Testing of a Low Profile Scallop Dredge and Escape Windows for Bycatch Reduction

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- **The Low Profile Dredge**
  - Background
  - LPD Design Features
  - LPD Testing
  - Results
  - Future Research and Development
- **Escape Windows**
  - Background
  - Testing of Escape Windows
  - Results
  - 2014 RSA Gear Testing Project

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Low Profile Dredge Background

- The TDD deflects turtles from the dredge path like a cattle guard. The LPD was designed to hopefully deflect flatfish away from the bag by lowering the height of the head bale.

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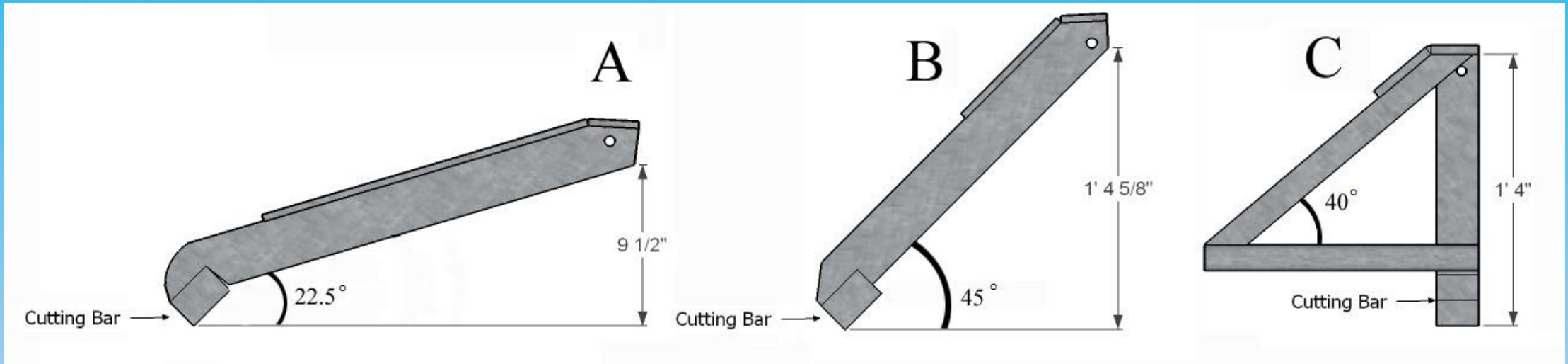
Low Profile Dredge Design



- The Low Profile Dredge is a derivative of the CFTDD and was first developed and tested in 2011.

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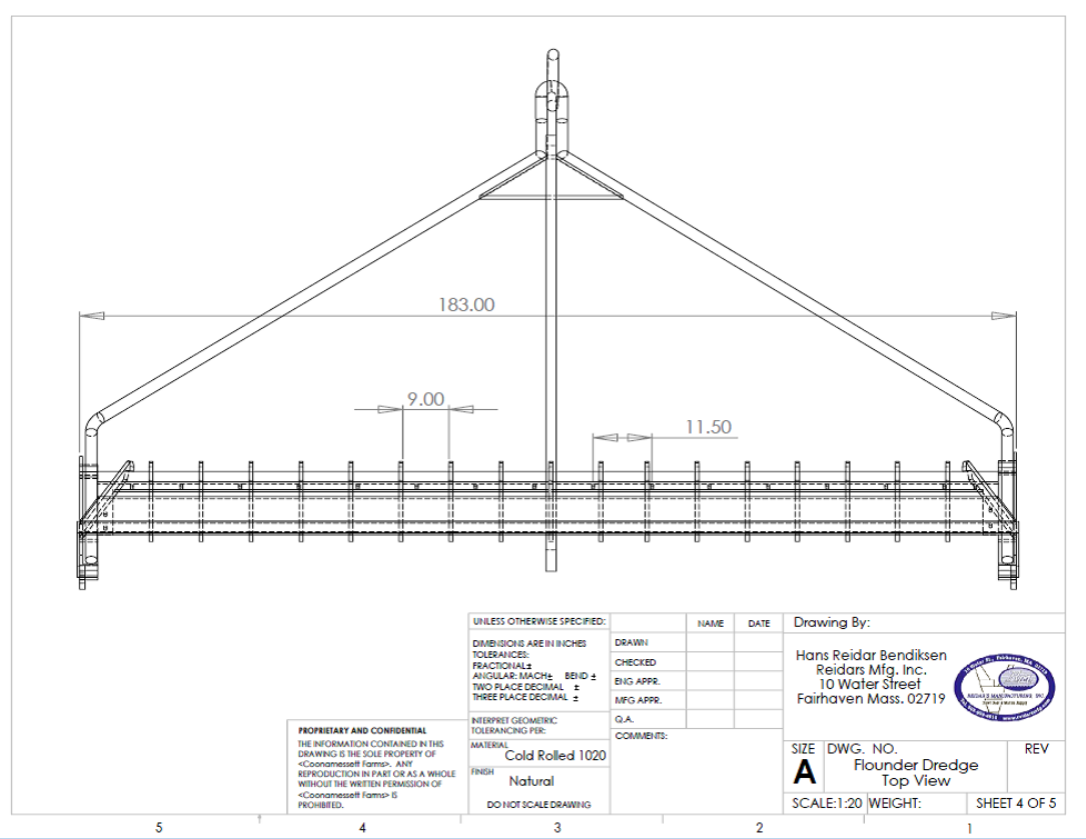
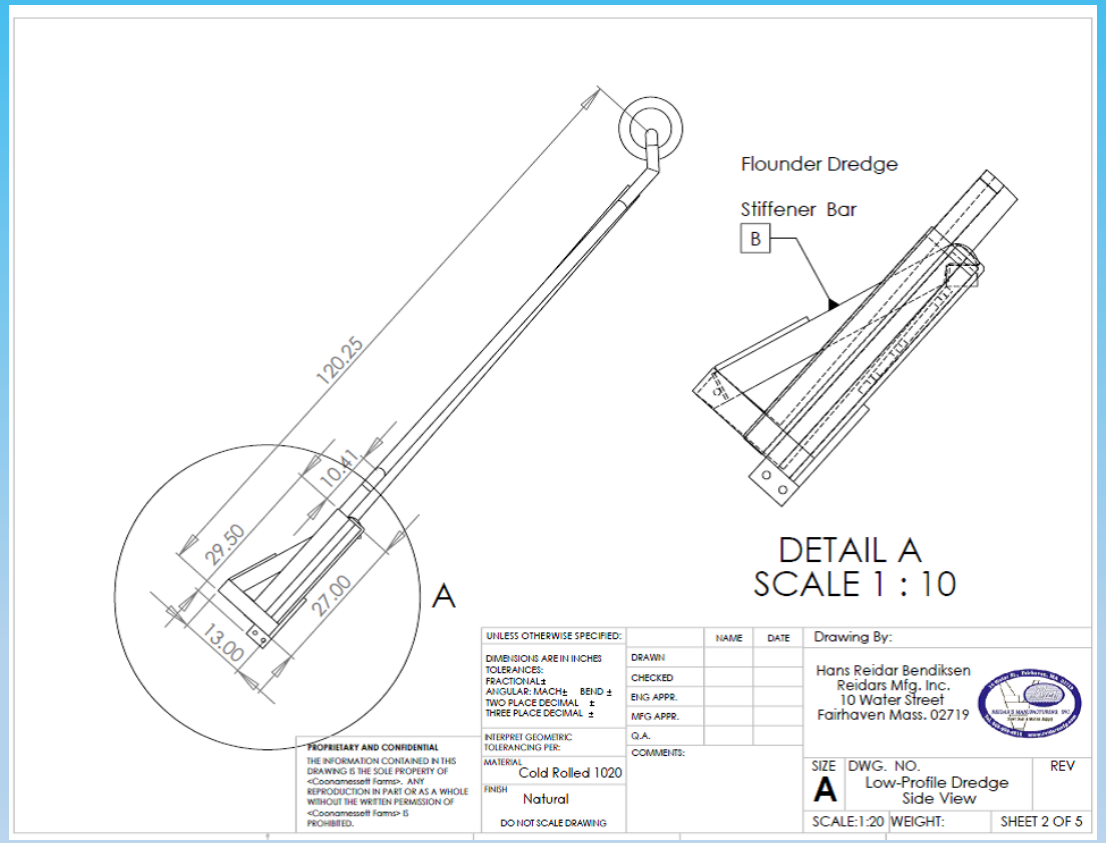
Low Profile Dredge Design





Field Testing of the LPD

- 2011 RSA Gear Testing Project
  - Grant: NA11NMF4540021
  - Five dedicated research trips
    - Three trips: LPD vs. CFTDD
    - Two trips: LPD vs. NBD
- 2012 RSA Gear Testing Project
  - Grant: NA12NMF4540041
  - Tested the LPD with a 5 ring apron for two of the four trips.
    - The LPD Frame was bent on the first trip and the bend became exacerbated on the second trip.
- 2013 RSA Gear Testing Project
  - Grant: NA13NMF4540012
  - 24 DAS used to test the LPD aboard LAGC vessels
    - Alternate tow strategy

2011 LPD Testing

- Depressor Plate Size
  - 10, 13, 15 and 20 inch depressor plates
  - Lacing between depressor plate and cutting bar
- Twine Top Hanging Ratio
  - 1:1 and 2:1 hanging ratio
- Results were not conclusive due to a small sample sizes. The 20” depressor plate had the most promising results and this became the standardized LPD design for future projects.

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2012-2013 LPD Testing

- The LPD was tested on two trips against a standardized turtle deflector dredge in 2012.
  - 5R apron and 1.5:1 Twine Top
- In 2013 the LPD was tested aboard LAGC vessels.
  - Tested with a control bag using 12 DAS against a CFTDD with a control bag
  - Tested with an experimental bag (5R and 1.5:1 twine top) for 12 DAS against a CFTDD with the experimental bag
  - Anecdoctal evidence suggests that the LPD has a greater tow efficiency
- 2013 results will be available with the final report

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2011 Results

- There was decrease in the catch of both target and non-target species in with the LPD utilizing a 20” depressor plate.

	Scallops (bu)	Little Skate	Winter Skate	Windowpane Flounder	Yellowtail Flounder	Winter Flounder	Barndoor Skate	Monk	Summer Flounder	4 Spot	Benthos (bu)
Low Profile	246	6434	43	594	190	27	30	884	232	148	152
New Bedford	281	9456	80	833	413	31	36	920	244	397	456
# diff	-35	-3022	-37	-239	-223	-4	-6	-36	-12	-249	-303
% diff	-14%	-47%	-86%	-40%	-117%	-15%	-20%	-4%	-5%	-168%	-199%

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2012 Results

- Standardized gear and tow parameters allowed for a determination of the significance of the results (Mann-Whitney Rank Sum Test).
- The LPD frame was bent; which, may have contributed to a further decrease in scallop catch.

	Yellowtail (SD)	Winter (SD)	Windowpane (SD)	Summer Flounder (SD)	Sea Scallops (SD)
Experimental (LPD)	3.20 (4.24)	0.61 (0.97)	2.08 (3.42)	5.91 (12.03)	22.28 (20.99)
Control	5.31 (6.36)	1.89 (2.14)	3.83 (5.56)	10.18 (12.68)	32.21 (26.92)
Difference	-2.11	-1.28	-1.75	-4.27	-9.99
% Difference	-39.79%	-67.85%	-45.67%	-41.99%	-31.03%
N	80	33	127	53	149
U Statistic	2368	312	8621	824	8156
P-Value	0.004*	0.002*	0.001*	0.001*	<0.001*
* Denotes significiant difference ($p < 0.05$)					

Back to the Drawing Board with the LPD

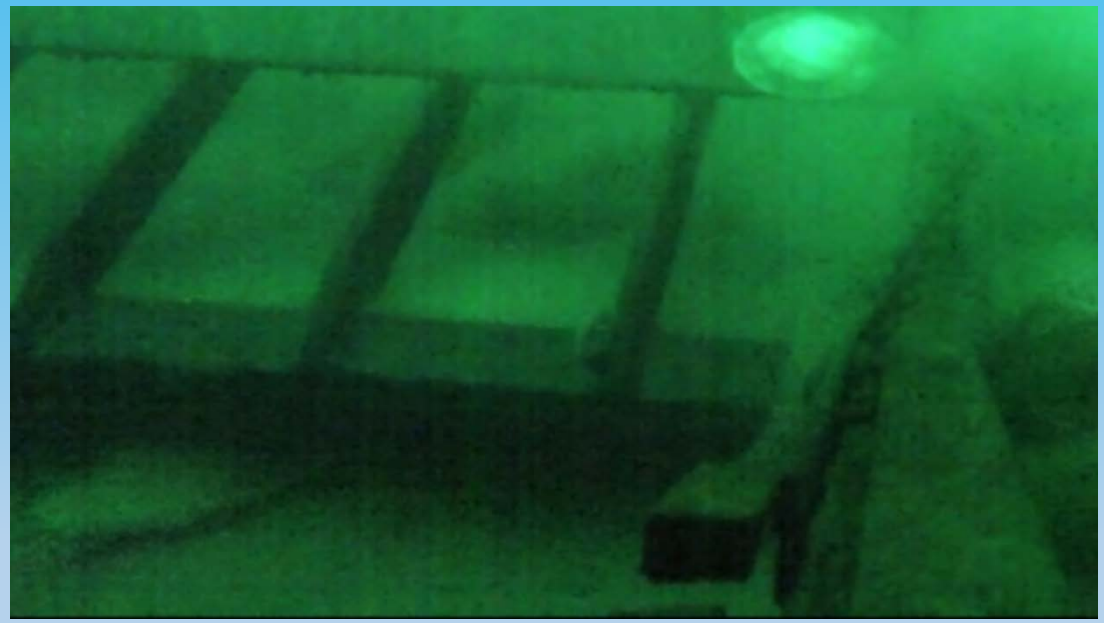
- With the significant loss in the catch of scallops the LPD as it was designed would not be a viable bycatch reduction solution.
- Removal of the bale bars changes the center of gravity and the change in the hydrodynamic forces associated with reducing the angle of the depressor plate for the LPD caused the cutting bar to be too high above the seafloor to be effective.
  - The height of the cutting bar off the seafloor was close to 5”

Is the new design viable?

- In January of 2014, the FV Celtic took the new version of the LPD out to the NLCA. The dredge appeared to catch an equivalent amount of scallops as the gear typically used by the FV Celtic. Without standardization the data could not be statistically analyzed. We intend to test the new dredge design with standardized tow and gear parameters by the end of April.

Escape Windows

- Flatfish utilize a detection minimization strategy to avoid predation and therefore often react within 1 meter of trawl gear (Main and Sangster 1981, Walsh and Hickley 1993, and Ryer and Barnett 2006, Ryer 2008).
- Scallop dredges are towed at greater speeds than trawl gear; which, would mean that flatfish are likely to be overcome by the dredge so a post capture escape mechanism may be a solution to decrease bycatch.



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Escape Window Preliminary Results

Gear Type		Yellowtail Flounder	Winter Flounder	Windowpane Flounder	Summer Flounder	Scallops
Experimental (5R window)	Fish Weight (lbs)	339.05	33.70	0.90	17.00	856.93
	Bycatch Rate	0.40	0.04	0.00	0.02	
Control	Fish Weight (lbs)	566.40	64.05	7.40	21.00	913.40
	Bycatch Rate	0.62	0.07	0.01	0.02	

- During the 2012 RSA Gear Testing Project thirty trial tows were done with windows in the sides of the 5R bag. We did not test windows in 2013 because more data was need on the 5R bag, but for the 2014 Gear RSA windows are going to be tested.

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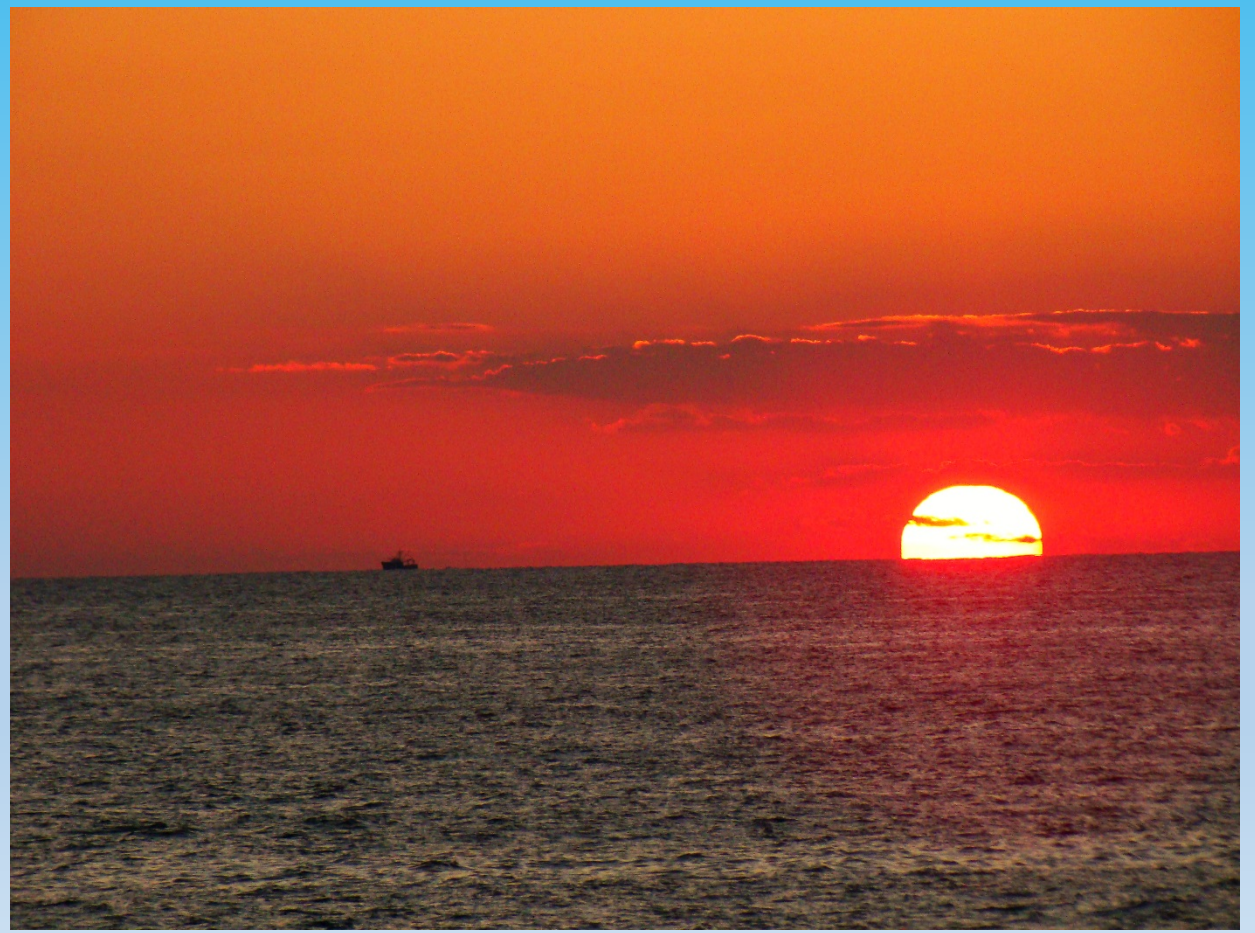
Acknowledgements

Thanks to all the participating vessels and to our collaborators at VIMS



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