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Experiments in the Gulf of Mexico to Evaluate Bluefin Tuna Bycatch Mitigation Measures in the Yellowfin Tuna Fishery

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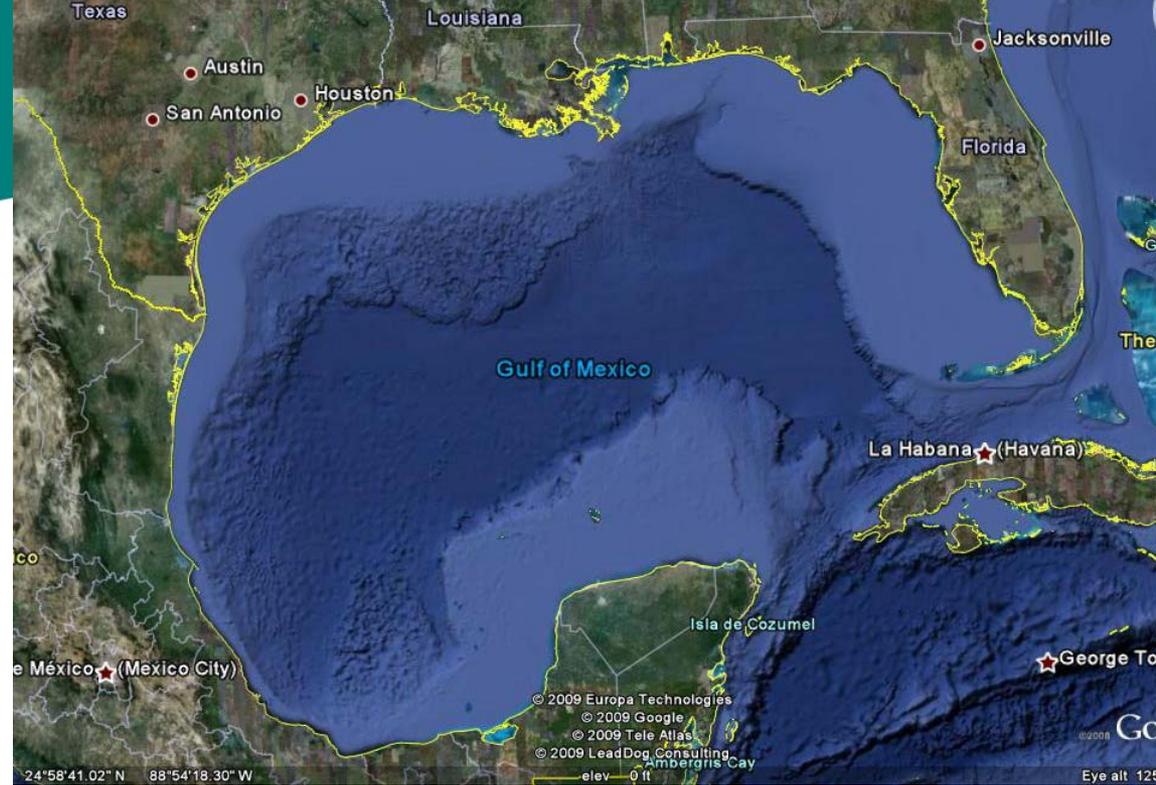
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Problem



The Gulf Mexico is a major spawning area for the western Atlantic bluefin tuna stock and has become an area of concern due to the bycatch mortality of spawning bluefin tuna in the directed yellowfin tuna longline fishery.



Background Information

Anecdotal information indicates that spawning bluefin tuna, which are much larger than yellowfin tuna, are capable of straightening some hook types used in the yellowfin fishery.

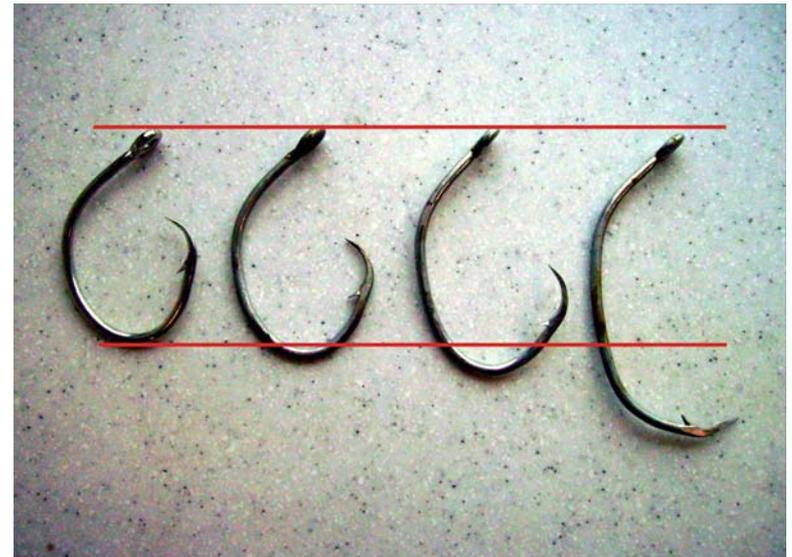
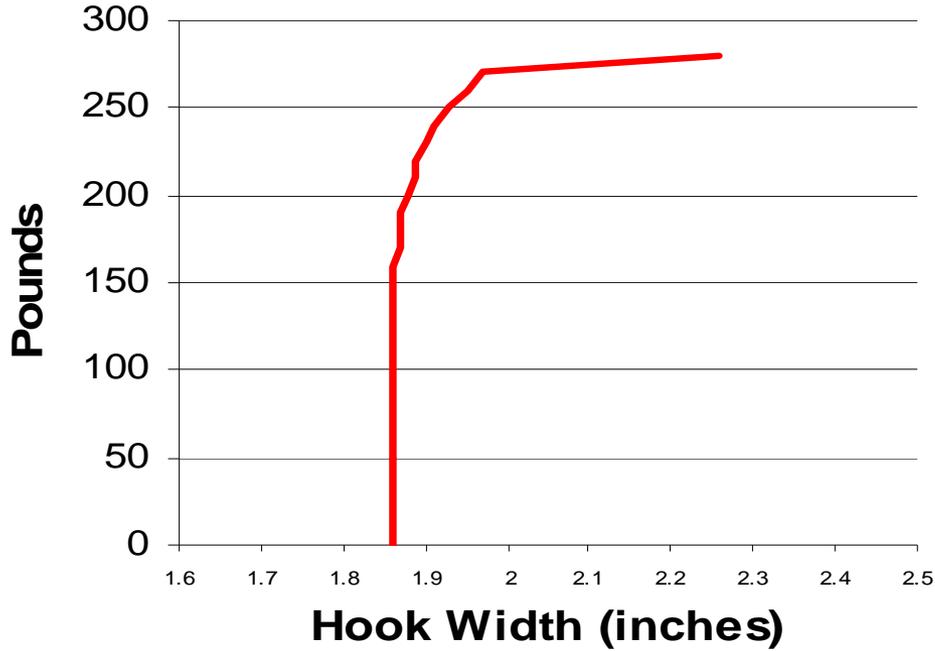


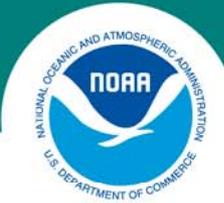


Hook Pull vs Strain

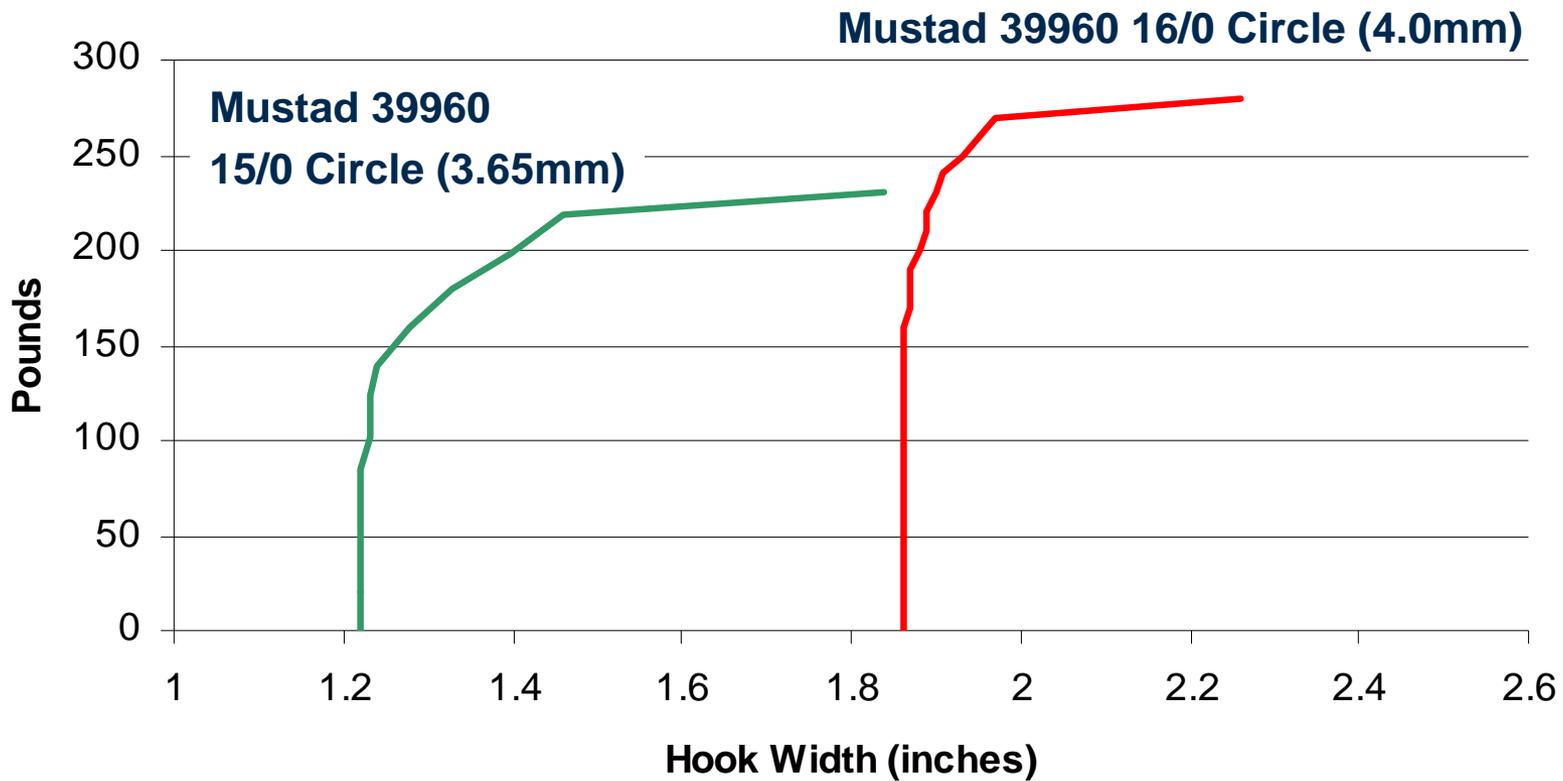


Mustad 39960 16/0 Circle (4.0mm)



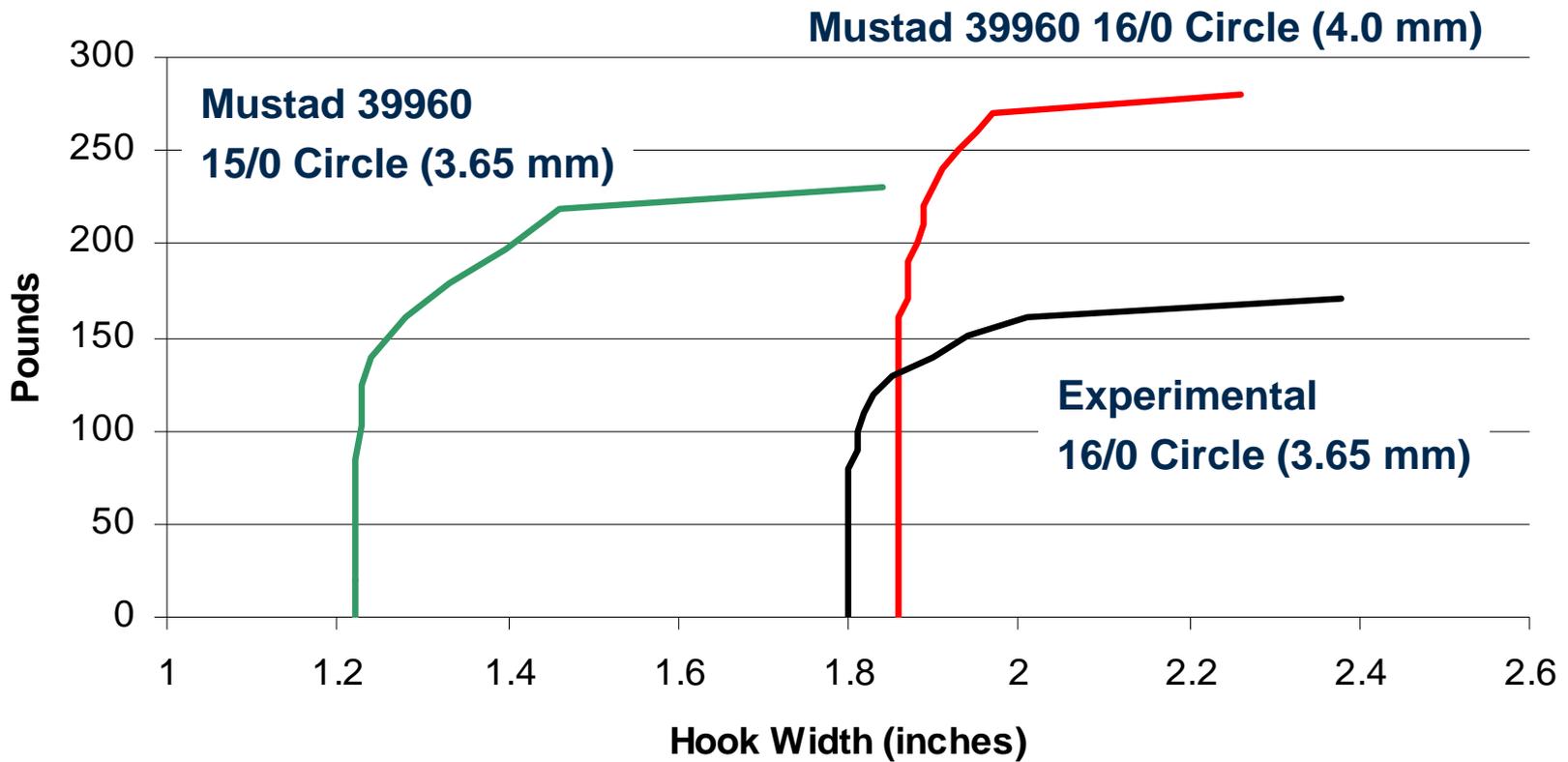


Hook Pull vs Strain



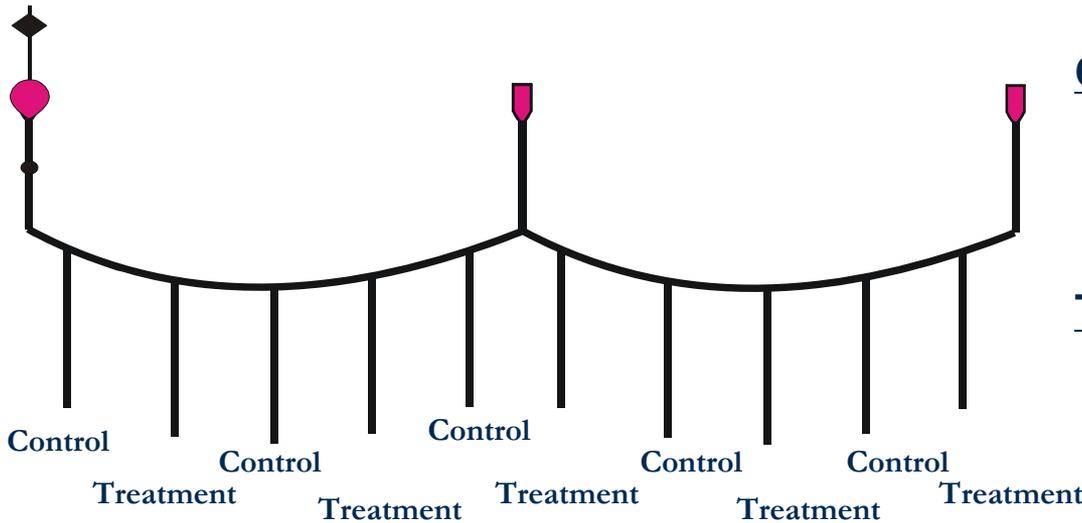


Hook Pull vs Strain





2008-10 Experimental Design Gear Configuration



Control: Standard 16/0
Mustad Carbon Steel
Circle Hook
w/Sardine bait

Treatment : Custom 16/0
Mustad Circle Hook
Constructed of 15/0
Carbon Steel Material
w/Sardine bait



2008-10 Gulf of Mexico PLL Bluefin Tuna Mitigation Research

2008 – 2010 Research

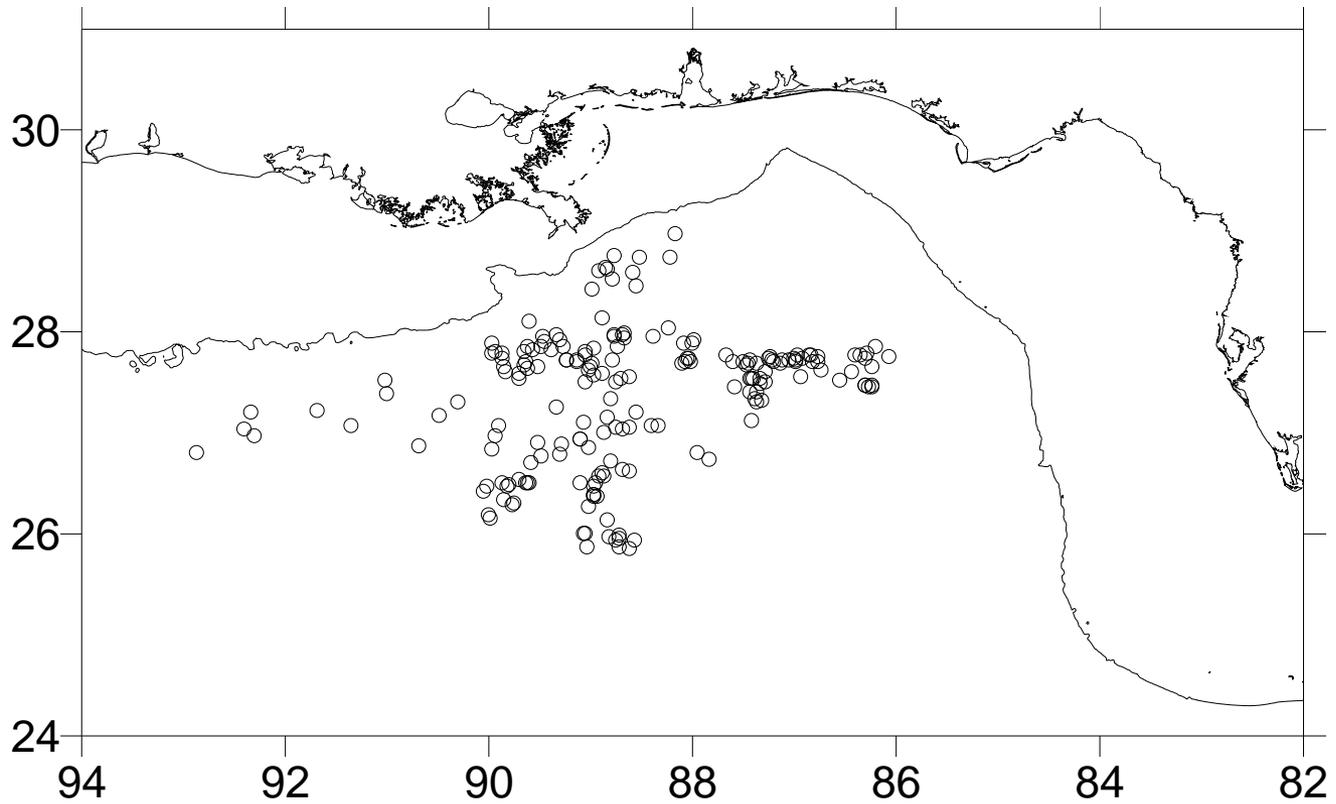
- 5 Vessels
- 260 Sets
- 172,573 hooks

2010 Summer (ongoing)

- 2 Vessels
- July-September
- 50 Sets



2008-2009 Effort Distribution





Statistical Analysis

Catch rate - hook type, mean sea surface temperature, vessel and year:

- logistic regression analysis (with maximum likelihood estimation procedure) for binary response

Size-frequency distributions:

- Kolmogorov-Smirnov (KS) test.

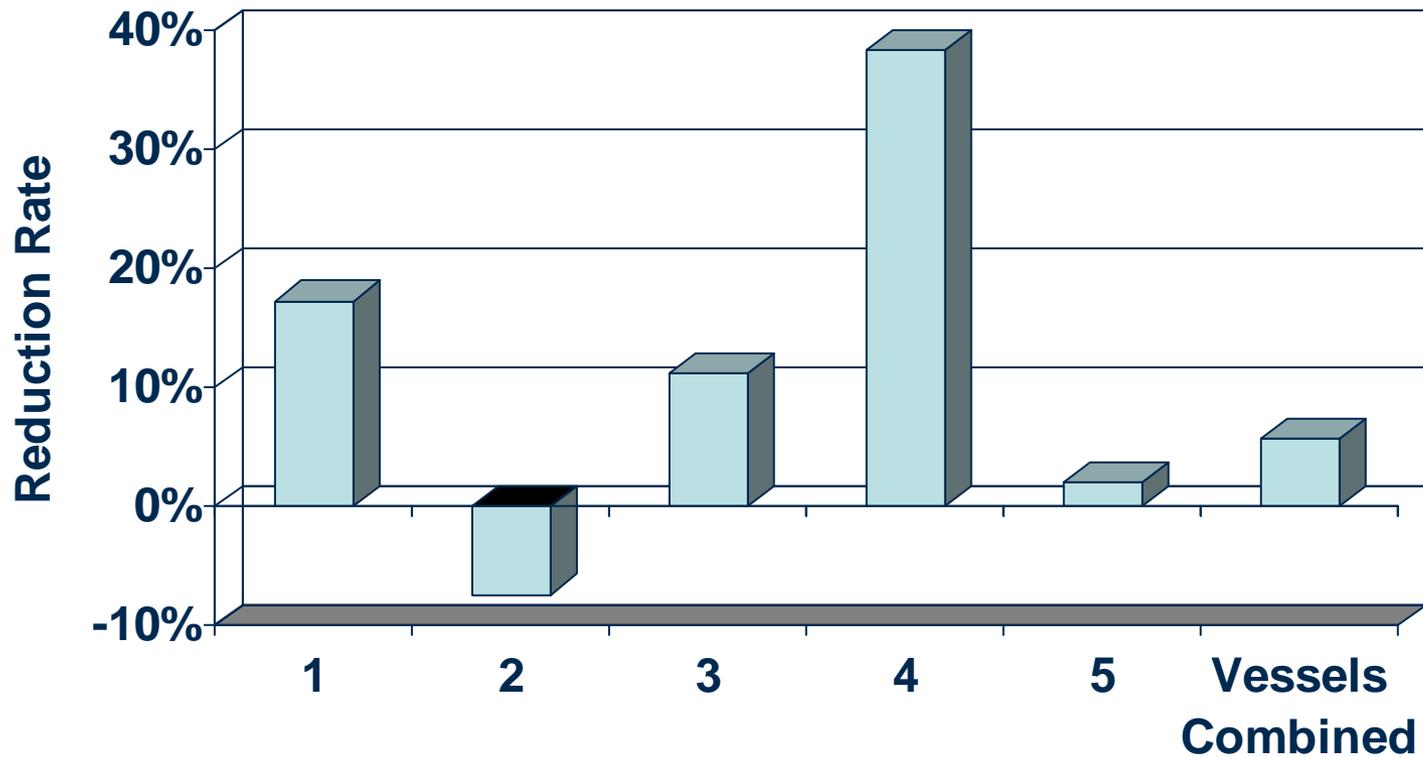


2008 – 2010 Results

260 sets		CPUE (x1000)		% Reduction	<i>ProbChi Sq</i>
	n	Control	Exp.		
Bluefin Tuna	33	0.266	0.116	56.5	0.0279
Yellowfin Total Count	1785	10.697	9.990	6.7	0.1457
Yellowfin Kept	1385	8.518	7.533	11.7	0.0217



Yellowfin Marketable catch (Yellowfin Kept)



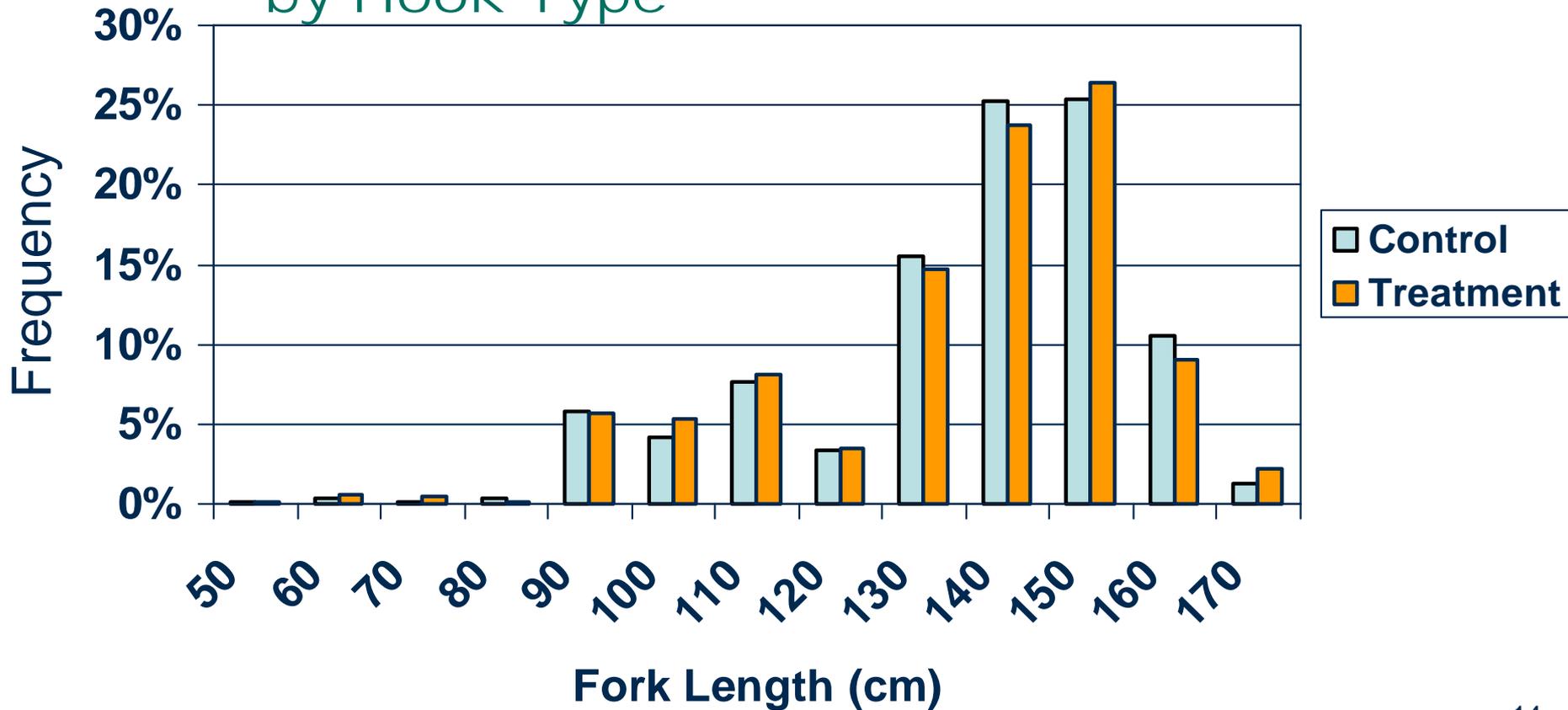


2008 – 2010 Results Minus Vessel #4

195 Sets		CPUE (x1000)		% Reduction	<i>ProbChi Sq</i>
	n	Control	Exp.		
Bluefin Tuna	20	0.266	0.066	75.0	0.0131
Yellowfin Total Count	1551	12.964	12.814	1.2	0.8177
Yellowfin Kept	1170	10.006	9.440	5.7	0.3173

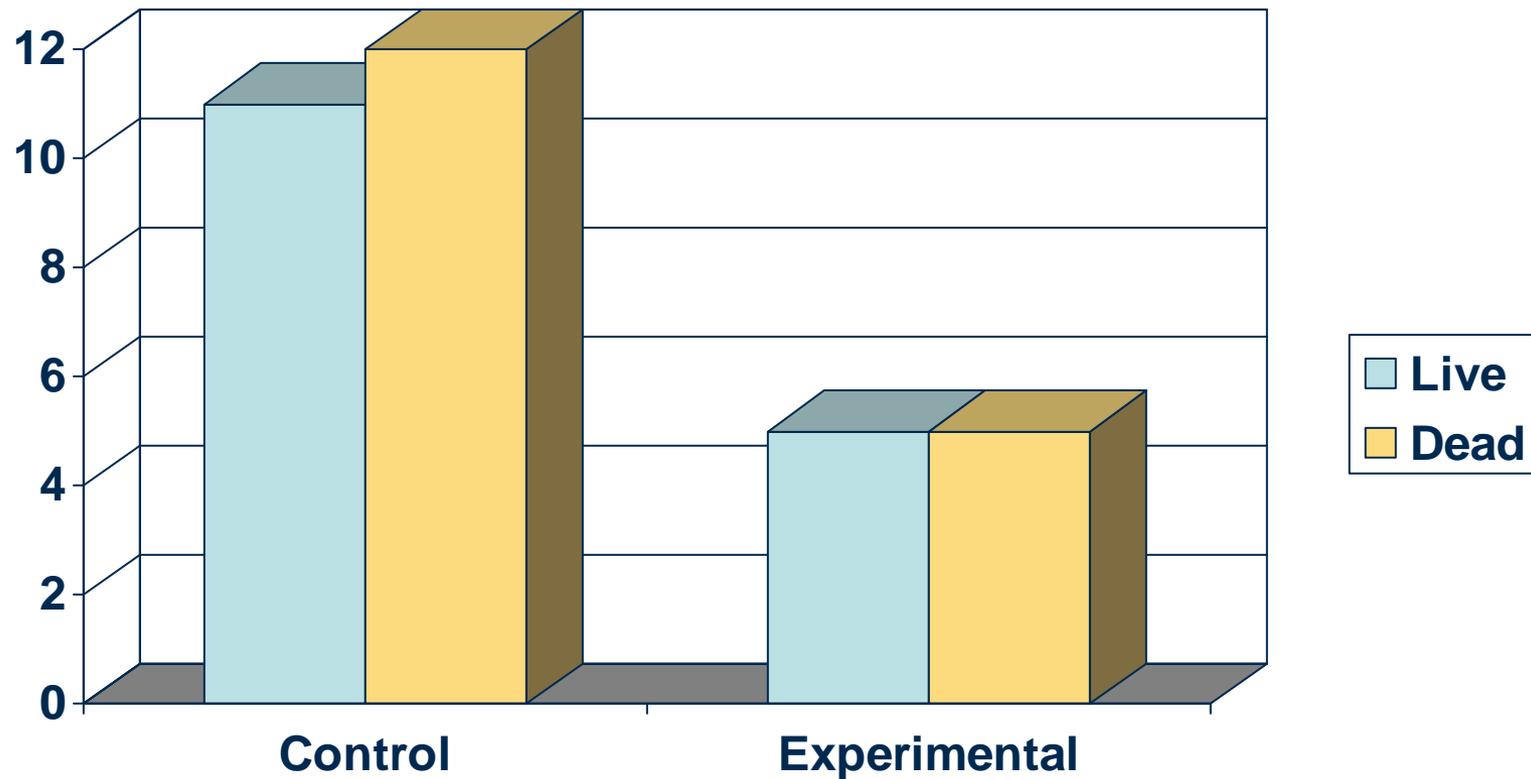


2008-09 Yellowfin Size distribution by Hook Type



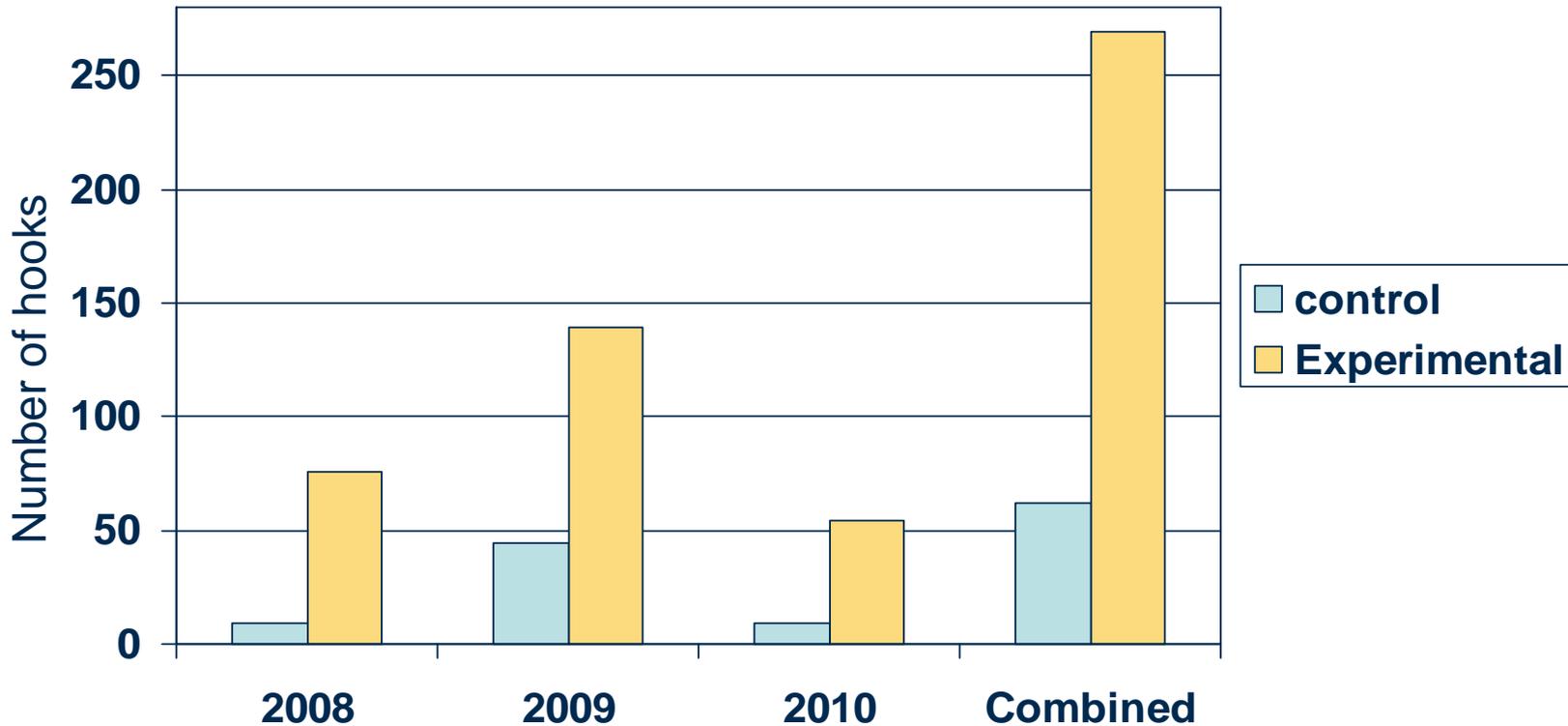


Bluefin Tuna Boarding Status





Straightened Hooks Species Unknown



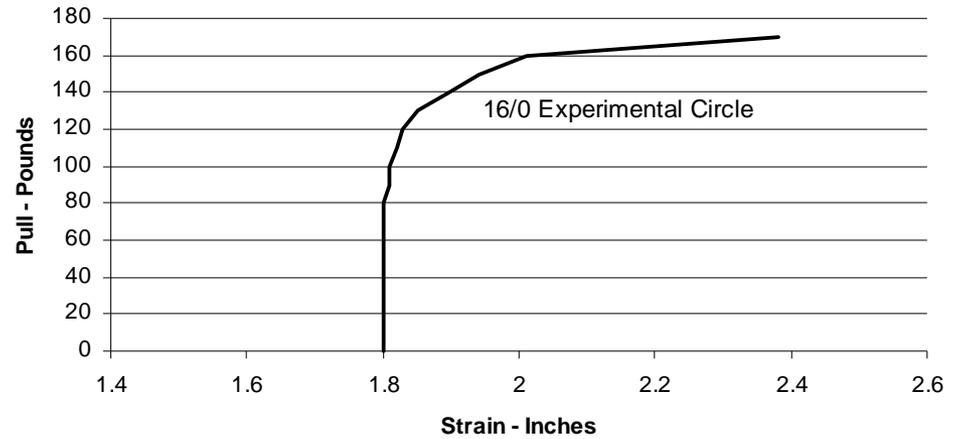


Hooks with bluefin catch

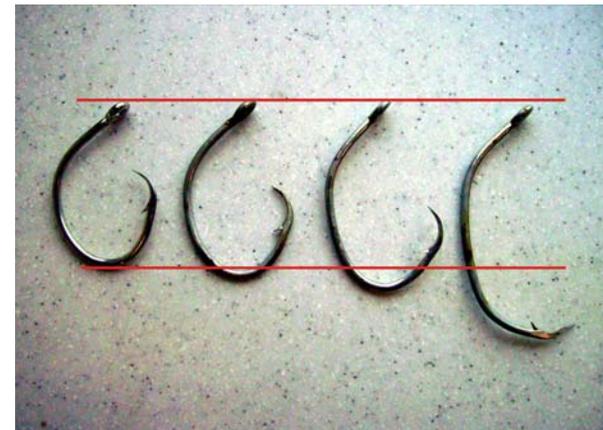
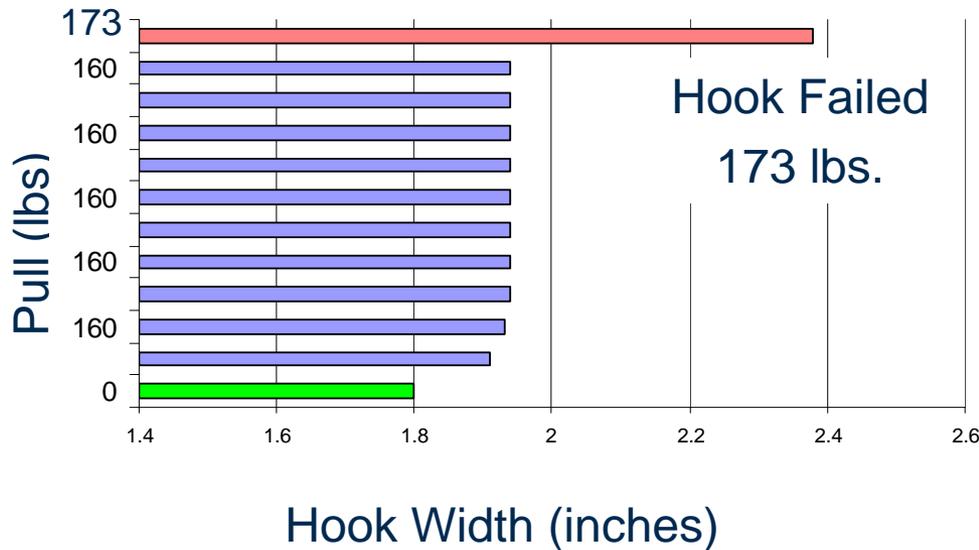
Control

Experimental



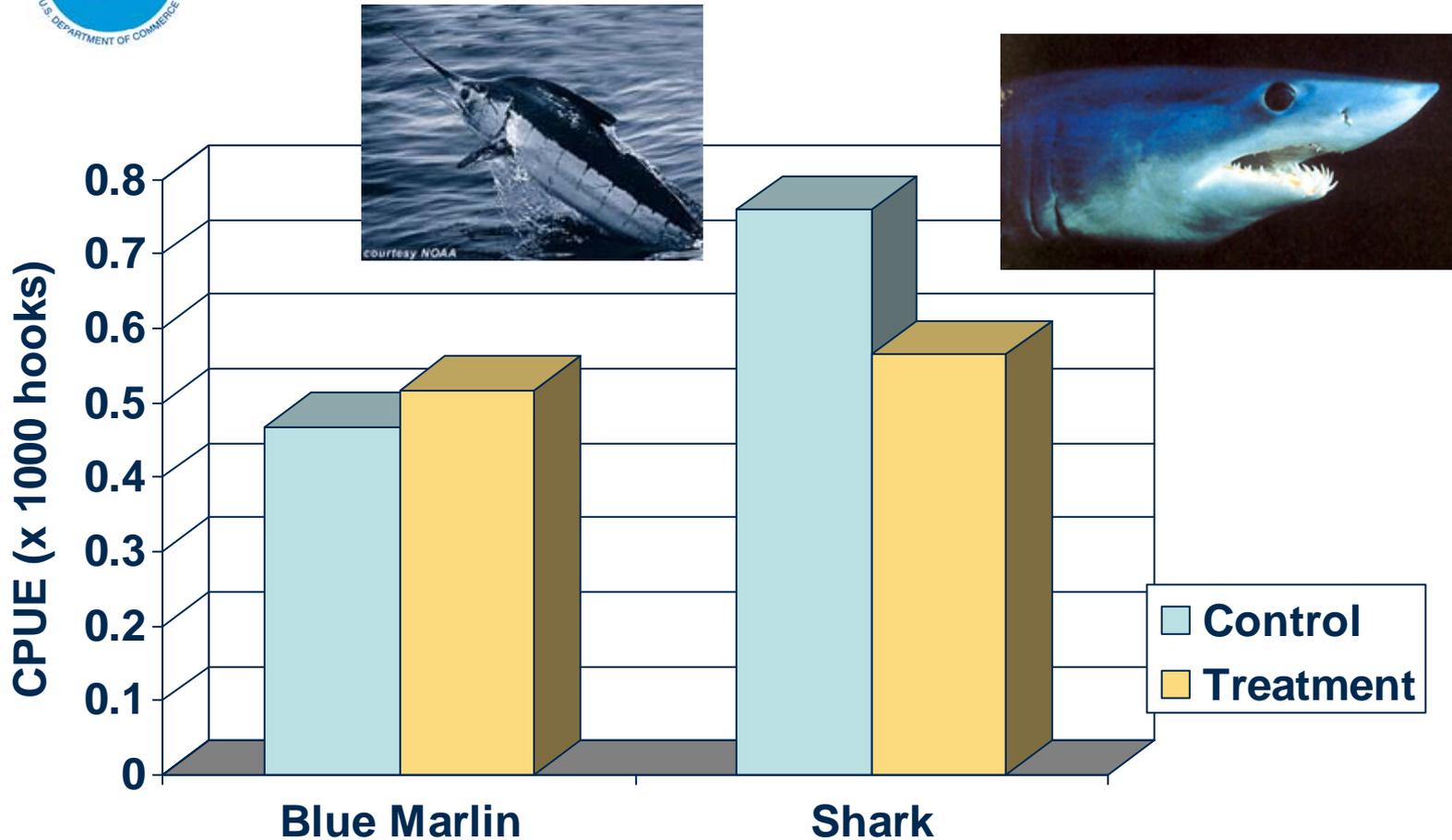


Experimental Hook Multiple Exposure Test





Other Potential Mitigation Benefits





Shark Catches 2008-2009

Common Name	Scientific Name	Control	Exp.
SANDBAR	Carcharhinus plumbeus	14	13
SILKY	Carcharhinus falciformis	13	8
TIGER	Galeocerdo cuvier	9	8
MAKO SHORTFIN	Isurus oxyrinchus	3	5
DUSKY	Carcharhinus obscurus	4	2
THRESHER BIGEYE	Alopias superciliosus	4	2
MAKO LONGFIN	Isurus paucus	4	
THRESHER	Alopias	3	
MAKO SPP	Isurus	1	2
WHITETIP OCEANIC	Carcharhinus longimanus	2	
SC. HAMMERHEAD	Sphyrna lewini		1
THRESHER COMMON	Alopias vulpinus	1	



Summary

- New 16/0 hook design bends with less force
- Observed 56.5% reduction in Bluefin (S)
- Observed 6.7% reduction in Yellowfin (NS)
- Retention of target catch vessel dependant

Current Testing:

- Test the new hook design later in the season for temporal effect on yellowfin tuna catch