

Science, Service, Stewardship



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

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Engineering and
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**NOAA
FISHERIES
SERVICE**

NOAA Fisheries

Harvesting Systems and
Engineering Branch

Pascagoula, Mississippi USA



- Working with industry
to develop selective
fishing gear

- *Trawl Gear*
- *Longlines*
- *Gill nets*
- *Trap Gear*



Atlantic Ocean

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Data SIO, NOAA, U.S. Navy, NGA, GEBCO

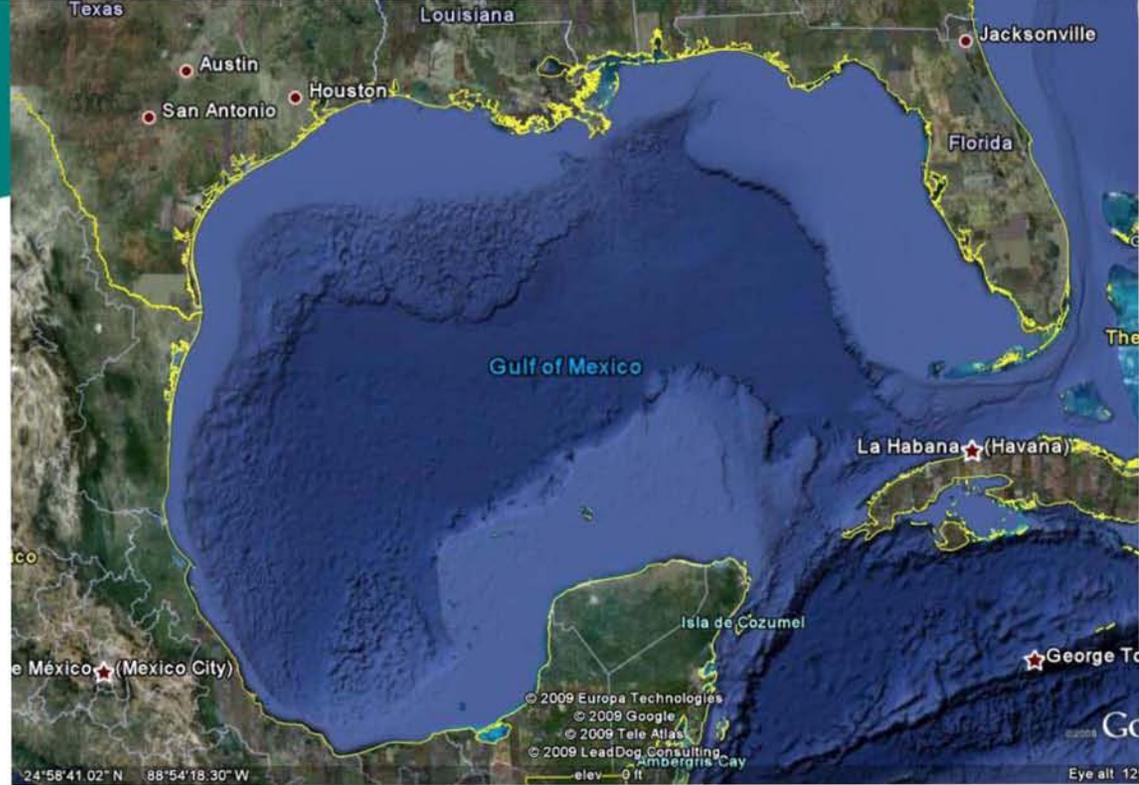
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52° 82" N 43° 06' 59.53" W

elev. 0 ft



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.



Management Options

Time Area Closures

Gear modifications and/or changes in fishing practices to reduce bluefin tuna bycatch mortality.



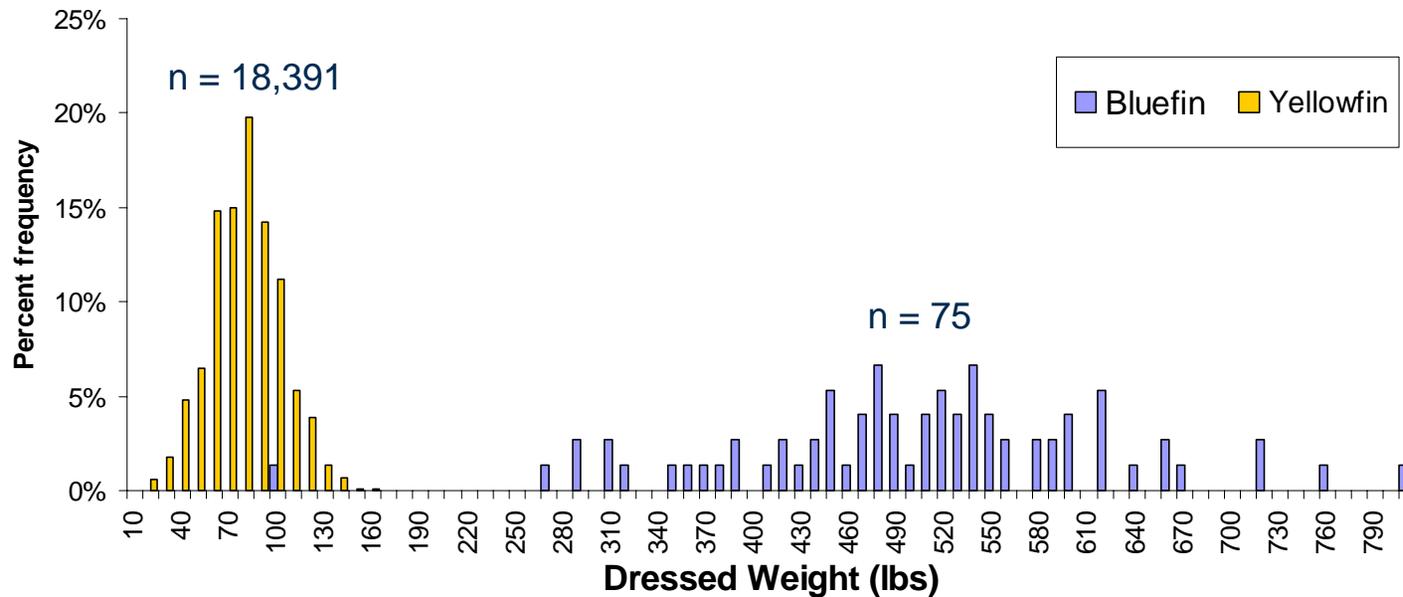
Background Information

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.



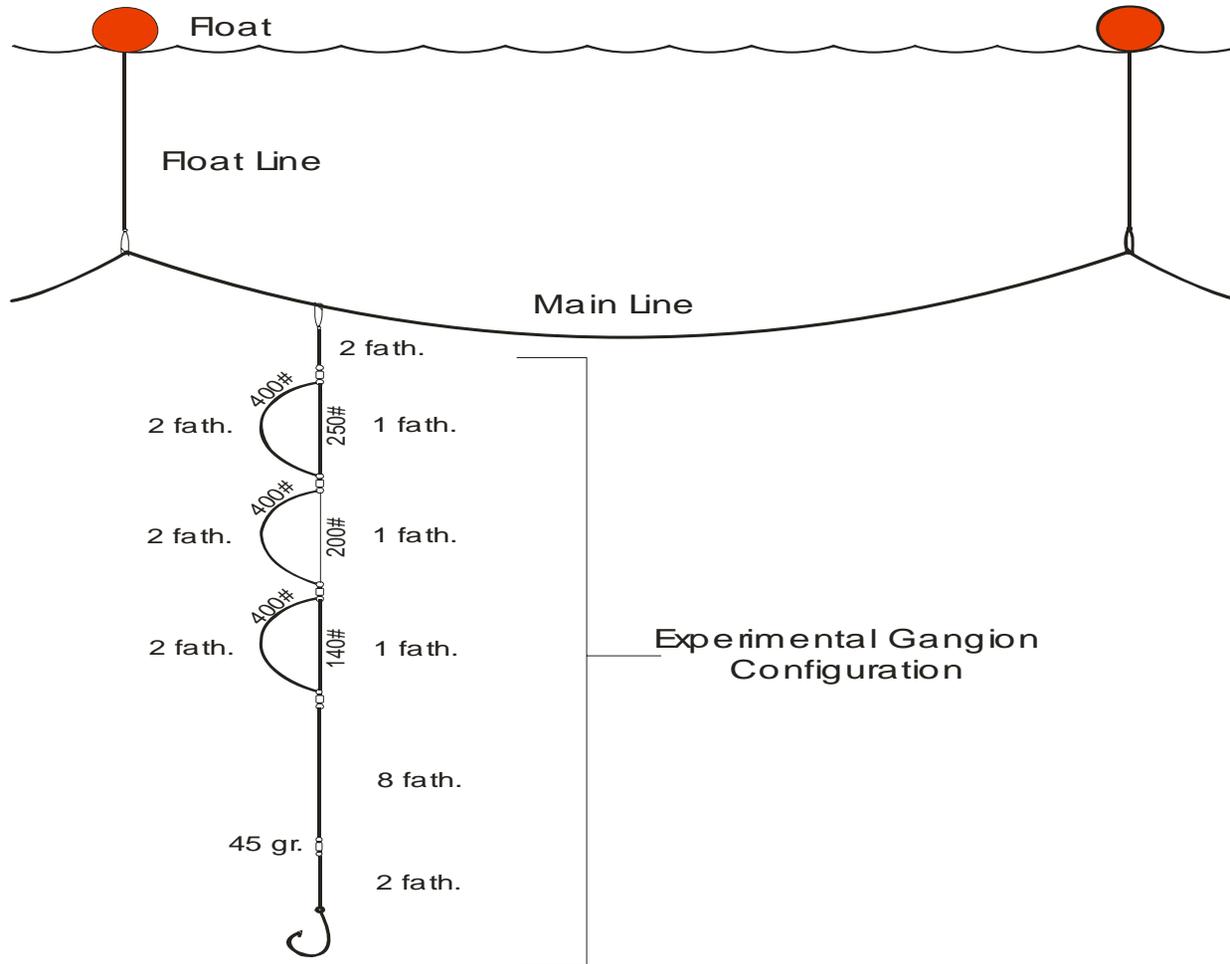


1992-2006 GOM Landed Tuna Weight Distribution from Observer Data





First Phase 2007 Experimental Gangion





2007 Results

Data collected suggest break-away components of the gangion that fail at between 140lbs and 200lbs of tension may be capable of releasing bluefin tuna while maintaining the target catch.

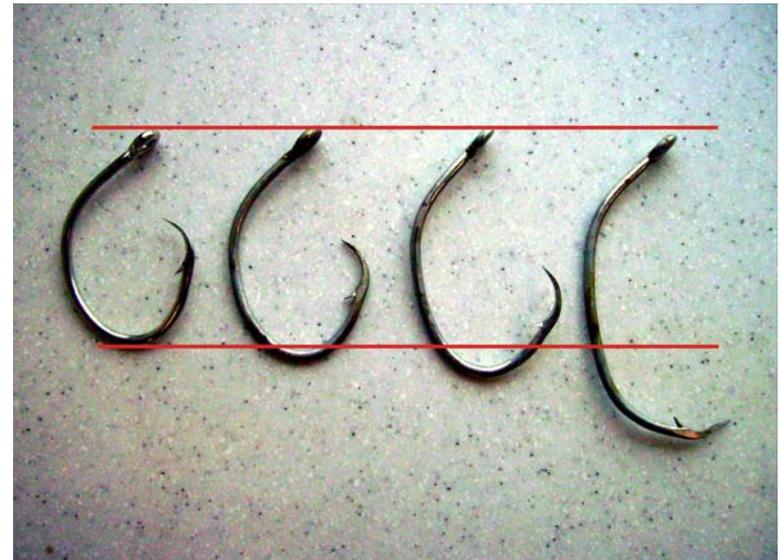
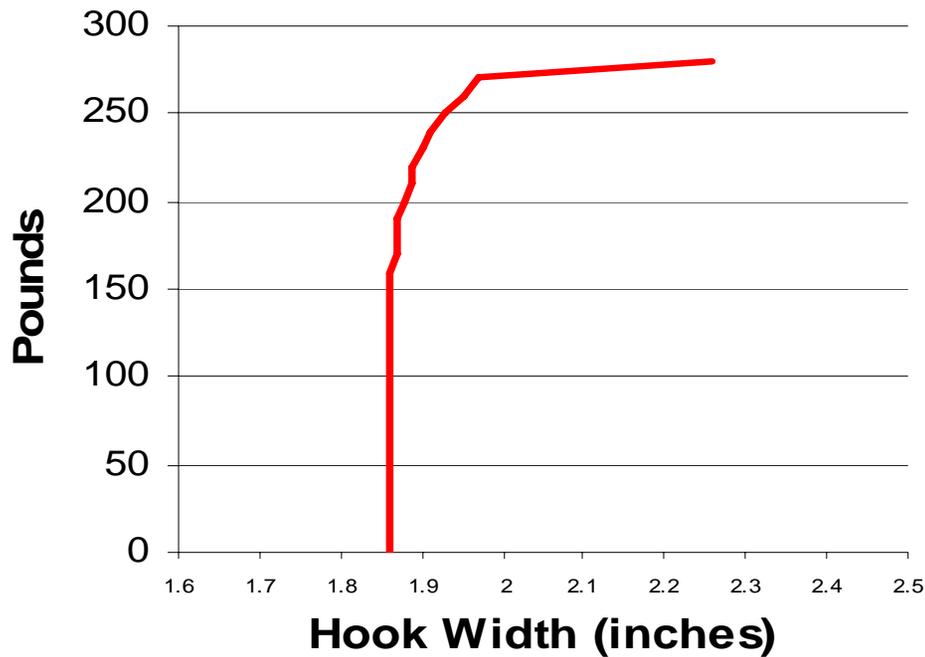




Hook Pull vs Strain

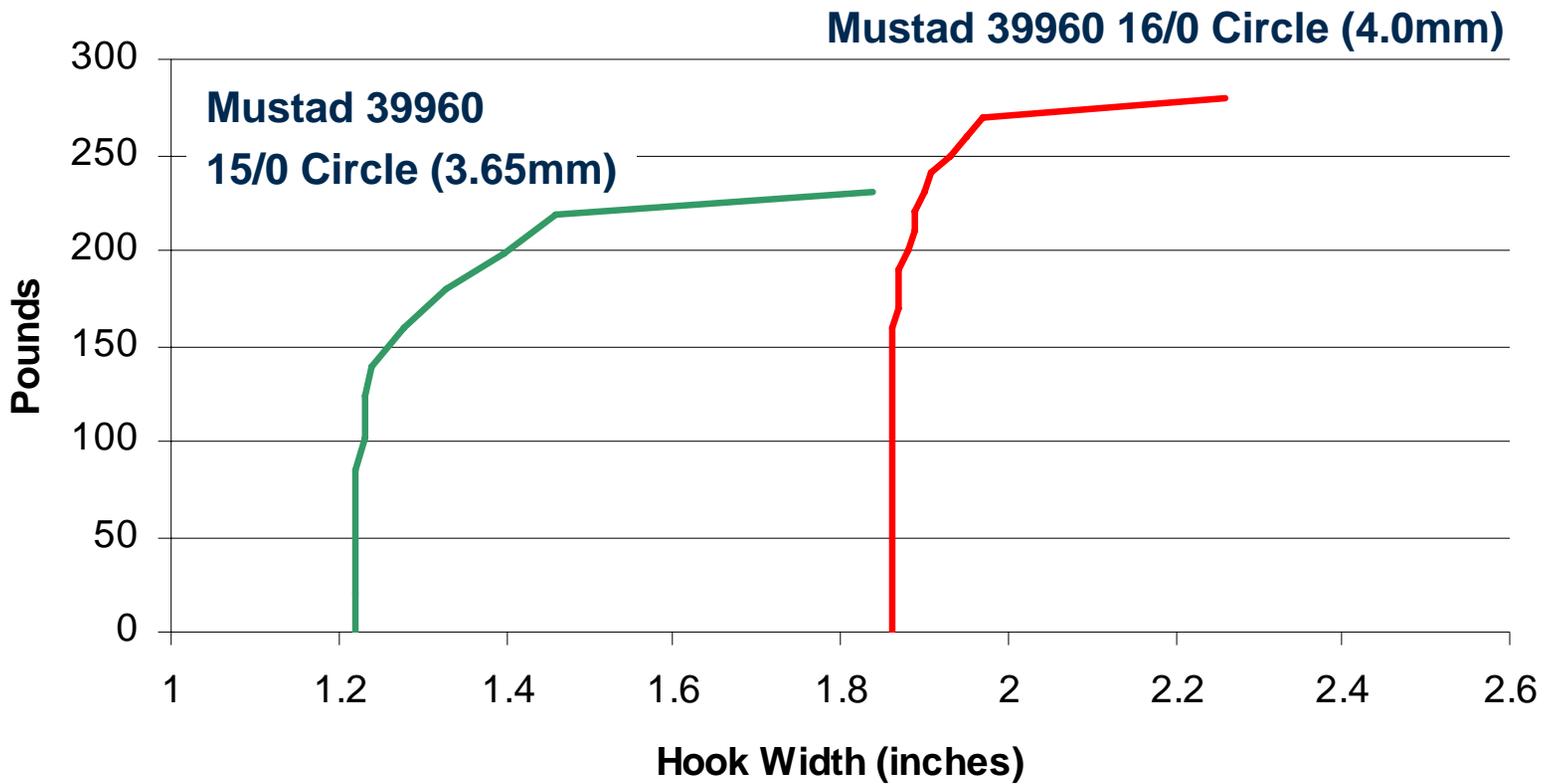


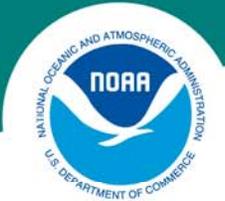
Mustad 39960 16/0 Circle (4.0mm)



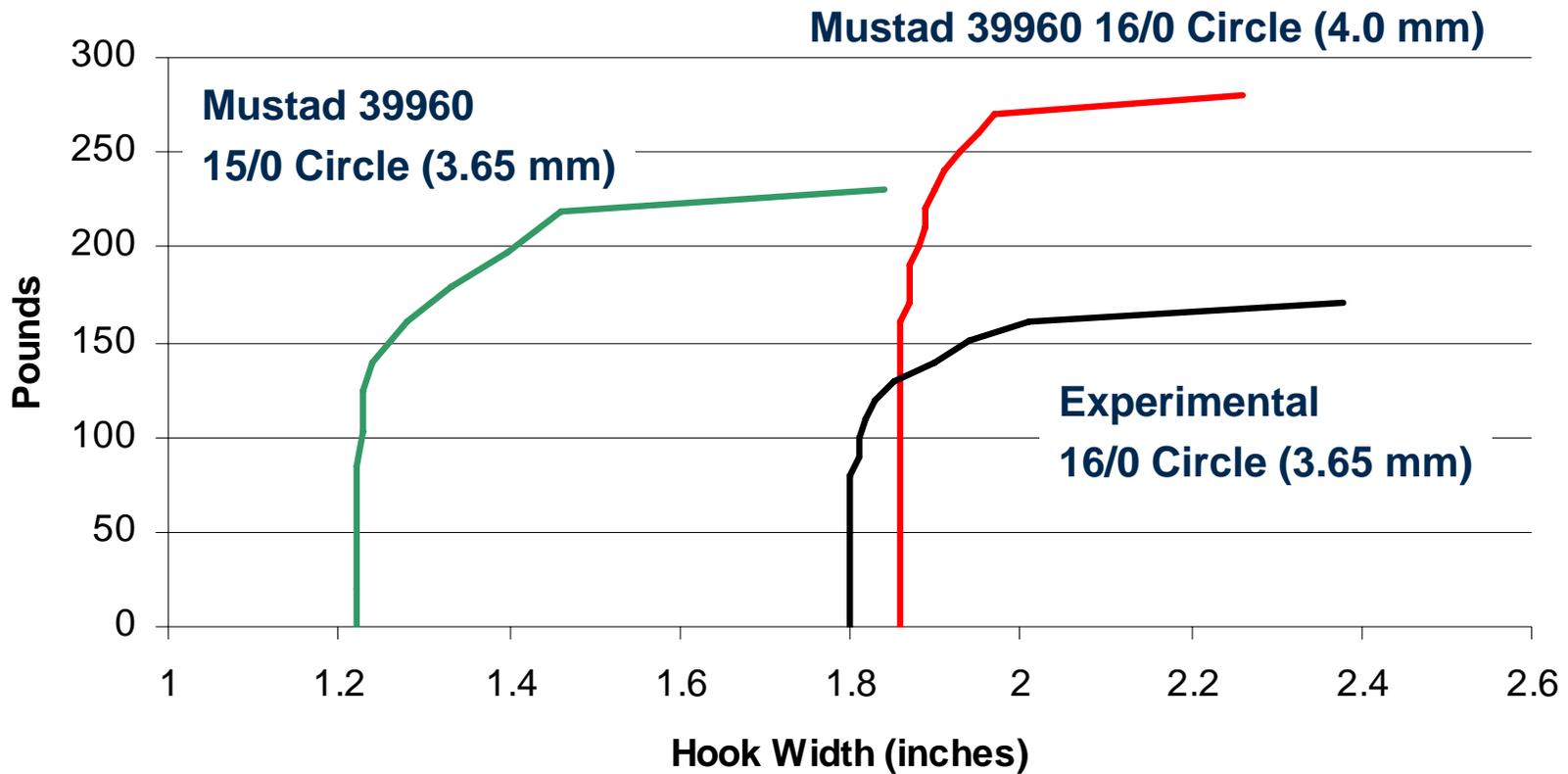


Hook Pull vs Strain



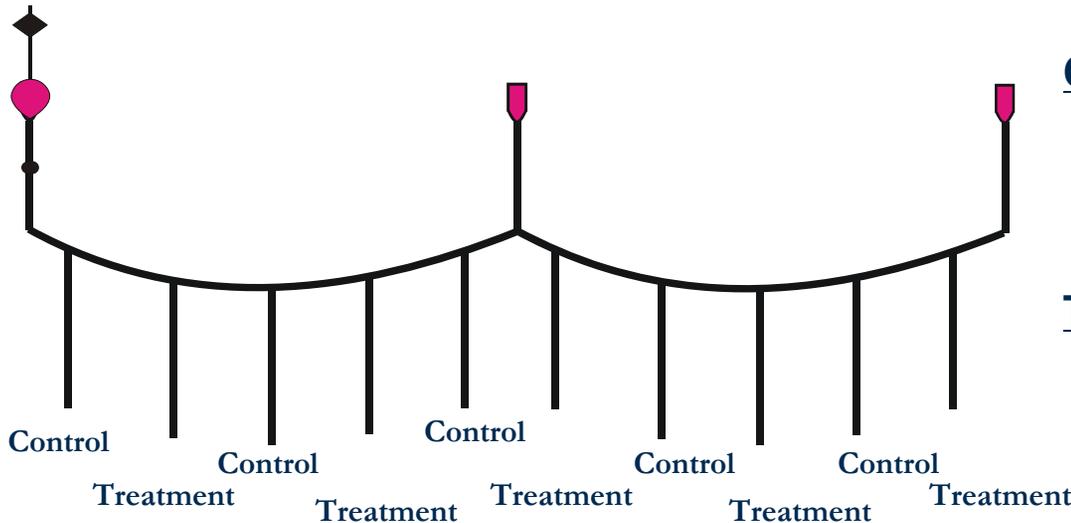


Hook Pull vs Strain





2008-09 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



2008-09 Gulf of Mexico PLL Bluefin Tuna Mitigation Research

2008 Research

- 2 Vessels
- 72 Sets
- 36,766 hooks

2009 Research

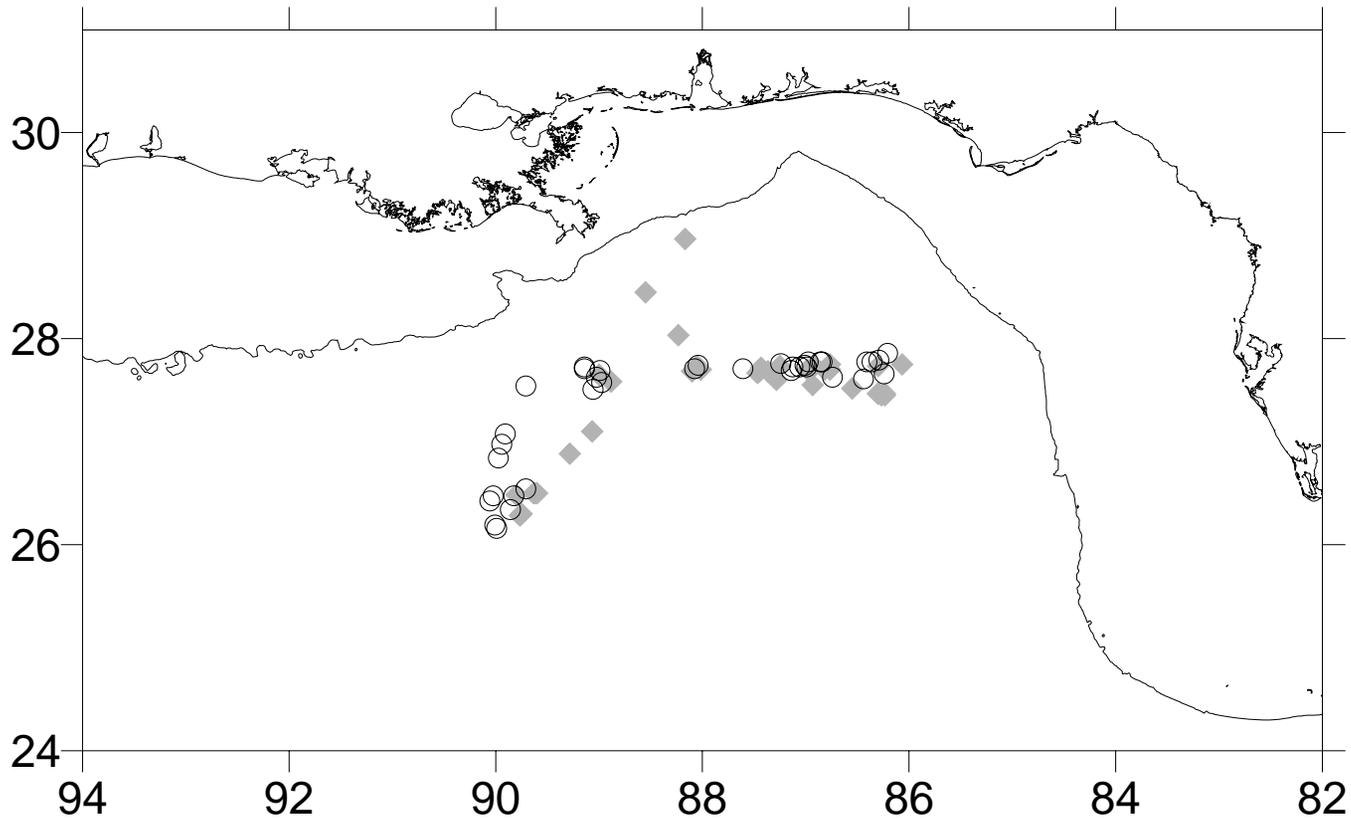
- 5 Vessels
- 125 Sets
- 87,106 hooks

2008-2009 5 vessels

- 123,872 hooks

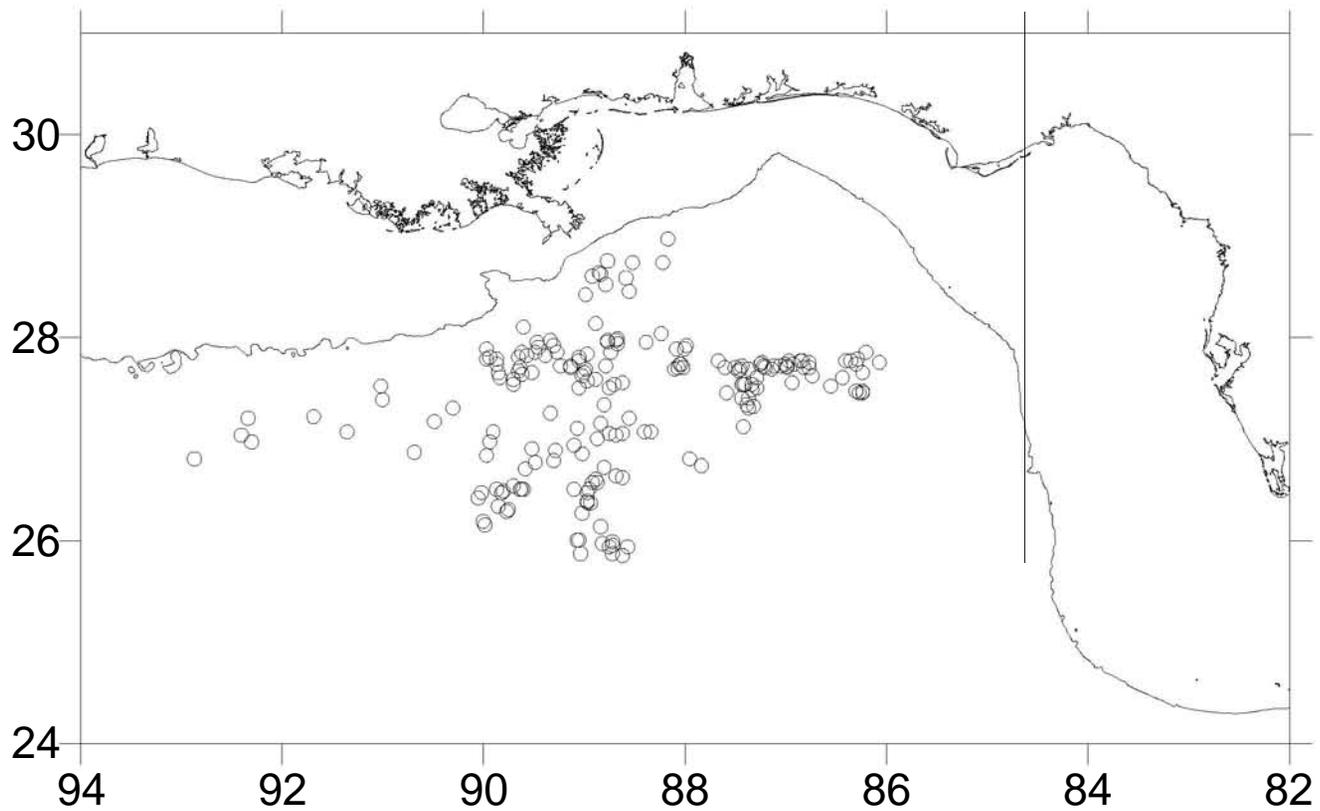


2008 Effort Distribution





2008-2009 Effort Distribution





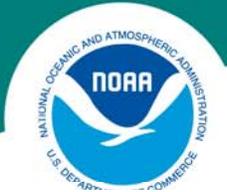
Statistical Analysis

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

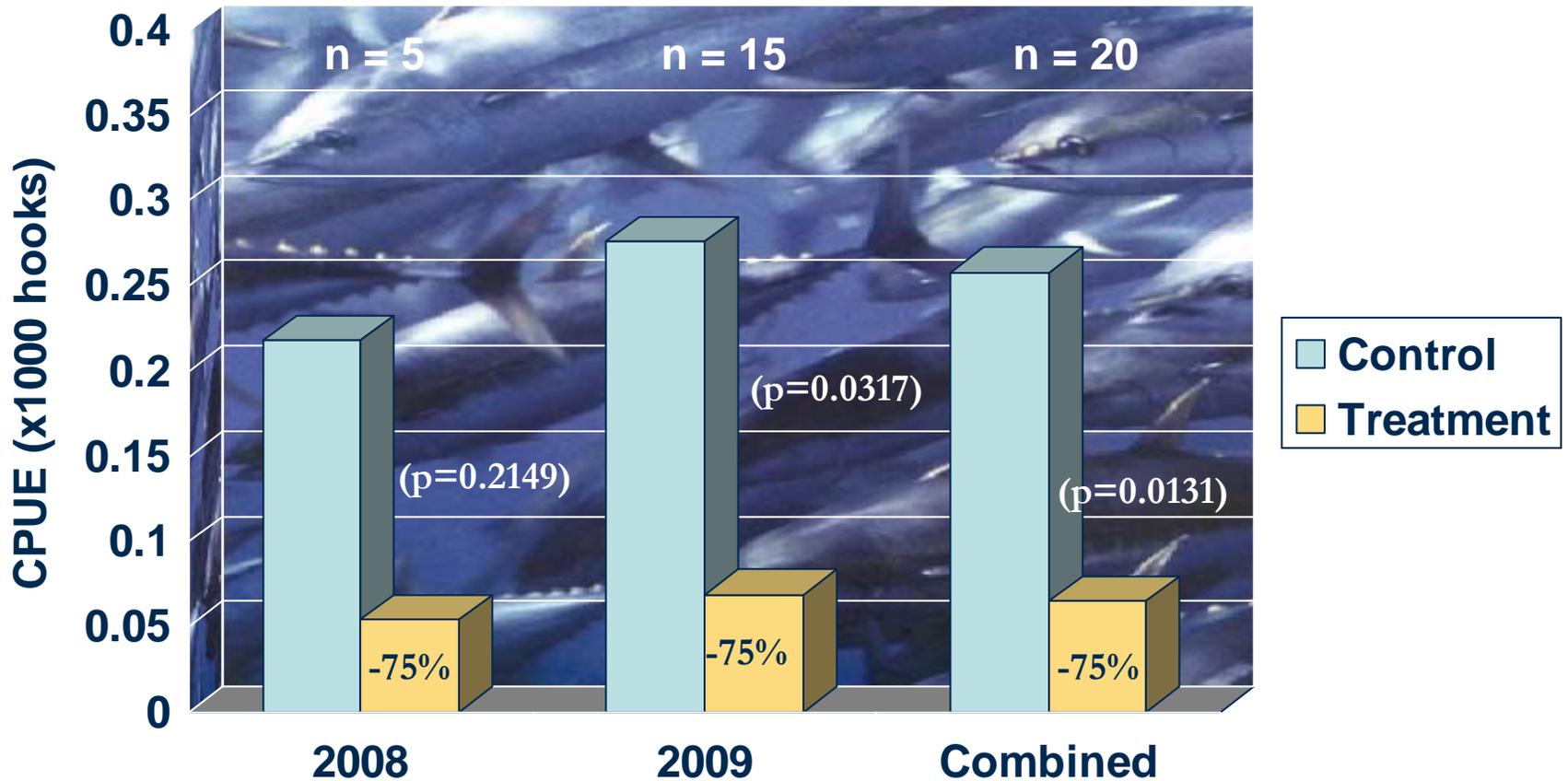
- generalized linear models

Size-frequency distributions:

- Kolmogorov-Smirnov (KS) test.

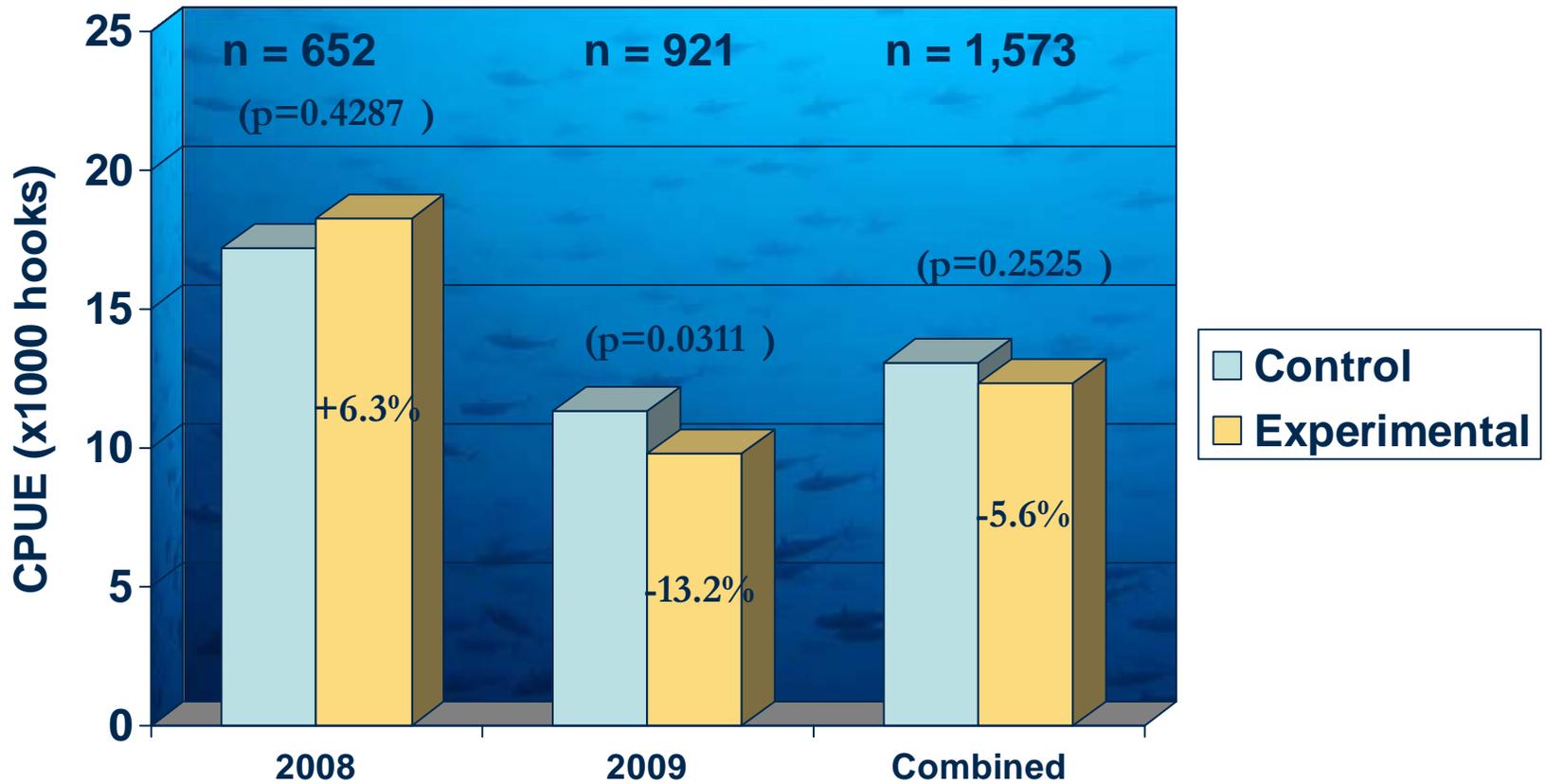


Bluefin CPUE



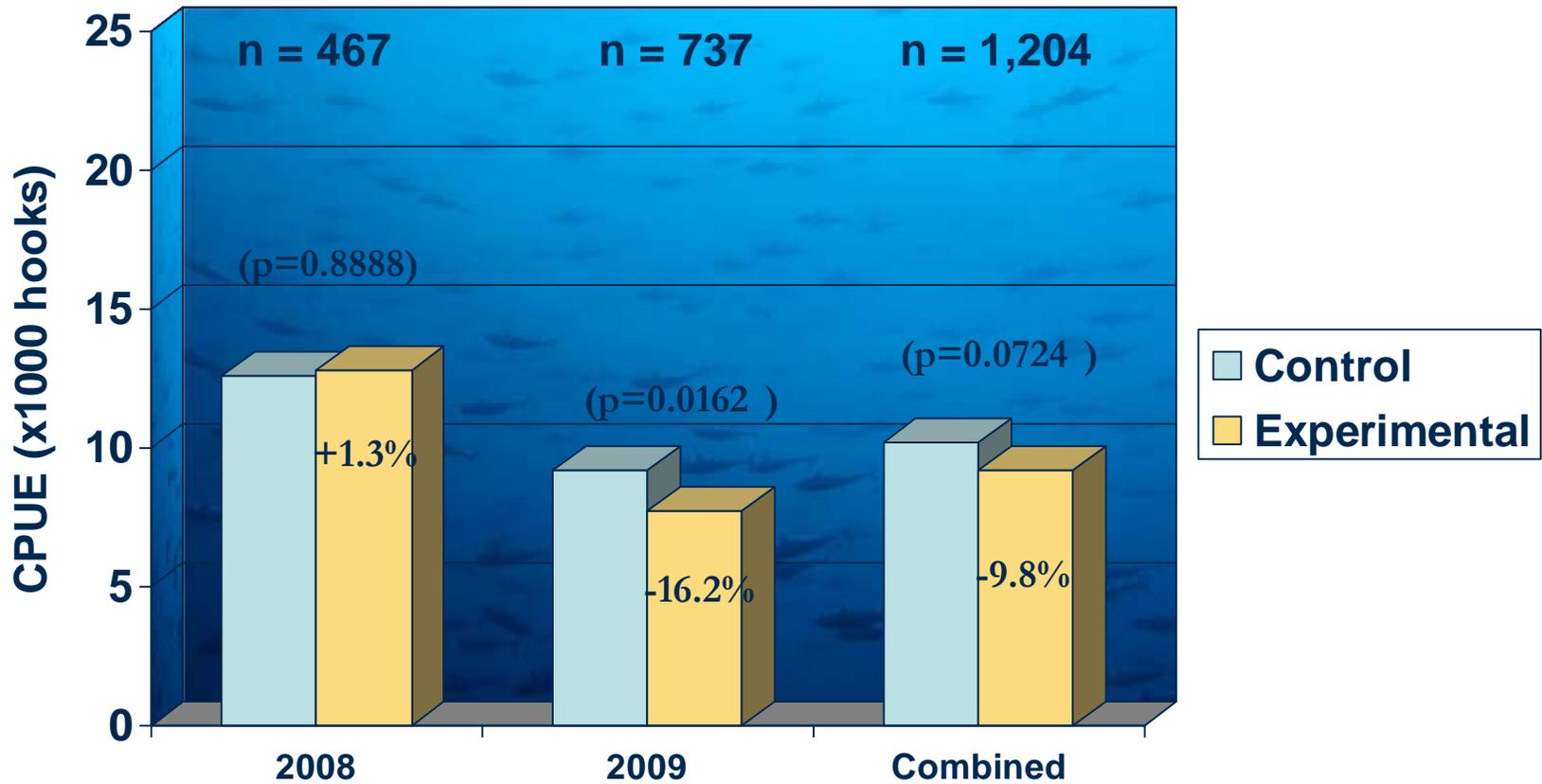


Total Yellowfin CPUE



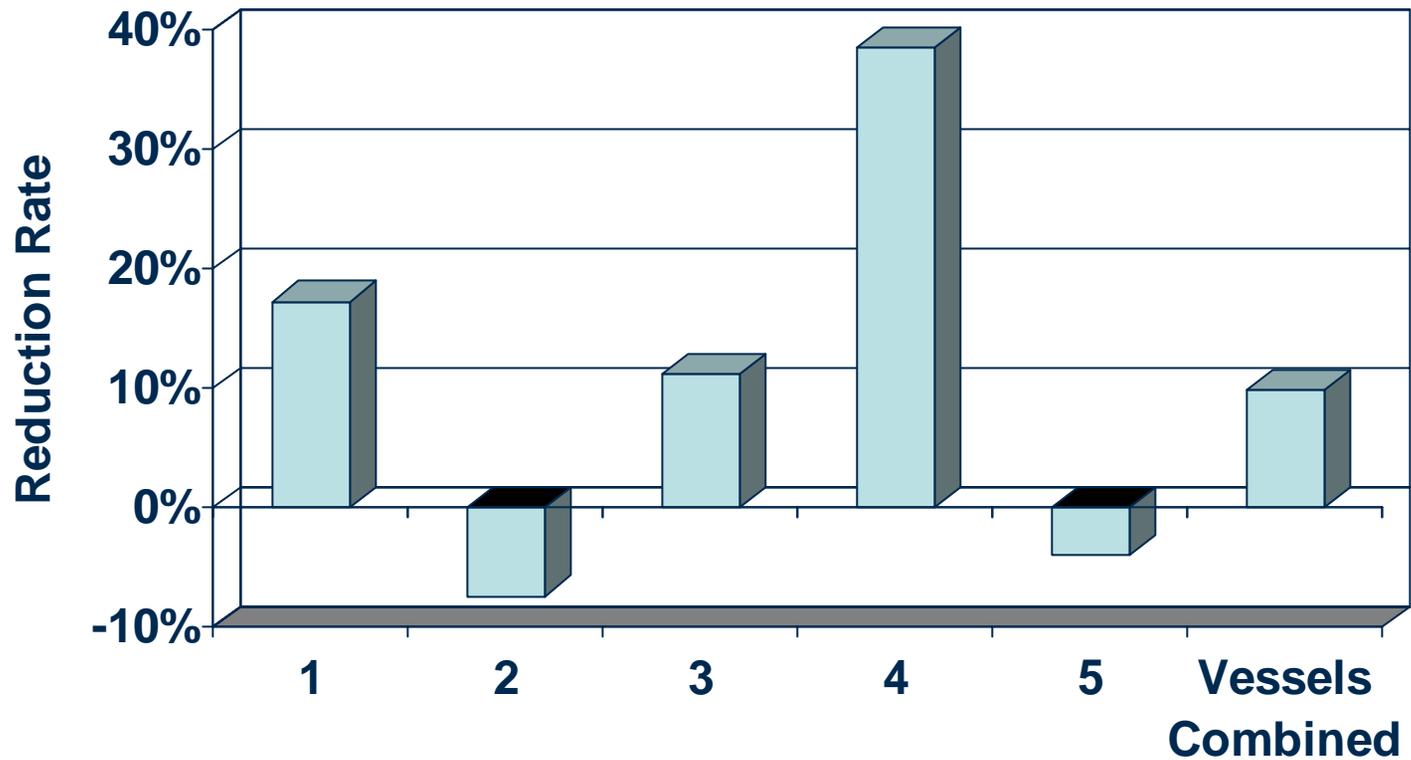


Marketable Yellowfin CPUE



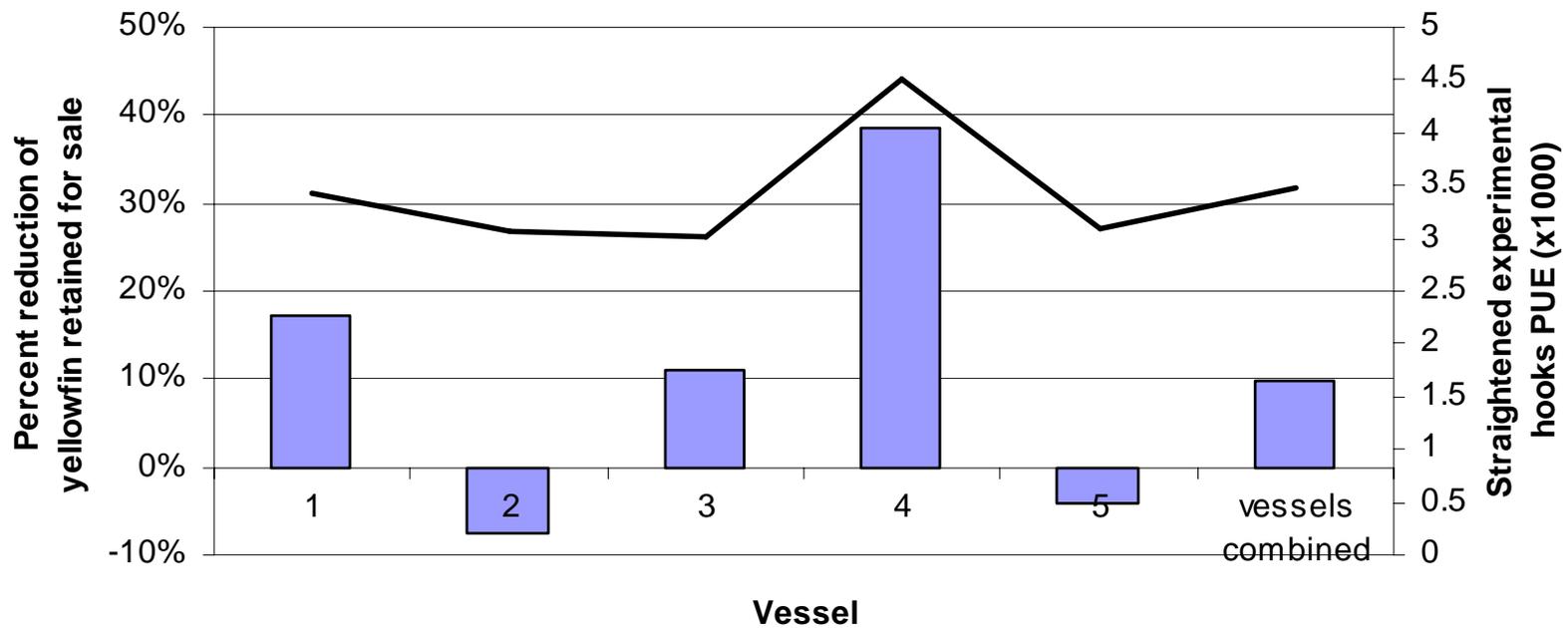


Yellowfin Marketable catch



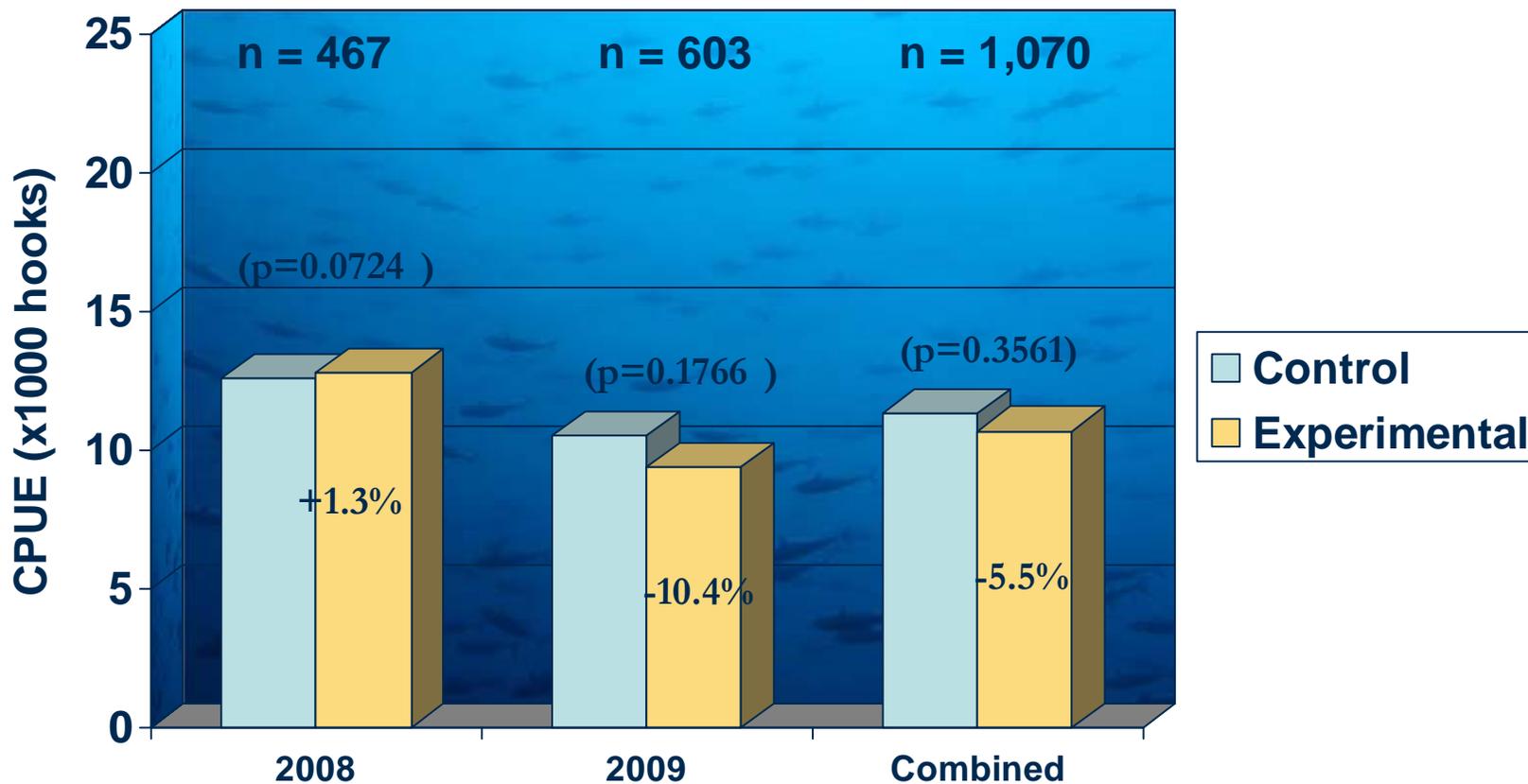


Yellowfin Reduction and Straightened Experimental Hooks





Marketable Yellowfin CPUE Minus Vessel #4 Data



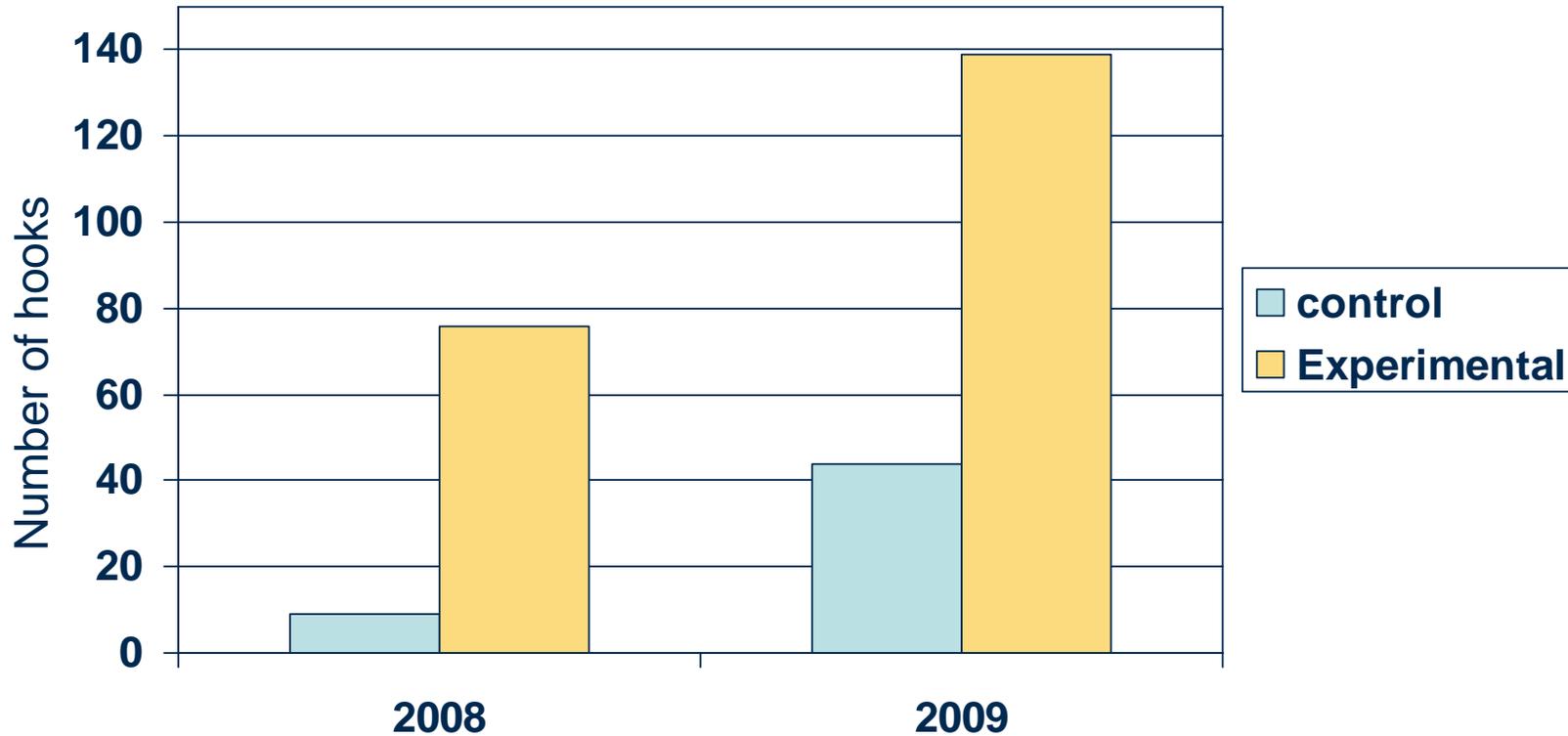


Hook Analysis





Straightened Hooks Species Unknown





Hooks with bluefin catch

Control



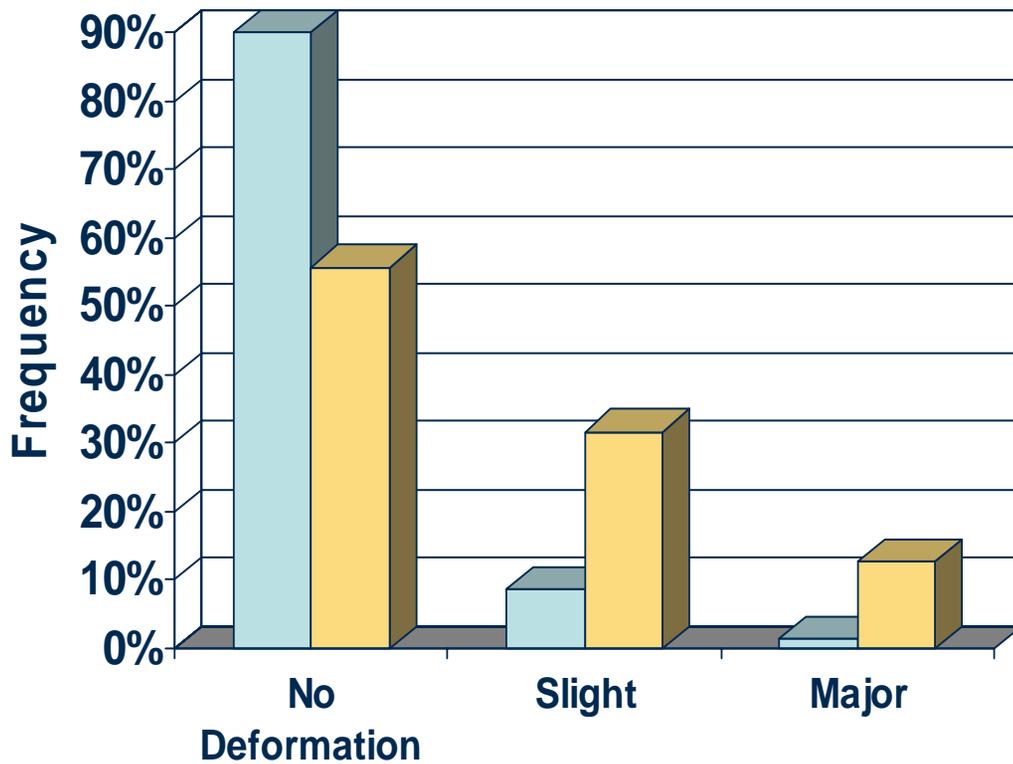
Experimental



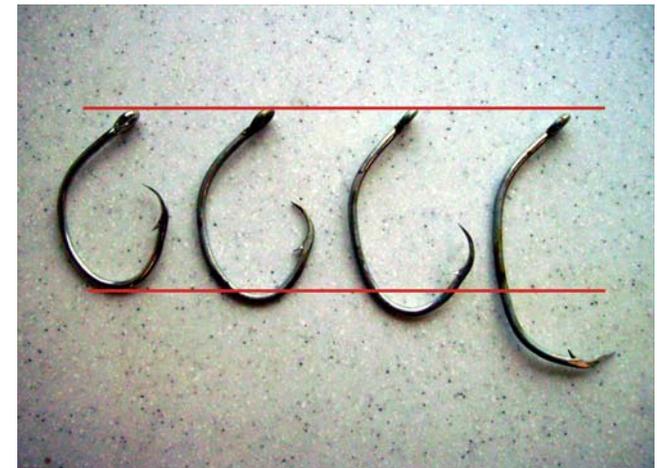


2009 Hook Condition after YFT Capture

n = 392

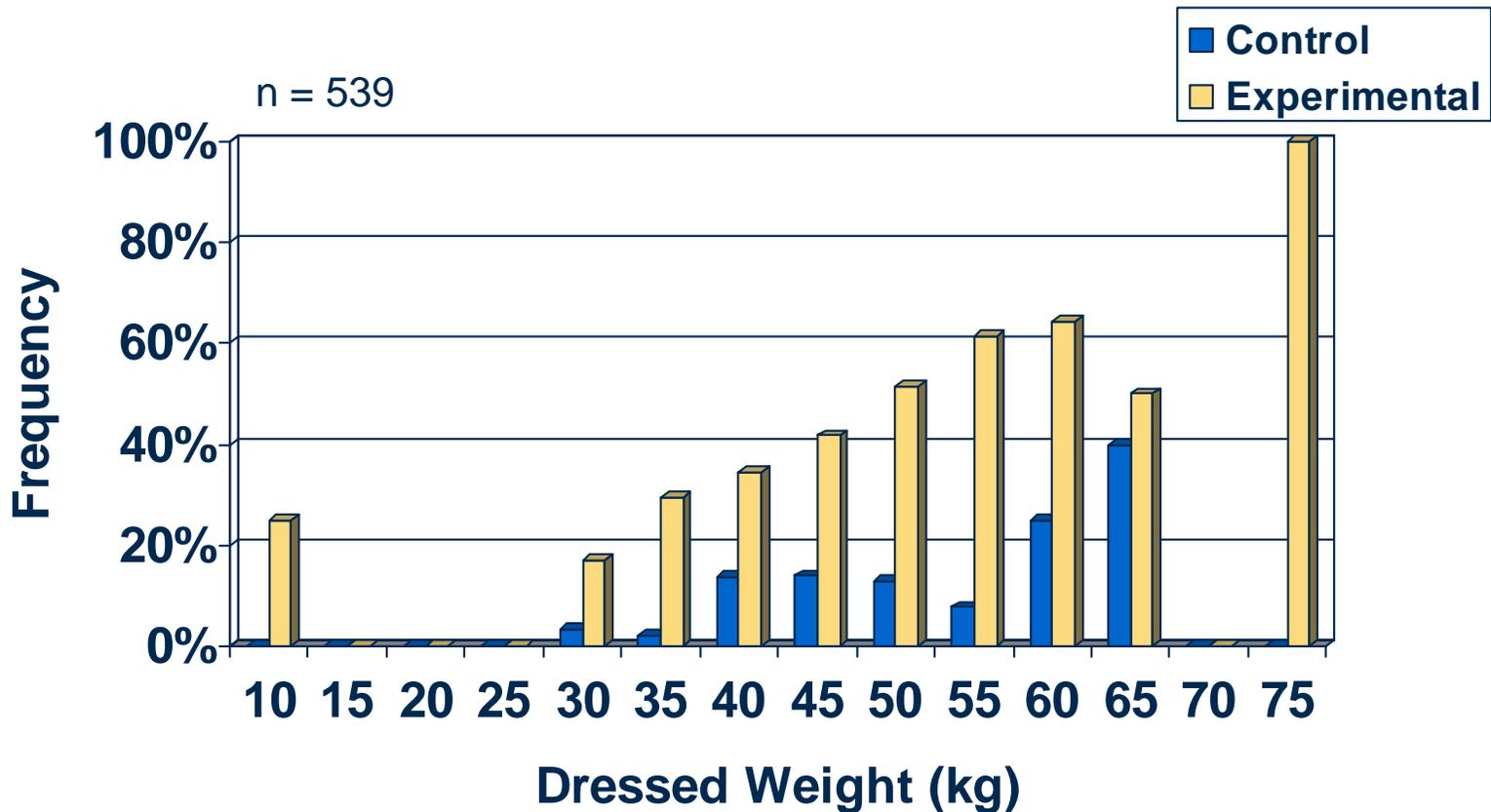


Control
Experimental



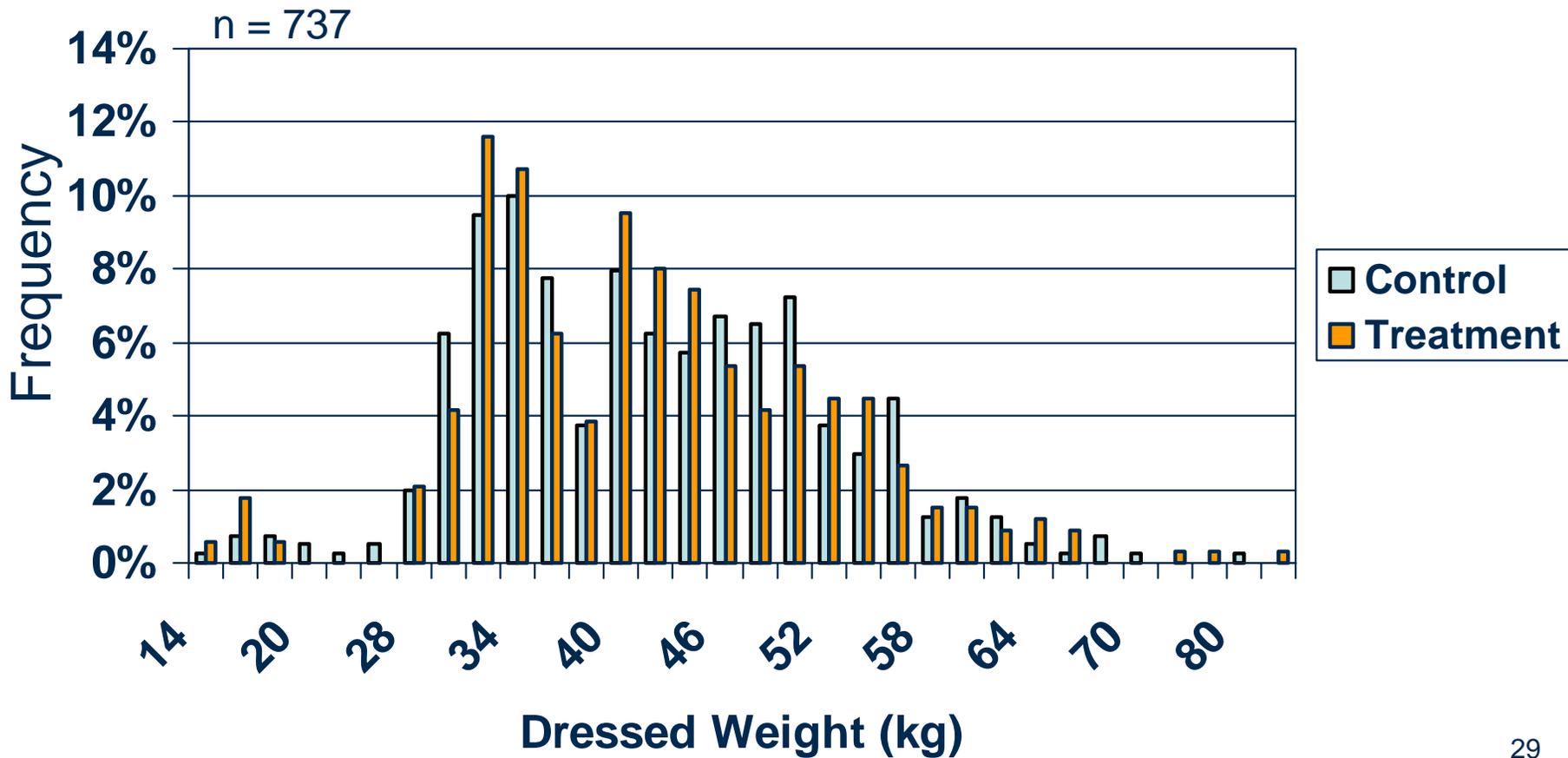


Experimental hook Frequency of bending by YFT



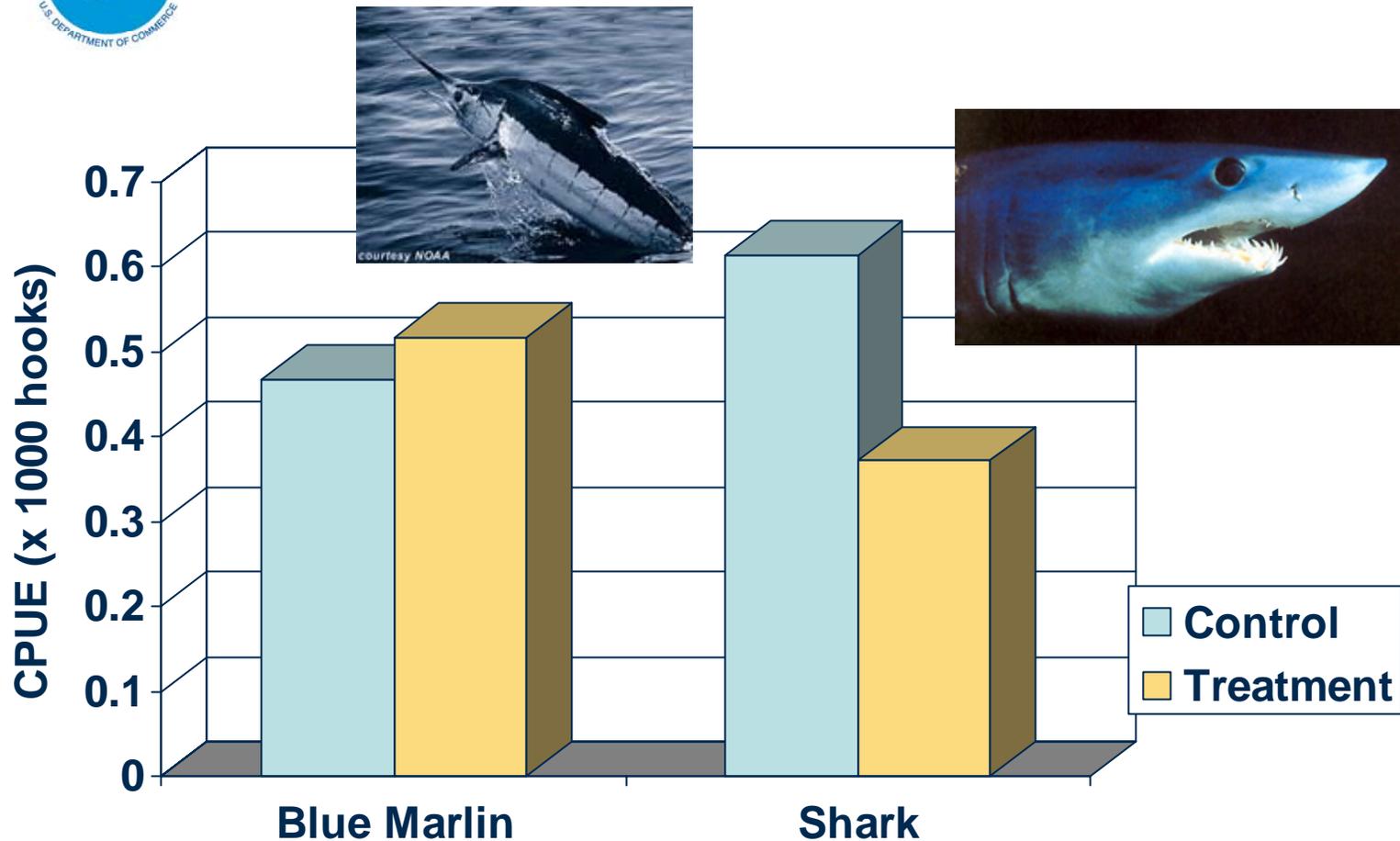


2008-09 Yellowfin Size distribution by Hook Type





Other Potential Mitigation Benefits





Summary

New 16/0 hook design bends with less force

Observed 75% reduction in Bluefin

Observed 5.6% reduction in Yellowfin

Future Testing:

- Additional Bluefin data with current design
- Test the new hook design later in the season for yellowfin tuna catch



Acknowledgements

NOAA Fisheries Pelagic Observer Program
(Larry Beerkircher)

Pelagic longline vessel captains, crew, owners