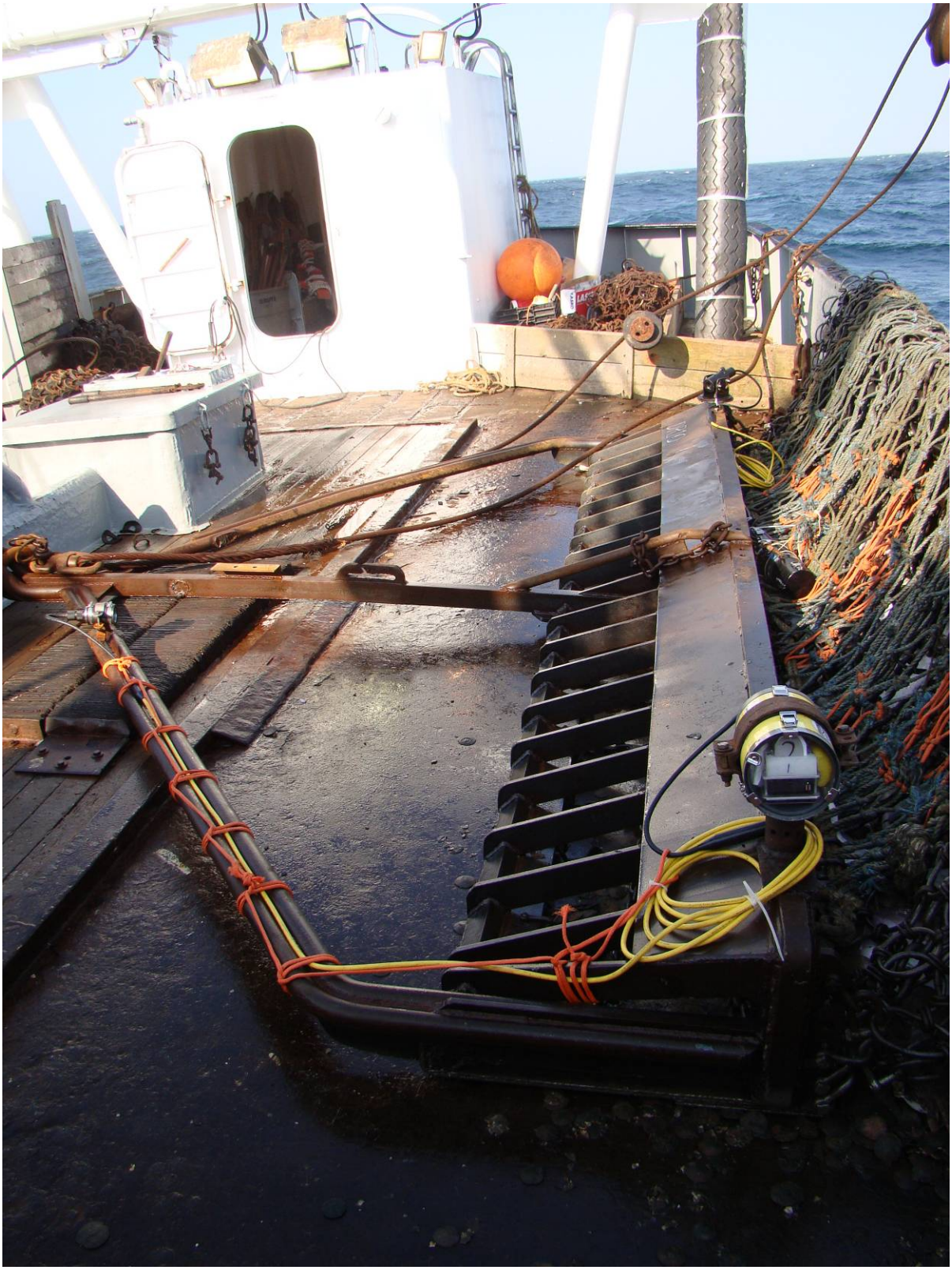

Table 1: Catch results form a commercial trip Celtic 2010-1

Tow #	Turtle Dredge			Low-profile Dredge		
	Scallops (bu)	Skate	Fish	Scallops (bu)	Skate	Fish
1	6	50	8	4	30	4
2	5	41	14	4	30	4
3	4	28	10	3	1	8
4	5	34	8	5	42	14
5	3	46	7	3	40	3
6	3.5	45	9	4	37	7
7	3.25	21	3	3	30	4
8	2	41	7	2	44	3
9	3	56	7	3.5	63	6
10	3	32	6	3.25	22	10
11	4	42	9	3	56	9
12	3	13	8	3	17	8
13	3	25	10	4	20	8
14	3	42	3	2.5	25	4
15	5	74	3	5	45	2
16	3	29	4	3	29	6
17	5	59	10	3.25	47	7
18	4.25	34	6	1.5	30	5
19	4	93	4	4	94	7
20	5.5	118	2	4	125	2
21	5	86	7	4	55	5
22	4	79	4	3	37	3
23	4	33	2	4	31	2
24	4	20	4	4	19	4
25	4	24	5	3	15	2
26	3	23	3	3	15	3
27	4	28	2	4.5	20	1
28	4	13	2	4	20	1
29	3.5	16	0	3.5	7	3
30	4	11	2	4	21	2
31	4	25	4	4	17	3
32	3.25	36	6	3.5	26	6
33	4	31	0	4	16	0
34	4	18	3	4	23	3
35	4	10	6	4	18	6
36	3	16	1	3	15	2
37	3	18	1	3.25	34	5
38	3	19	3	3	34	4
39	3.5	40	2	4	60	7
40	3	72	6	3	70	4
41	3	40	1	3	39	0
42	3	11	3	3	10	3
43	4	43	5	4	40	0
44	2.75	26	4	3.5	31	5
45	2.75	25	4	4	13	3
46	3	29	0	1	7	2
47	3.75	98	5	3	97	4
48	4	13	0	1.5	7	4
49	3	20	3	2	12	7
50	3	13	5	4	17	3
51	2	25	0	3	19	4
52	5	26	0	5	20	8
53	4.5	20	2	4.5	21	8
54	4.25	17	0	5	18	4
55	4	23	2	4	15	4
56	5.75	20	0	5.75	17	1
57	2.75	20	0	3.5	16	0
58		10	2	4	16	5
59	1.25	9	5	1.5	13	6
60	6	12	4	5	17	9
61	3	12	4	2.5	7	4
62	7.25	7	4	6.25	10	2
63	3.75	9	4	5	11	4
64	6	13	2	6.25	13	1
65	4	11	3	1.5	9	1
66	6	12	2	7.5	13	1
67	6	12	3	5	13	2
68	5.5	13	4	7	10	1
69	3.5	10	2	3	8	1
70	3.2	10	2	4	7	3
71	2	8	2	2	6	1
72		10	4	3	7	5
73	2	22	5	3	28	3
Totals	**271.7**	**2190**	**287**	**267**	**1967**	**296**

Table 2: Tow data for F/V Tradition 2010-1.

Tow #	Date	start time	end time	Start Position Lat	Long	End Position Lat	Long	Vessel Speed	Depth Fms	Wire Out Fathoms	Tide	Sea State	Vessel Heading	Wind
1	09/23/10	22:15	22:40	4101.670	7112.214	4100.888	7110.300	4	25	60	N	3-5		
2	09/23/10	22:46	23:00	4100.792	7110.010	4100.117	7108.910	4	25	75	N	3-5		
3	09/23/10	23:08	23:40	4100.040	7108.762	4058.366	7110.916	5	26	75	N	3-5		
4	09/24/10	6:42	7:55	4058.491	7111.123	4058.418	7110.89	5	29	75	N	3-5		
5	09/24/10	8:15	9:22	4058.795	7110460	4058.649	7110.600	4.9	29	80	N	3-5		
6	09/24/10	9:32	10:40	4058.653	7110.589	4058.474	7111.083	4.9	29	75	NE	1-3		
7	09/24/10	11:36	11:50	4058.706	7110.383	nk	nk	4.7	28	75	NE	1-3		
8	09/24/10	13:40	14:32	4058.888	7109.625	4058.912	7108.175	4.8	28	75	slack	1-3		
9	09/24/10	15:12	16:15	4058.850	7108.323	4058.955	7109.851	4.8	28	75	slack	1-3		
10	09/24/10	16:25	17:19	4058.933	7109.938	4059.240	7109.001	4.8	28	75	WNW	1-3		
11	09/24/10	17:33	18:33	4059.251	7108.982	4050.00	7102.11	5.0	26	75	S	1-3		
12	09/24/10	18:43	19:35	4100.23	7103.12	4100.35	7158.10	5.0	26	75	slack	1-3		
13	09/25/10	6:41	19:30	4100.142	7056.354	4101.539	7051.520	5.0	25	65	N	8-10		
14	09/25/10	7:43	7:43	4101.620	7051.23	4103.547	7045.556	5.0	25	60	N	8-10		
15	09/25/10	9:25	10:35	4103.876	7044.290	4103.551	7039.885	5.0	24	60	N	8-10		
16	09/25/10	10:58	12:00	4103.389	7039.410	4102.992	7034.677	5.0	22	50-55	N	8-10		
17	09/25/10	12:18	13:20	4103.045	7034.266	4103.352	7033.370	5.0	22	55	NE	8-10		
18	09/25/10	13:43	14:50	4103.65	7031.905	4100.686	7028.697	5.0	22	55	NE	8-10		
19	09/25/10	15:09	15:38	4100.627	7028.521	4100.554	7027.541	5.0	22	55	NE	8-10		
20	09/25/10	16:20	17:15	4059.885	7027.946	40.57.123	7027.292	5.0	22	55	ENE	8-10		
21	09/25/10	17:15	18:20	4057.018	7027.395	4057.217	7029.066	5.0	24	65	NE	3		NE 10-15
22	09/25/10	18:28	19:20	4057.631	7029.371	4001.240	7031.398	5.0	24	65	N	3	350	NE 10-15
23	09/25/10	19:30	18:20	4001.687	7031.656	4001.13	7032.625	5.0	24	65	N	3	338	NE 10-15
24	09/25/10	18:28	19:18	4000.751	7033.015	4000.935	7035.836	5.0	24	65	N	3	237	NE 10-15
25	09/26/10	6:11	7:00	4101.165	7038.513	4004.485	7040.469	5.0	23	60	N	3	348	NE 10-15
26	09/26/10	7:12	8:01	4104.796	7040.733	4106.386	7045.347	5.0	23	60	N	3	340	NE 10-15
27	09/26/10	8:10	8:50	4106.218	7045.662	4104.311	7048.670	5.0	21	55	NN	3	231	NE 10-15
28	09/26/10	9:41	10:30	4104.279	7049.100	4106.700	7045.327	5.0	21	55	N	3	90	NE 10-15
29	09/26/10	10:51	11:43	4106.560	7044.980	4105.553	7039.833	5.0	22	60	NE	3	136	NE 10-15
30	09/26/10	12:17	13:00	4105.212	7040.241	4103.856	7045.124	4.5	23	60	ENE	3	267	NE 10-15
31	09/26/10	1:24	14:18	4103.824	7045.373	41037.44	7050.168	4.5	23	60	ENE	3		NE 10-15
32	09/26/10	2:46	15:40	4103.713	7050.378	4105.623	7046.016	5.0	20	55	ENE	3	79	NE 10-15

Table 3: Catch results of the Tradition 2010-1 video camera study.

Tow #	Date	Scallop (bu) Low-profile	Skate Low-profile	Winter Skate Low-profile	Winter Fld. Low-profile	Yellowtail Low-profile	Fluke Low-profile	Sand Dab Low-profile	Four Spot Low-profile	Barndoor Skate Low-profile	Monkfish Low-profile
1	09/23/10	0.25	96	4	0	1	5	1	0	0	1
2	09/23/10	0.25	29	0	0	0	0	0	0	0	0
3	09/23/10	0.25	162	2	8	1	2	0	1	1	1
4	09/24/10	0.5	171	4	4	1	0	0	0	5	5
5	09/24/10	0.25	90	3	4	0	4	2	1	1	2
6	09/24/10	0.5	131	2	5	1	2	1	3	4	3
7	09/24/10	0.01	31	0	0	0	0	0	0	0	1
9	09/24/10	0.5	153	3	4	0	1	0	0	6	4
10	09/24/10	1	186	5	4	4	3	1	1	1	1
12	09/24/10	2.25	71	6	2	2	2	8	0	2	2
13	09/25/10	0.75	43	11	1	0	3	6	0	0	0
14	09/25/10	1.5	111	17	1	2	2	6	1	1	8
15	09/25/10	0.5	143	17	2	1	12	8	0	3	5
16	09/25/10	0.1	207	13	3	7	11	17	7	7	9
17	09/25/10	0.1	300	10	6	0	7	6	0	0	15
18	09/25/10	0.1	121	9	1	0	4	4	0	1	6
19	09/25/10	0.01	117	5	1	0	1	2	0	0	1
20	09/25/10	0	158	7	1	0	10	3	0	1	4
21	09/25/10	0	187	7	1	0	0	1	0	4	5
22	09/25/10	0	144	6	1	0	2	2	0	1	14
23	09/25/10	0.1	151	7	3	2	7	6	0	3	5
24	09/25/10	0.1	201	7	2	0	2	4	0	2	4
25	09/26/10	0.1	106	12	4	0	8	7	0	3	2
26	09/26/10	0.3	63	6	2	0	1	8	1	0	4
27	09/26/10	2	84	7	2	1	6	19	0	0	4
28	09/26/10	2.25	123	8	4	0	2	24	0	0	4
29	09/26/10	0.25	125	6	1	0	2	14	1	0	2
30	09/26/10	0.01	46	3	0	1	2	6	0	0	2
31	09/26/10	1.75	29	9	0	1	1	2	1	0	4
32	09/26/10	3	93	7	0	0	7	25	1	0	5
	SUM:	**18.68**	**3672**	**203**	**67**	**25**	**109**	**183**	**18**	**46**	**123**
	DIFFERENCE:	**-2.48**	**-3245**	**-55**	**-82**	**-2**	**-60**	**-212**	**-13**	**-14**	**14**
	% DIFFERENCE:	**-13%**	**-88%**	**-27%**	**-122%**	**-8%**	**-55%**	**-116%**	**-72%**	**-30%**	**11%**
	p (a =0.05):	**0.04**	**0.00**	**0.09**	**0.01**	**0.41**	**0.00**	**0.00**	**0.13**	**0.05**	**0.22**

Tow #	Date	Scallop (bu) Standard	Skate Standard	Winter Skate Standard	Winter Fld. Standard	Yellowtail Standard	Fluke Standard	Sand Dab Standard	Four Spot Standard	Barndoor Skate Standard	Monkfish Standard
1	09/23/10	0.25	72	0	1	0	1	2	0	0	1
2	09/23/10	0.9	41	2	0	2	1	1	0	0	1
3	09/23/10	0.5	173	4	10	0	1	1	0	0	2
4	09/24/10	0.75	427	1	9	4	5	3	6	5	4
5	09/24/10	0.25	304	5	0	0	2	0	1	1	2
6	09/24/10	0.5	229	6	0	1	7	0	0	3	4
7	09/24/10	0.5	77	2	2	0	2	0	0	4	1
9	09/24/10	0.3	303	7	7	0	3	0	1	10	7
10	09/24/10	1.1	238	7	1	3	5	6	0	2	3
12	09/24/10	2	107	7	2	0	4	7	0	1	4
13	09/25/10	1	76	7	1	2	4	8	0	0	7
14	09/25/10	1.5	162	6	2	5	4	12	4	3	5
15	09/25/10	0.5	144	7	2	2	14	12	1	2	4
16	09/25/10	0.1	340	17	17	2	22	39	1	5	6
17	09/25/10	0.1	620	15	25	1	11	21	0	3	7
18	09/25/10	0.1	348	18	2	0	4	16	0	2	8
19	09/25/10	0.25	195	6	4	0	2	8	1	1	3
20	09/25/10	0	285	9	6	0	6	6	2	3	2
21	09/25/10	0	251	16	3	1	5	2	0	5	3
22	09/25/10	0	451	7	10	0	3	4	0	2	4
23	09/25/10	0.1	675	26	11	0	8	19	1	1	6
24	09/25/10	0.1	463	17	11	0	6	8	0	0	7
25	09/26/10	0.1	226	16	5	2	13	24	2	4	1
26	09/26/10	0.25	109	2	6	0	4	17	5	0	2
27	09/26/10	2	95	7	1	0	2	37	0	0	7
28	09/26/10	2	158	7	2	0	9	47	0	0	3
29	09/26/10	0.5	91	8	2	0	6	26	1	1	0
30	09/26/10	0.01	79	4	5	1	7	20	3	0	1
31	09/26/10	2	66	12	0	1	4	10	1	1	3
32	09/26/10	3.5	112	10	2	0	4	39	1	1	1
	SUM	21.16	6917	258	149	27	169	395	31	60	109

Appendix A: Camera Log Sheets

CAMERA LOG SHEET

Tow Number: 7 Date: 9-24-10 Bottom Temp 52.2 °F

Number of Cameras Operating During Tow: 1

	REMARKS	
	Camera 1☒	**Camera 2☐**
Location of Camera	right outside corner on top of trim line dredge frame looking forward towards cutting bar and gooseneck	
Recorded?	Yes ☒ No ☐	Yes ☐ No ☐
Clarity of Footage	Good ☐ Fair ☐ Poor ☒	Good ☐ Fair ☐ Poor ☐
Camera type	STACK DVR2-500, DSPL camera	.....

Description of Video Footage

Time:	Description

Comments:

-Camera and recorder on experimental low profile dredge, starboard side. Port side is standard New Bedford dredge with no cameras mounted.
-All tows were completely sampled and recorded on separate logsheet.
-This was a test tow for the cameras, so the tow length is shorter.
-Mostly sunny skies with calm seas.
-because of the low profile of the experimental dredge, the cameras are closer to the bottom and often in the sediment cloud. The experimental dredge also sends more sand over the dredge frame and into the camera.

CAMERA LOG SHEET

Tow Number: 8 ***Date: 9-24-10*** ***Bottom Temp 52.2 °F***

Number of Cameras Operating During Tow: 2

	REMARKS	
	Camera 1☒	**Camera 2☒**
Location of Camera	right outside corner on top of trim line dredge frame looking forward towards cutting bar and gooseneck	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☐ Poor ☒	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	STACK DVR2-100, DSPL camera

Description of Video Footage

Time:	Description
13:49:00	Vis becomes clearer
13:57:18	Camera 1, fld. escapes
14:00:27	Camera 1, fld on cutting bar
14:03:50	Camera 1, fld. escapes
14:06:00	black out conditions again

Comments:

- Lots of sand going through and over the dredge frame.
- Visibility is lost once dredge reaches the bottom.
- Camera 1 angle was moved downwards towards cutting bar since visibility is only 6-8 ft

CAMERA LOG SHEET

Tow Number: 15 ***Date: 9-25-10*** ***Bottom Temp 54.5°F***

Number of Cameras Operating During Tow: 2

	REMARKS	
	Camera 1☒	**Camera 2☒**
Location of Camera	right outside corner on top of trim line dredge frame looking forward towards cutting bar and gooseneck	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☒ Poor ☐	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	STACK DVR2-100, DSPL camera

Description of Video Footage

Time:	Description
10:03	camera 1, fish escapes
10:06	camera 1, fish escapes
10:07:24	skate captured
10:07:48	fish escapes
10:12:18	buttons stuck on camera, loose vis
10:21:00 10:23:00 10:26:39 10:31:28 10:32:05 10:32:50	clear again button on camera skate escapes fld. Captured caught on lobster gear camera angle knocked off by lobster gear

Comments:
-camera 2 appeared to have stopped towards the end of the tow but then starts again during dumping.
-better visibility than yesterday.
-dredge encountered lobster gear, camera A was hung on a line and turned away from the dredge about ½ way through the tow. It was reset after the tow.

CAMERA LOG SHEET

Tow Number: 16 Date: 9-25-10 Bottom Temp 54.5 °F

Number of Cameras Operating During Tow: 1

	REMARKS	
	Camera 1 ☐	**Camera 2** ☐
Location of Camera	right outside corner on top of trim line dredge frame looking forward towards cutting bar and gooseneck	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☐ No ☒	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☐ Poor ☐	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	STACK DVR2-100, DSPL camera

Description of Video Footage

Time:	Description

Comments:

-camera 1 tripped off during set out, turned back on during haulback
-better light
-performance of camera 2 was poor

CAMERA LOG SHEET

Tow Number: 17 Date: 9-25-10 Bottom Temp 54.5 °F

Number of Cameras Operating During Tow: 2

	REMARKS	
	Camera 1☐	**Camera 2☐**
Location of Camera	right outside corner on top of trim line dredge frame looking forward towards cutting bar and gooseneck	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☒ Poor ☐	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	STACK DVR2-100, DSPL camera

Description of Video Footage

Time:	Description
12:49:11	fish escapes
12:50:44	fld. escapes
12:51:23	fish escapes, skate escapes
12:51:54	small fish escapes
12:52:30	skate escapes
12:53:12 12:56:41 12:57:28 12:57:43 12:58:53 13:01:22 13:04:23	Fld fish escapes fish escapes Fish escapes Fish escapes Skate escapes Become dark

Comments:

-The recording configuration for camera 2 was somehow reset to default during previous tow. They were reset to the highest bit rate after this tow.
-Camera 1 got good quality footage

CAMERA LOG SHEET

Tow Number: 28 Date: 9-26-10 Bottom Temp 55.6 °F

Number of Cameras Operating During Tow: 3

	REMARKS	
	Camera 1☐	**Camera 2☐**
Location of Camera	middle of frame looking forward and across towards left outside bail bar	right outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☒ Poor ☐	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	STACK DVR2-100, DSPL camera

Description of Video Footage

Time:	Description
9:33:28	better vis until 9:33 when it becomes dark

Comments:
-Camera 3a was a Panasonic SDR-H18 handheld camera with wide angle lens inside a Equinox housing mounted on left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
-sand waves
-bad signal on camera 2

CAMERA LOG SHEET

Tow Number: 29 Date: 9-26-10 Bottom Temp 55.6 °F

Number of Cameras Operating During Tow: 3

	REMARKS	
	Camera 1☐	**Camera 2☐**
Location of Camera	middle of frame looking forward and across towards left outside bail bar	right outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☐ Poor ☒	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	STACK DVR2-100, DSPL camera

Description of Video Footage

Time:	Description

Comments:
-Camera 3b was a Panasonic HD HDC-HS9P handheld camera with wide angle lens inside a Equinox housing mounted on left outside bail bar of trim line dredge near gooseneck, looking aft towards frame, poor quality footage due to low visibility

-Camera 2 came up with no power. The battery apparently did not charge correctly and died. The DSPL camera head for camera 2 was hit on the hatch cover during dumping. Signal was cutting in and out during recording (possibly the cable). Camera 2 system was completely removed after this tow.

CAMERA LOG SHEET

Tow Number: 30 Date: 9-26-10 Bottom Temp 55.6 °F

Number of Cameras Operating During Tow: 2

	REMARKS	
	Camera 1 ☐	**Camera 3a** ☐
Location of Camera	middle of frame looking forward and across towards left outside bail bar	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☐ Poor ☒	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	Panasonic SDR-H18 handheld camera with wide angle lens inside a Equinox housing

Description of Video Footage

Time:	Description
	dark

Comments:

-only cameras 1 and 3 were used for the last 3 tows

CAMERA LOG SHEET

Tow Number: 31 ***Date: 9-26-10*** ***Bottom Temp 55.6 °F***

Number of Cameras Operating During Tow: 2

	REMARKS	
	Camera 1☐	**Camera 3b☐**
Location of Camera	middle of frame looking forward and across towards left outside bail bar	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☐ Fair ☐ Poor ☒	Good ☐ Fair ☐ Poor ☒
Camera type	STACK DVR2-500, DSPL camera	Panasonic HD HDC-HS9P handheld camera with wide angle lens inside a Equinox housing

Description of Video Footage

Time:	Description
	buttons stuck on camera for most of tow

Comments:

CAMERA LOG SHEET

Tow Number: 32 Date: 9-26-10 Bottom Temp 55.6 °

Number of Cameras Operating During Tow: 2

	REMARKS	
	Camera 1☐	**Camera 3a☐**
Location of Camera	middle of frame looking forward and across towards left outside bail bar	left outside bail bar of trim line dredge near gooseneck, looking aft towards frame
Recorded?	Yes ☒ No ☐	Yes ☒ No ☐
Clarity of Footage	Good ☒ Fair ☐ Poor ☐	Good ☐ Fair ☒ Poor ☐
Camera type	STACK DVR2-500, DSPL camera	Panasonic SDR-H18 handheld camera with wide angle lens inside a Equinox housing

Description of Video Footage

Time:	Description
14:28:10	scallop swimming in front of dredge, captured
14:28:33	fish captured
14:33:33	good footage of skate being captured
14:35:12	skate in sand being captured
14:36:22	good footage of fld escaping
14:37:33	dredge speeds up, quality of footage decreases

Comments:
Best footage of the trip
Sand waves
Best tow speed for video was around 4 knots. However the dredges became bogged down at that speed (sand waves) which made maintaining a constant speed difficult.