

Science, Service, Stewardship



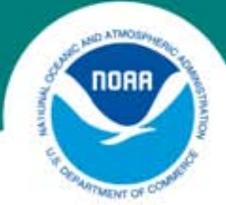
2012 Update Gulf of Mexico Weak Hook Research (Preliminary results)

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Engineering and
Harvesting Branch



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SERVICE**

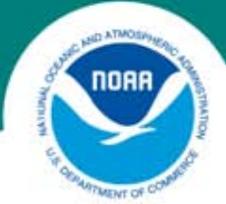


Background

NOAA Fisheries, Harvesting Systems Unit began PLL bluefin tuna mitigation research in 2007

2011 – Weak hook requirement (16/0 circle hook with round wire stock that is no larger than 3.65 mm in diameter)



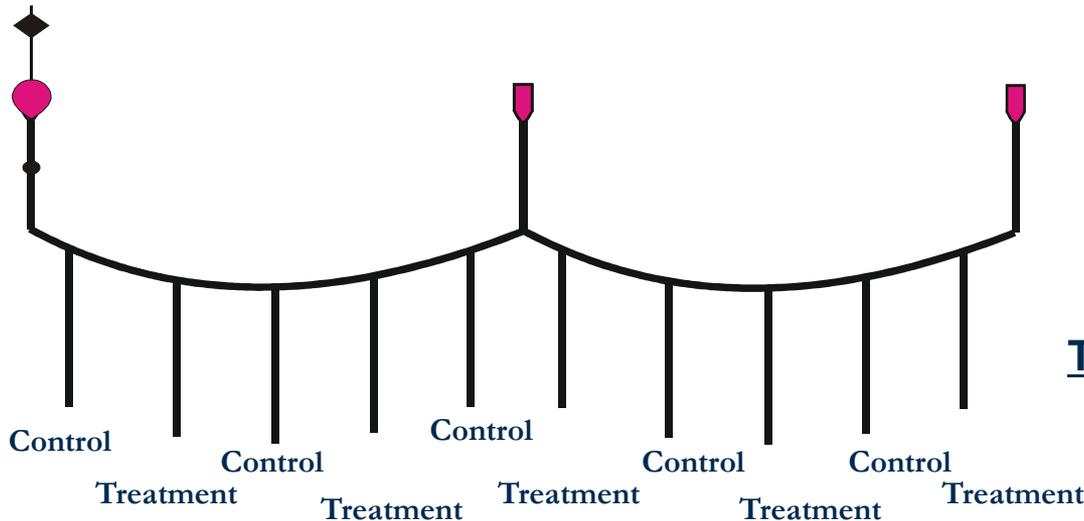


2012 Weak Hook Research Objectives

- Improve the precision of the point estimate and confidence interval of the reduction of bluefin tuna achieved with 16/0 weak hooks
- Use Hook Timers and Time Depth Recorders to better understand the process of fish escapement from weak hooks
- Deploy PSAT tags on yellowfin and bluefin tuna



2008-10 Experimental Design Gear Configuration



Control: Standard 16/0
Mustad 39960

Treatment : 16/0 Weak hook
Mustad 39988

Hook timers (HTRs) 300 hooks
150 on each hook type

Temperature Depth Recorders (TDRs)
150 weak hooks, 9 m above hooks



Hook timers and Time Depth Recorders

Hook Timer
Lindgrin Pitman
HT 600
600 m



Temperature Depth Recorder
Lotek Wireless
Model LAT1400
1000 m
Data point every 1-2 minutes





Research Effort

2012 Research

- 2 Vessels
- 111 Sets
- 51,067 Hooks

2008 – 2012 Research

- 8 Vessels
- 418 Sets
- 245,881 Hooks





2008 – 2012 Results

	n	CPUE (x1000)		311 sets	
		Control	Exp.	% Reduction	<i>P-value</i>
Bluefin Tuna	134	0.71	0.38	46.0	0.0007
Yellowfin Total Count	3312	13.68	13.26	3.1	0.3723
Yellowfin Kept	2547	10.68	10.04	6.0	0.1203
Swordfish Total Count	290	1.139	1.22	-7.1	0.597
Swordfish kept	69	0.325	0.24	27.5	0.2283
Dolphin Fish	918	3.93	3.54	9.9	0.1201
Wahoo	375	1.72	1.33	22.3	0.0173

* Negative value denotes increase

Fisher's Exact Test

2008 – 2012 Bycatch Results



	n	CPUE (x1000)		311 Sets	
		Control	Exp.	% Reduction	<i>P-value</i>
Blue Marlin	157	0.64	0.63	1.3	1
White Marlin/ Roundscale Spearfish	172	0.57	0.83	-45.7*	0.0178
Sailfish	62	0.28	0.22	22.9	0.3741
Large Coastal Sharks	108	0.48	0.40	16.9	0.3865
Pelagic Sharks	33	0.14	0.13	5.9	1

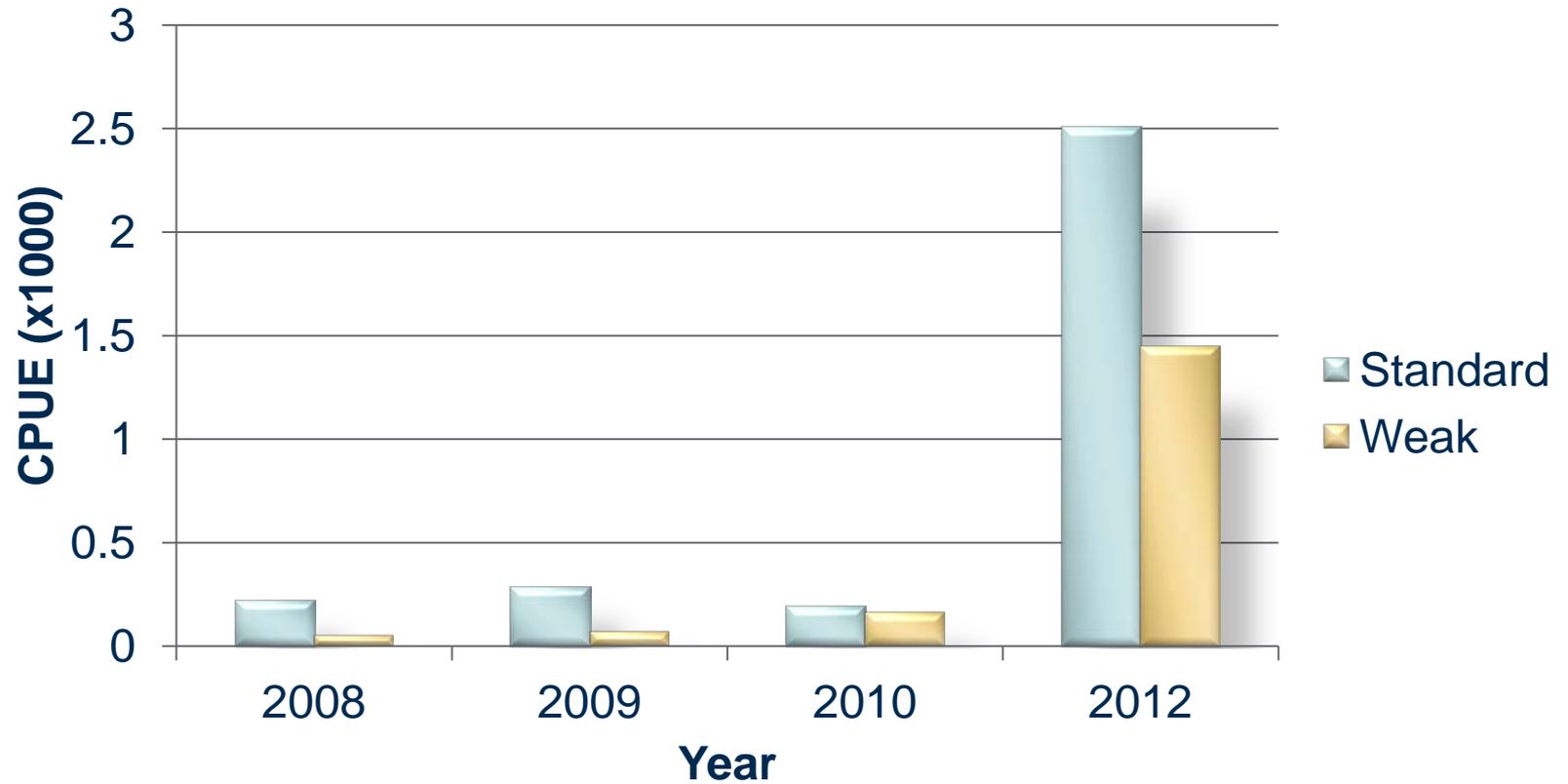
* Negative value denotes increase

Fisher's Exact Test



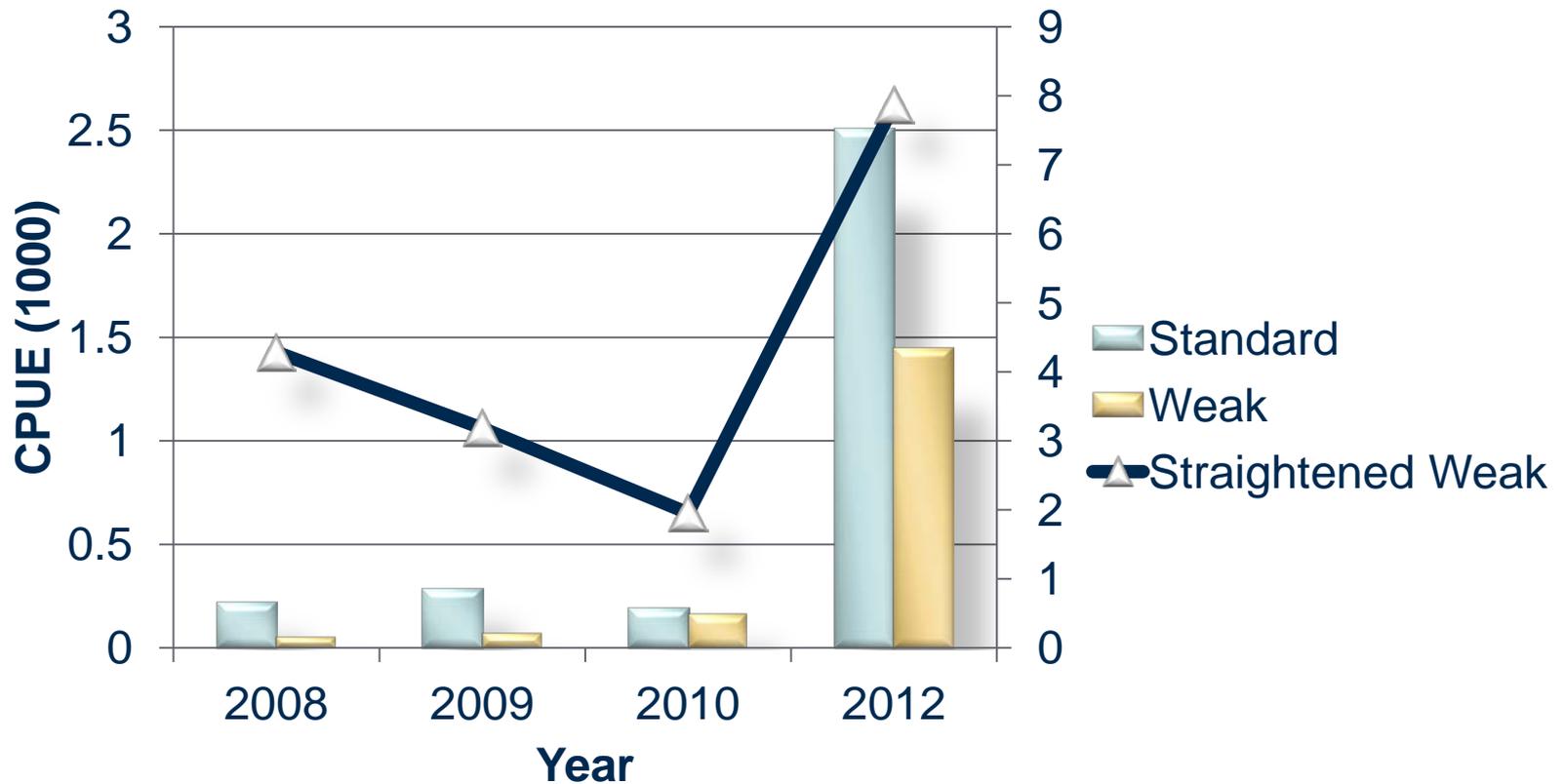


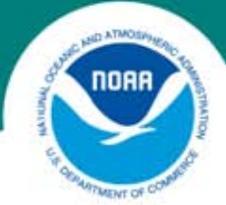
Bluefin CPUE





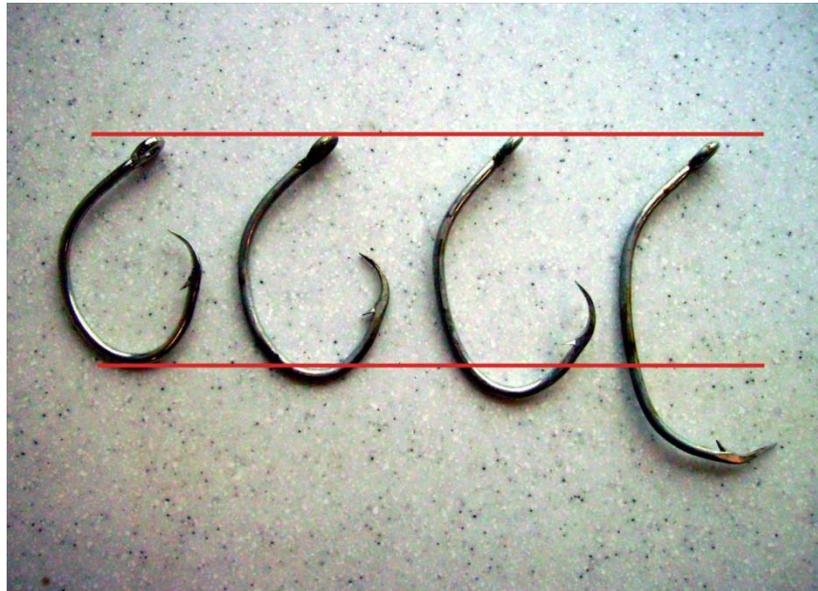
Bluefin CPUE and Straightened Weak Hook (escapes)





Straightened Hooks with TDRs

81 straightened hooks (escapes) with TDRs
72 with HTRs times (bite times)



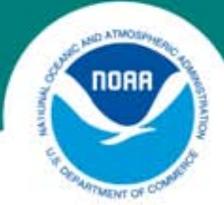


HTRs and TDRs to Evaluate Straightened Hooks

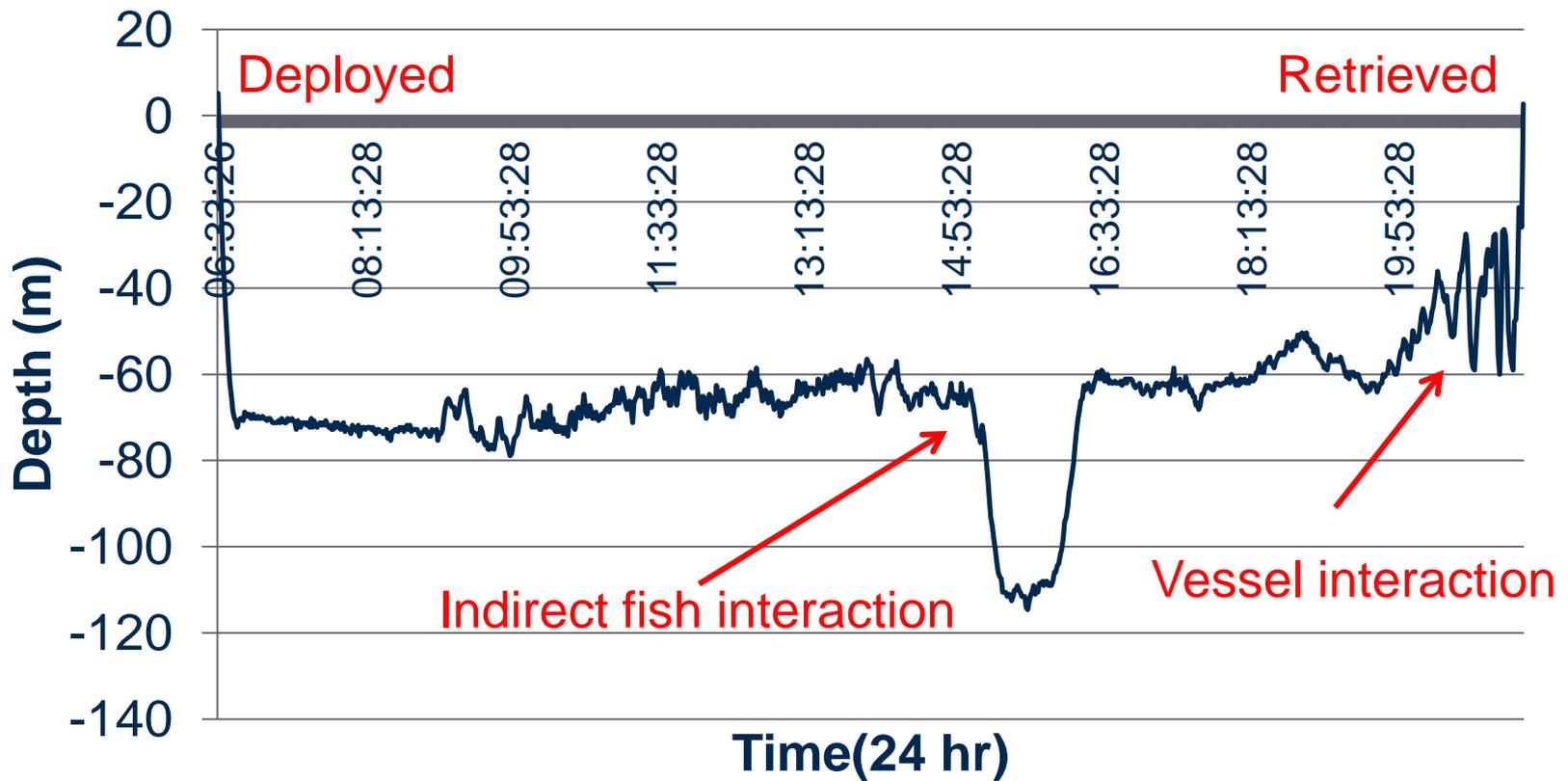
First Step

Develop an evaluation criteria using observations of known interactions to:

- Characterize fish activity
- Characterize mortality events

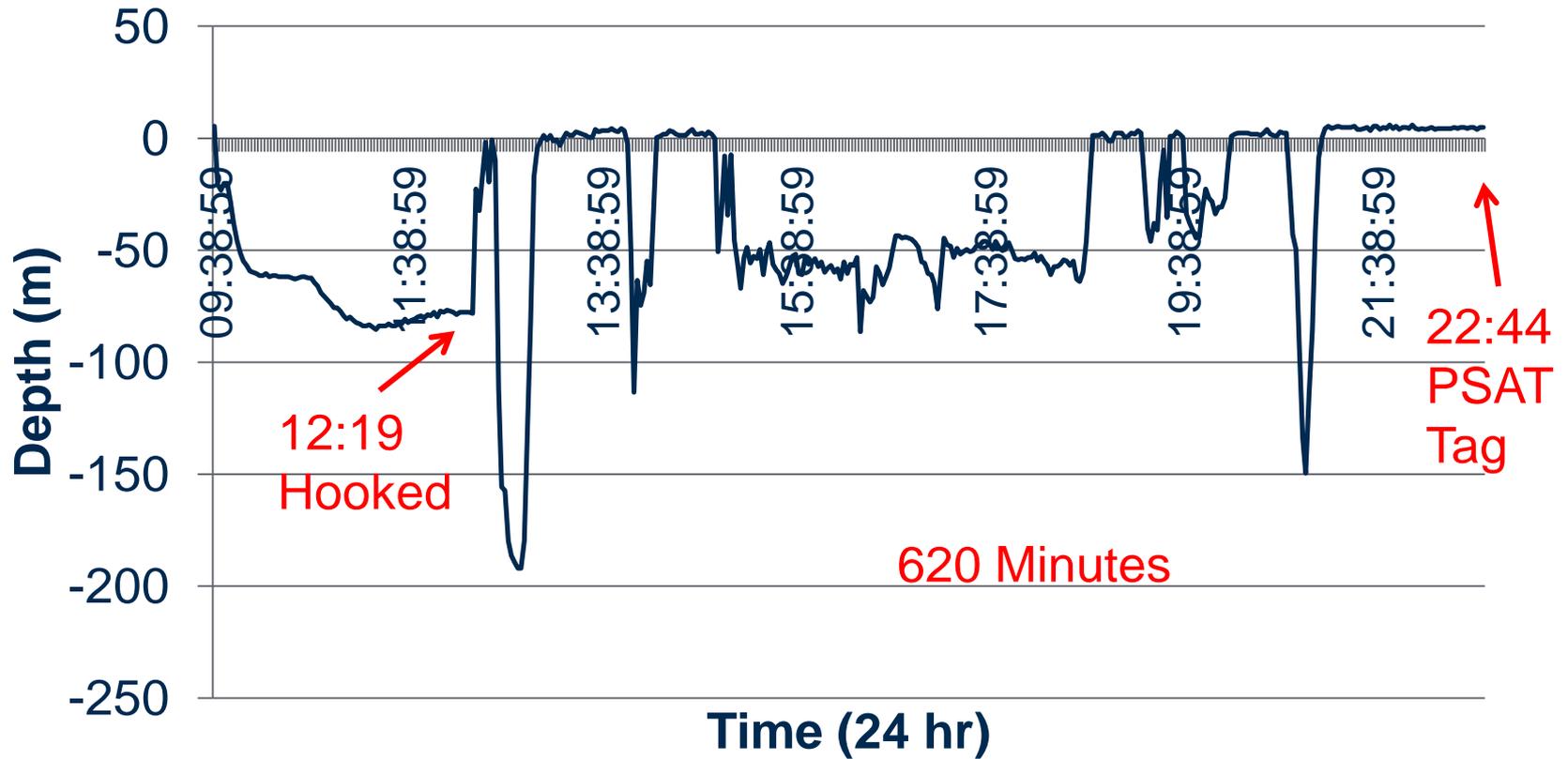


TDR profile (no direct fish interaction)



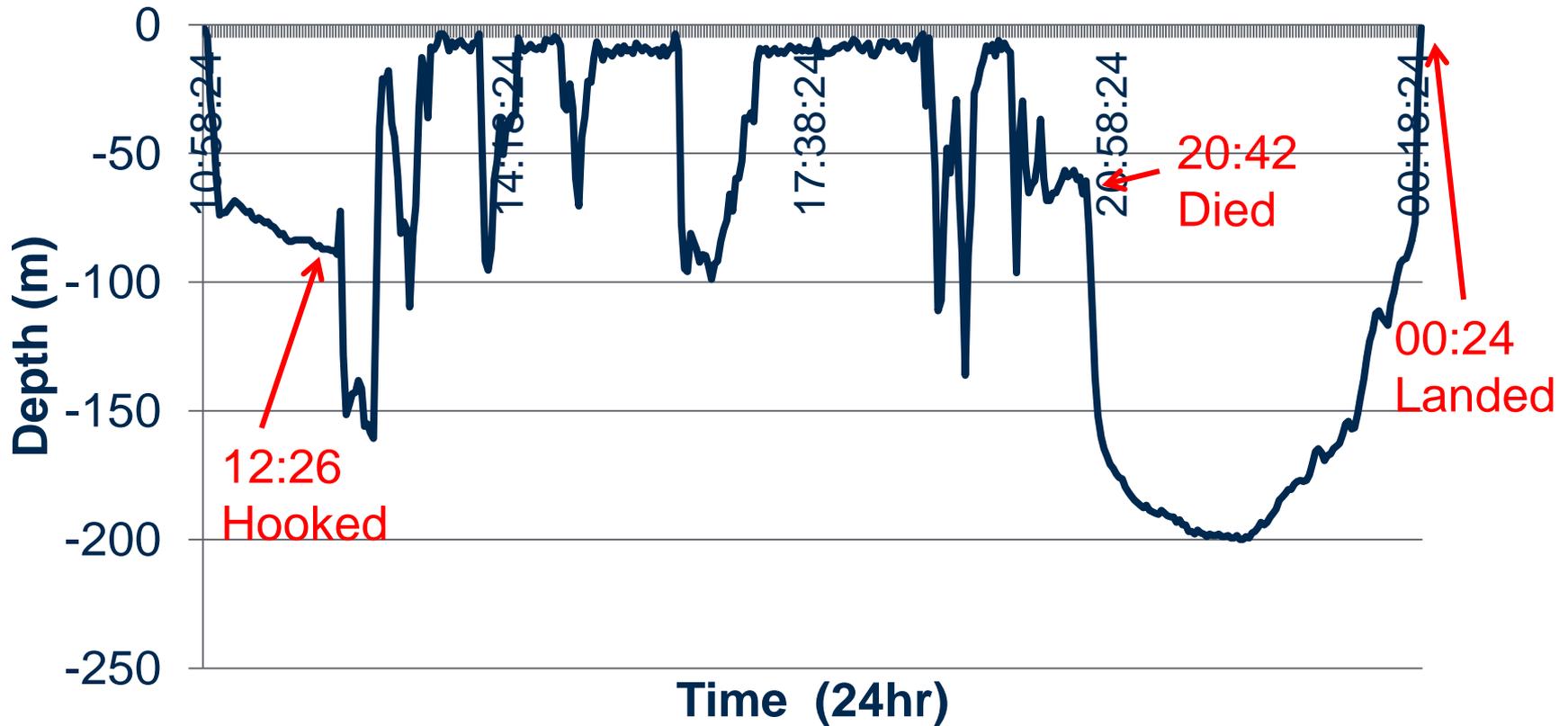


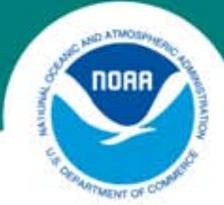
Bluefin tuna (live)



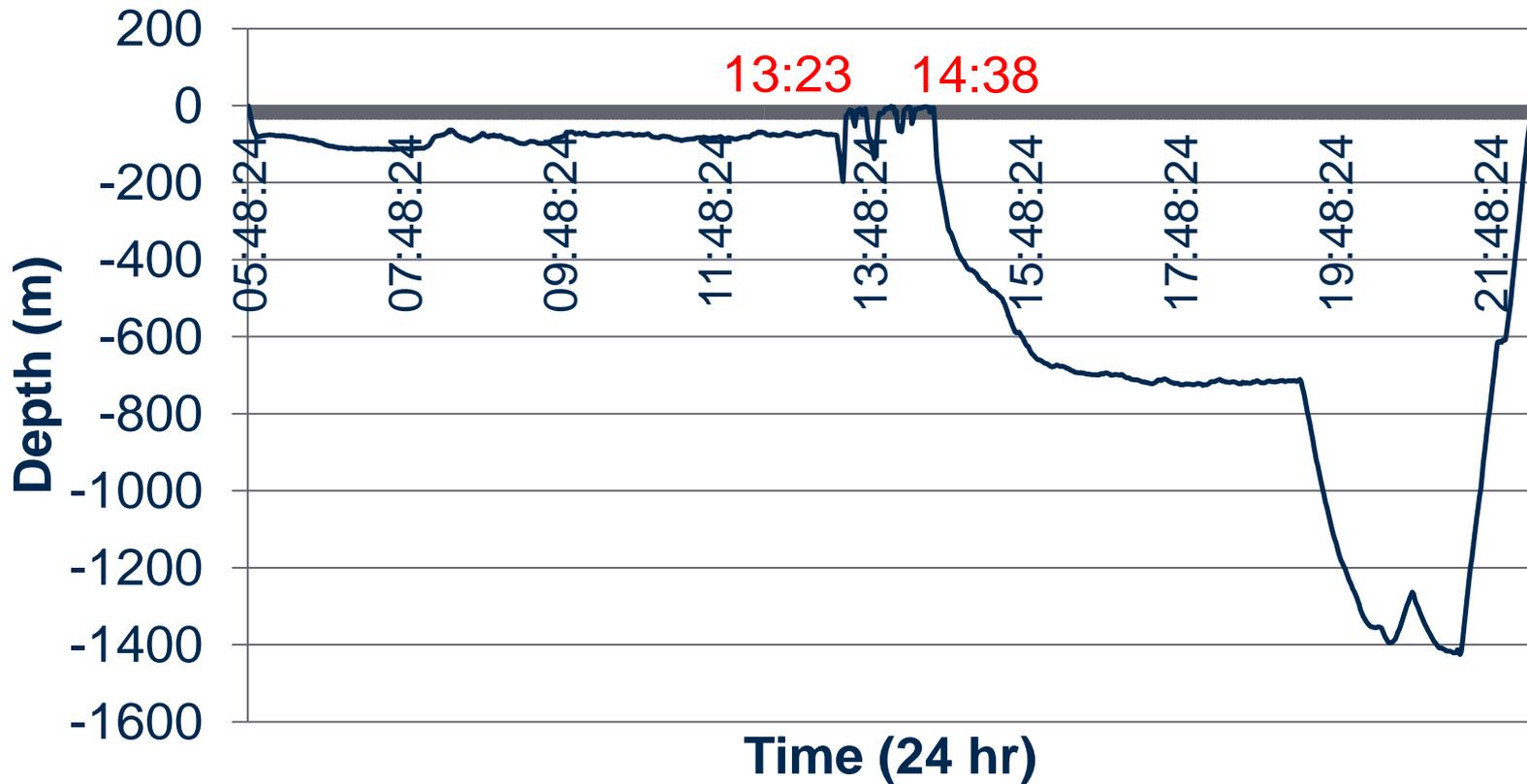


Yellowfin Tuna (mortality)





Bluefin Tuna (mortality)





Criteria for evaluating depth profile of straightened hooks

When possible, use HTRs to confirm bite time

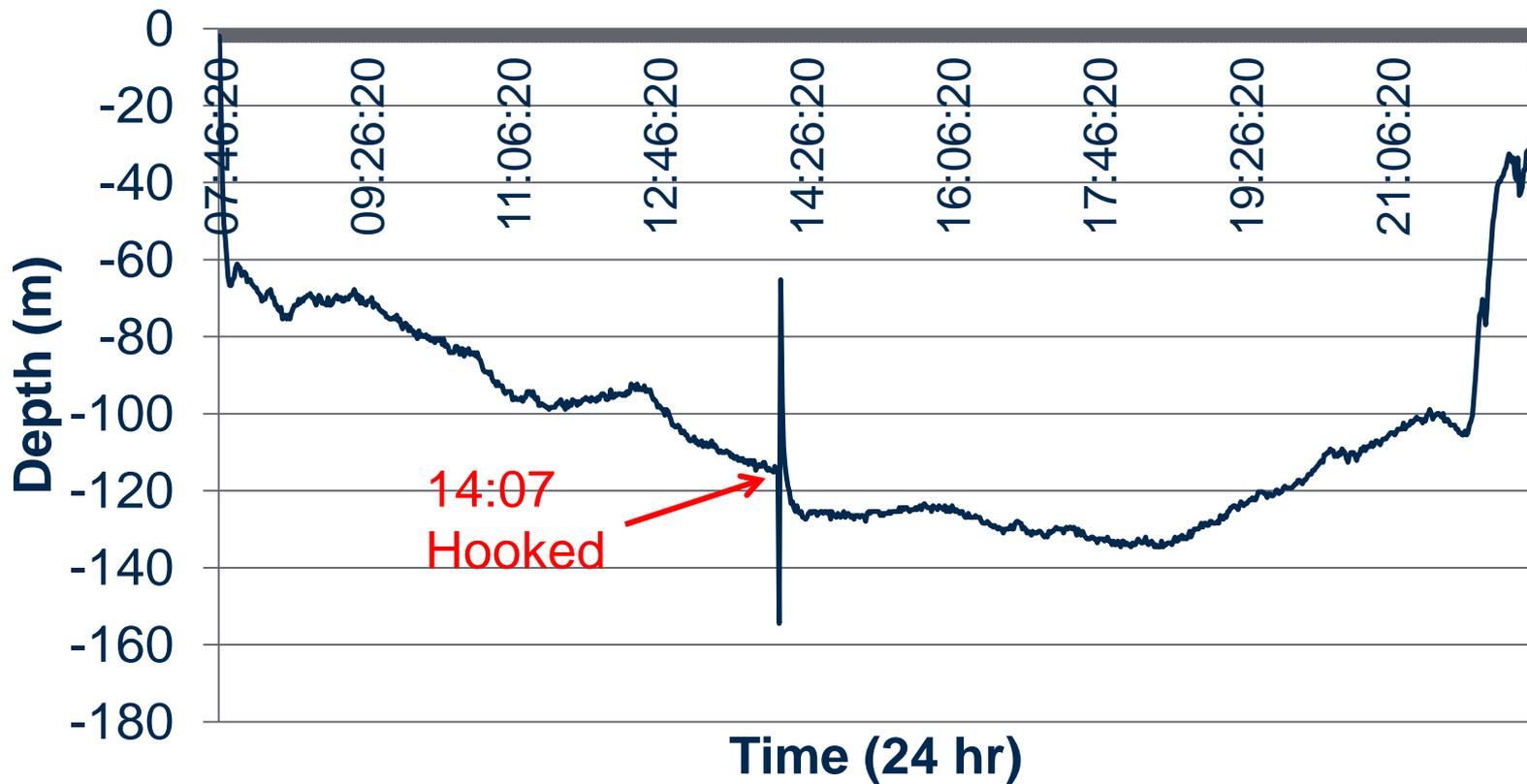
When interaction apparently ceases, compare the depth profile from hour before the bite with one hour after the interaction ceases

When interaction continues throughout the set, haul time is used as the end of interaction

When needed, TDRs on nearby hooks were used to clarify the interpretation of the interaction

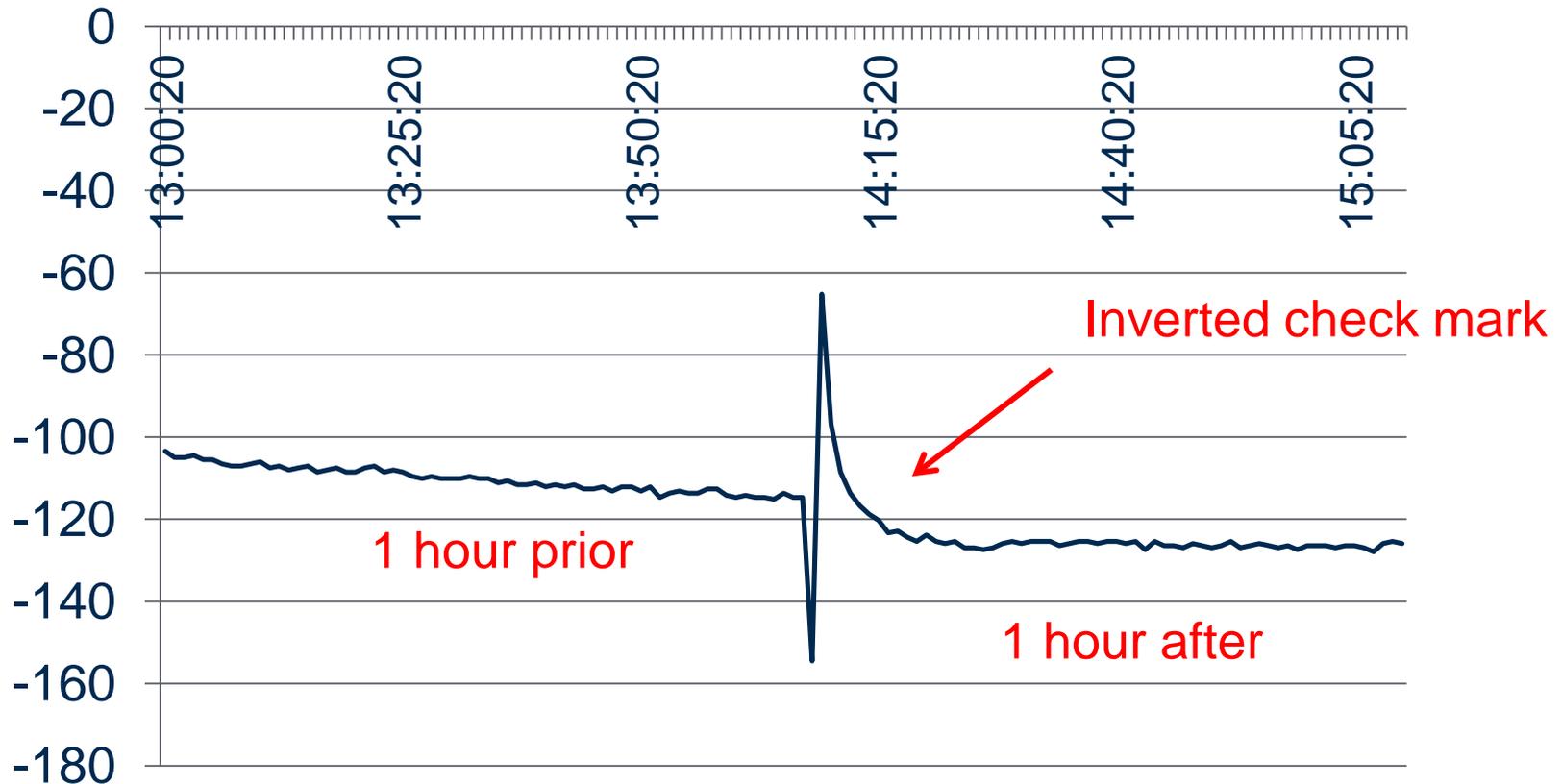


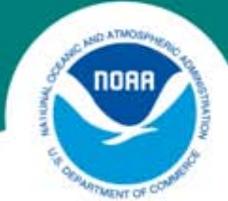
Straightened hook depth profile



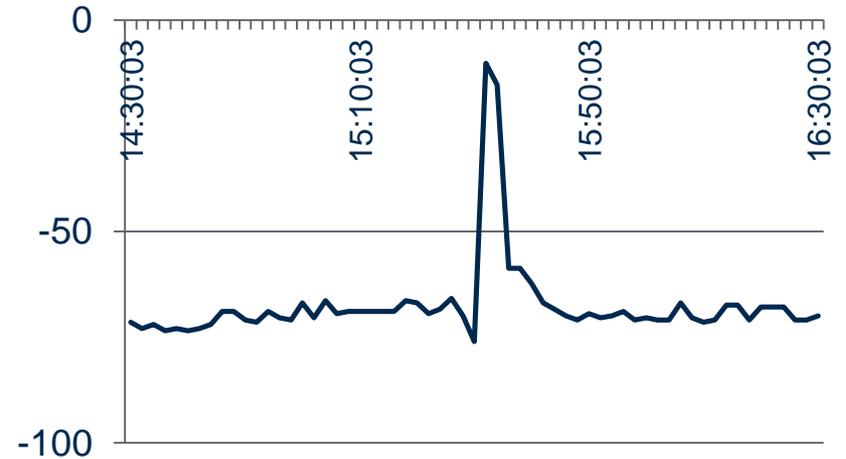
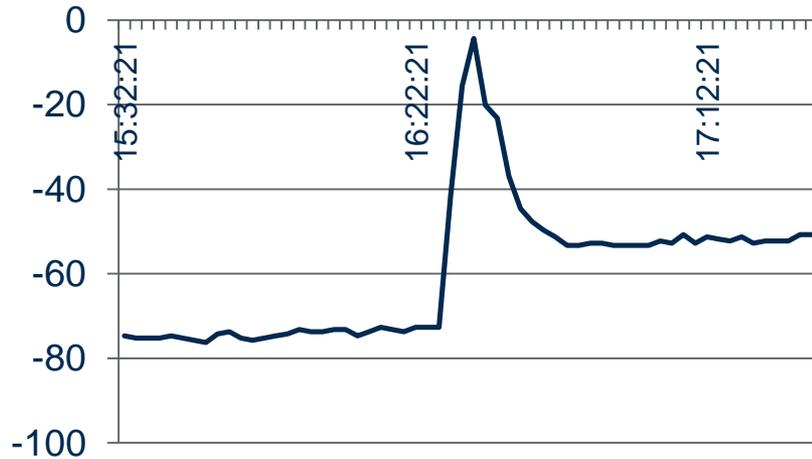
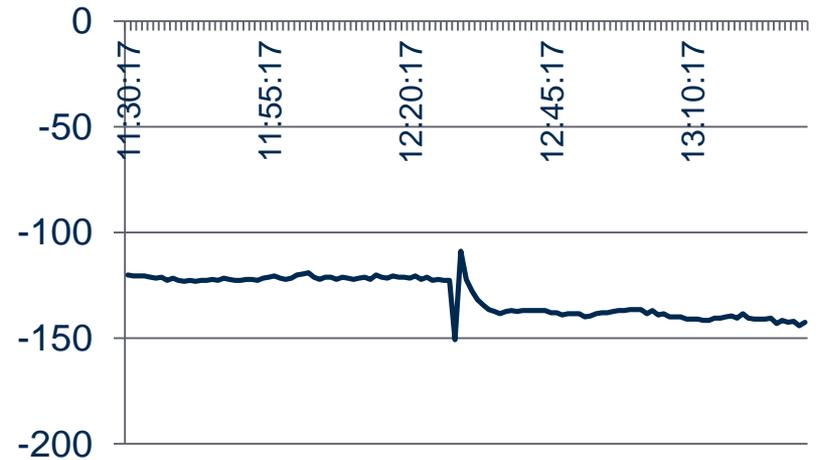
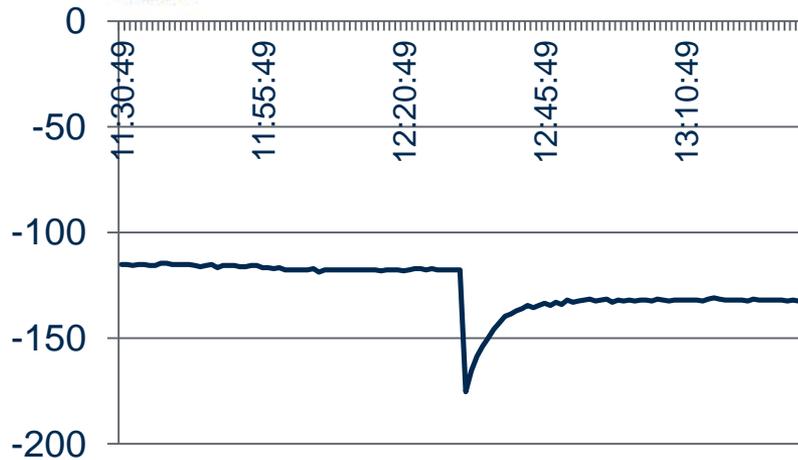


Straightened hook (quick release)



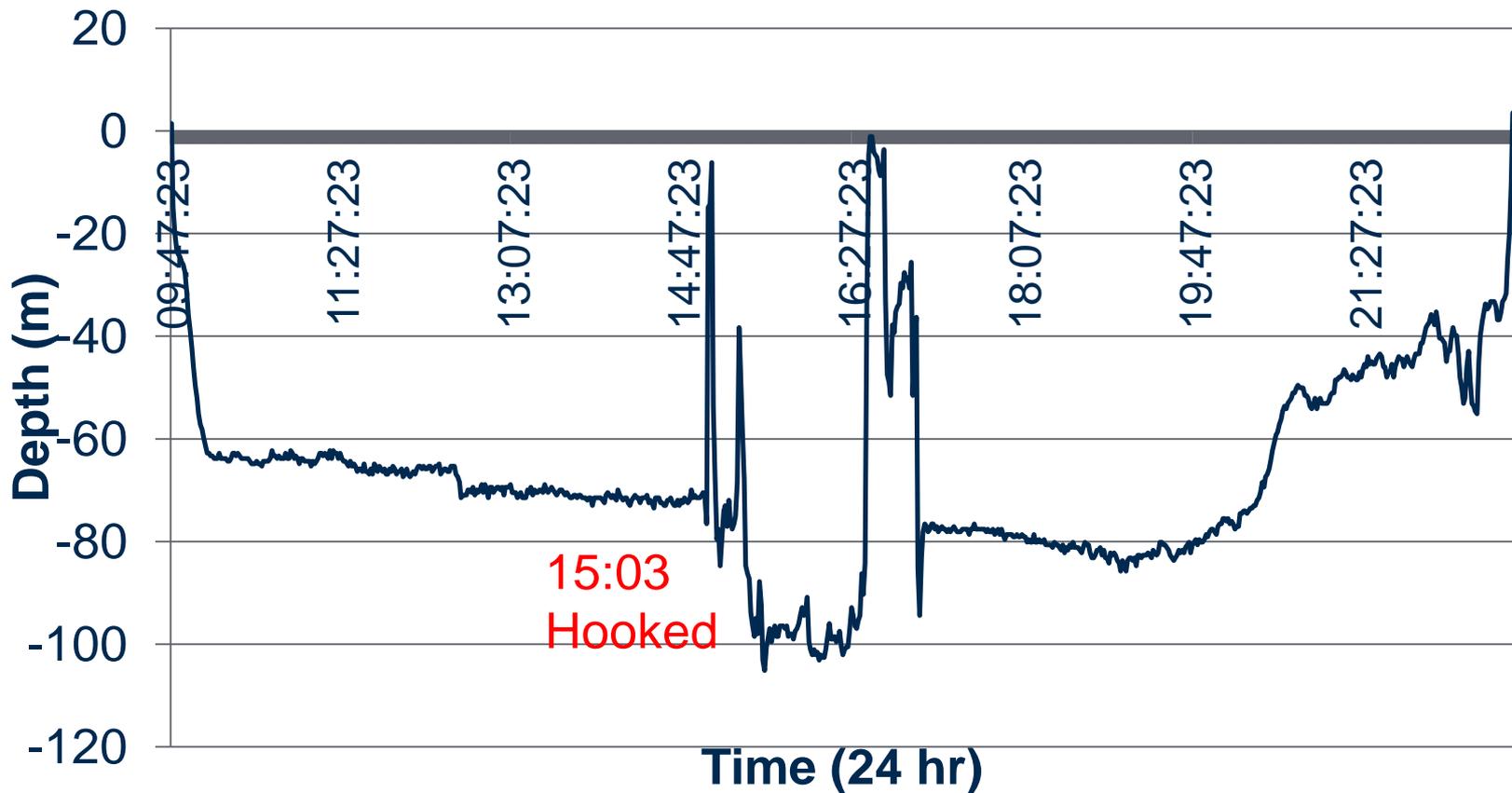


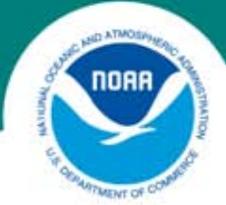
Examples of quick releases



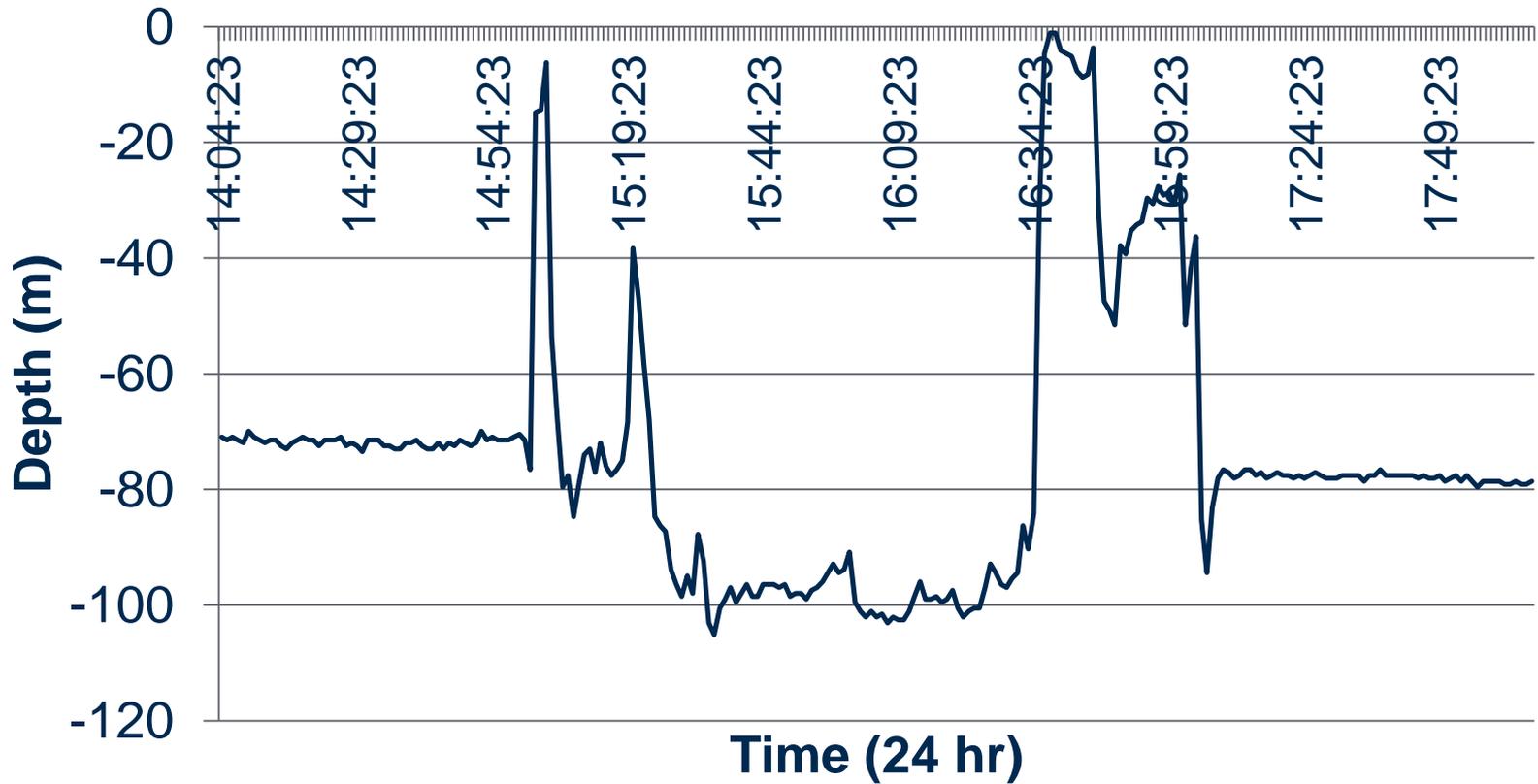


Extended Release



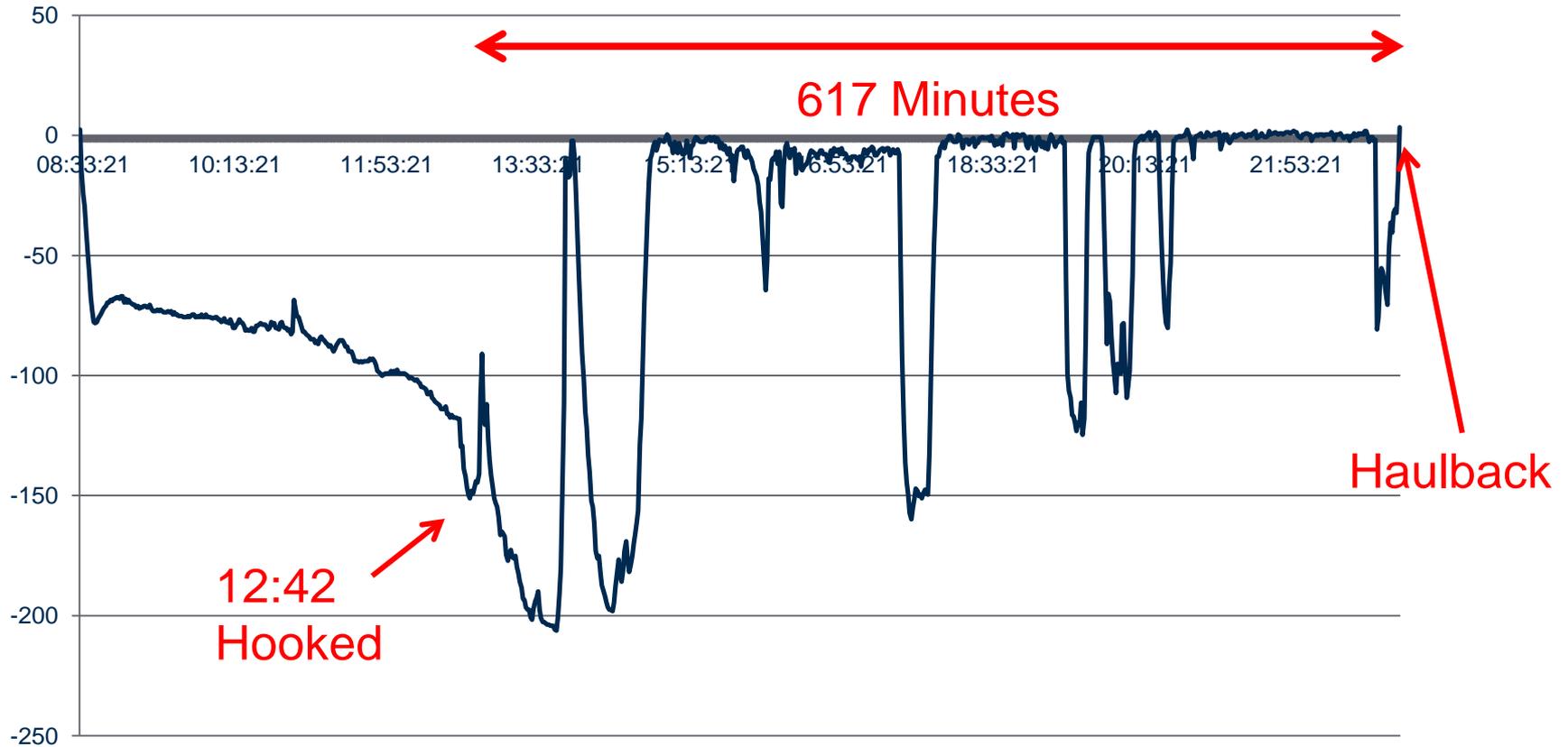


Extended Release





Released at Hauback





Straightened Hooks with TDRs

81 straightened hooks (no fish) with TDRs

72 with HTRs times (bite times)

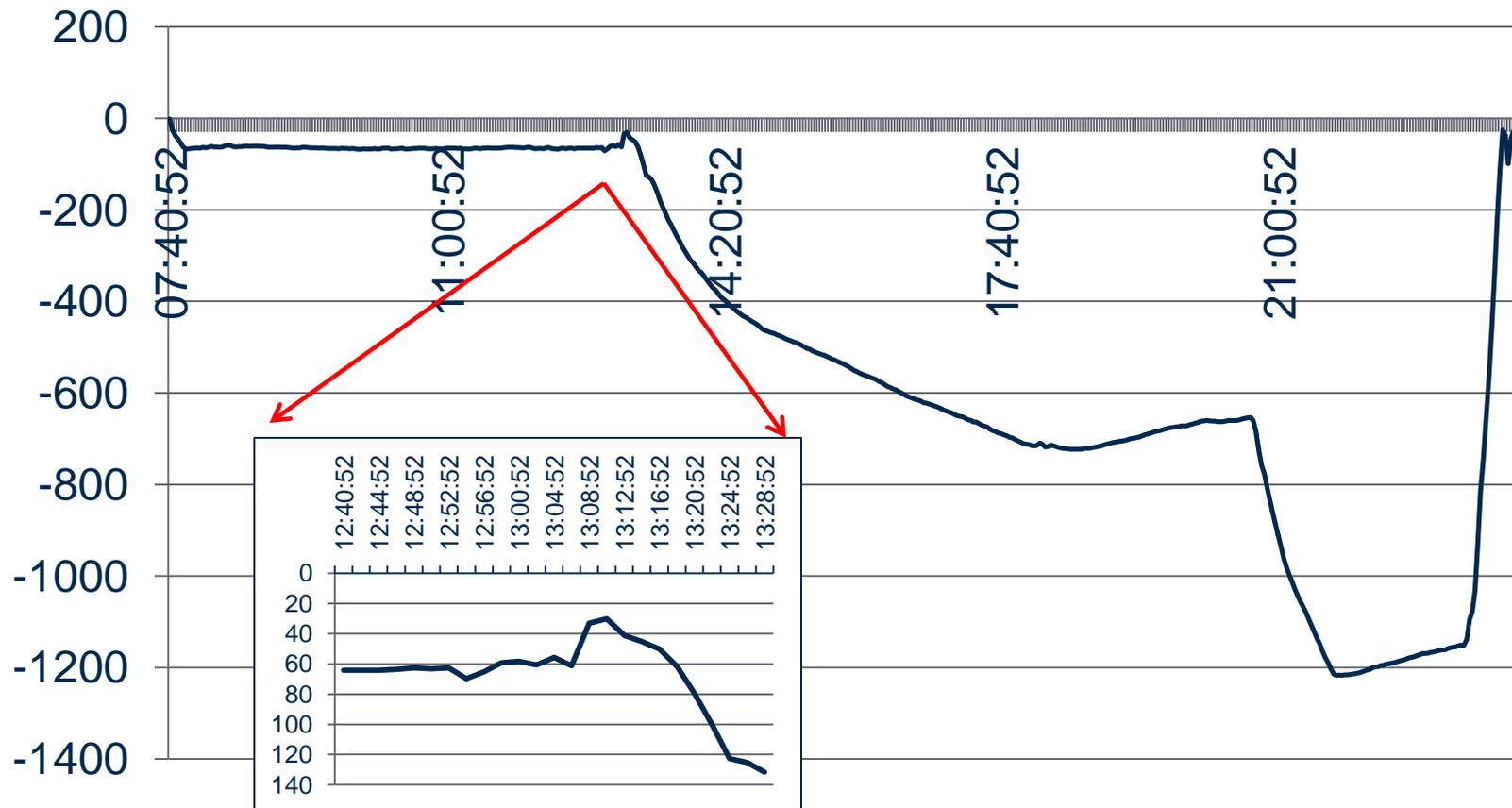
78 TDR profiles were conclusive

—1 possible mortality

3 TDR profiles were inconclusive



Straightened Hook Possible Mortality

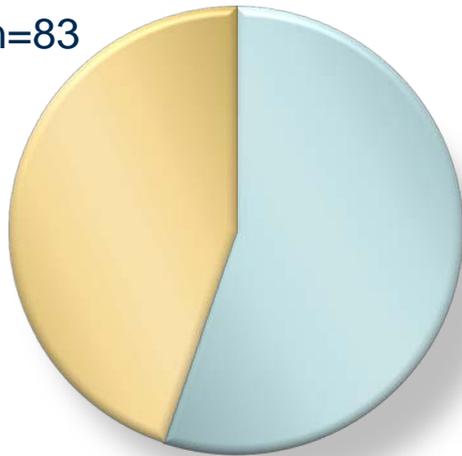




Bluefin Tuna Proportion of live vs dead

Standard

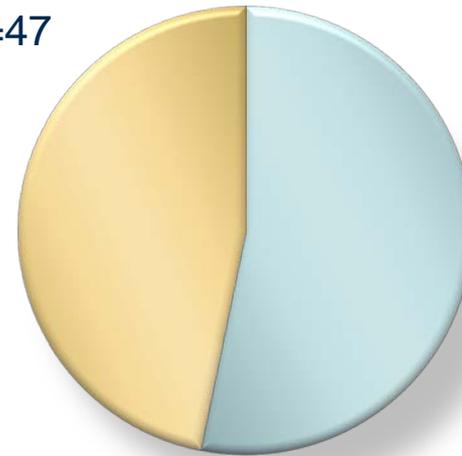
n=83



■ Live
■ Dead

Weak Hook

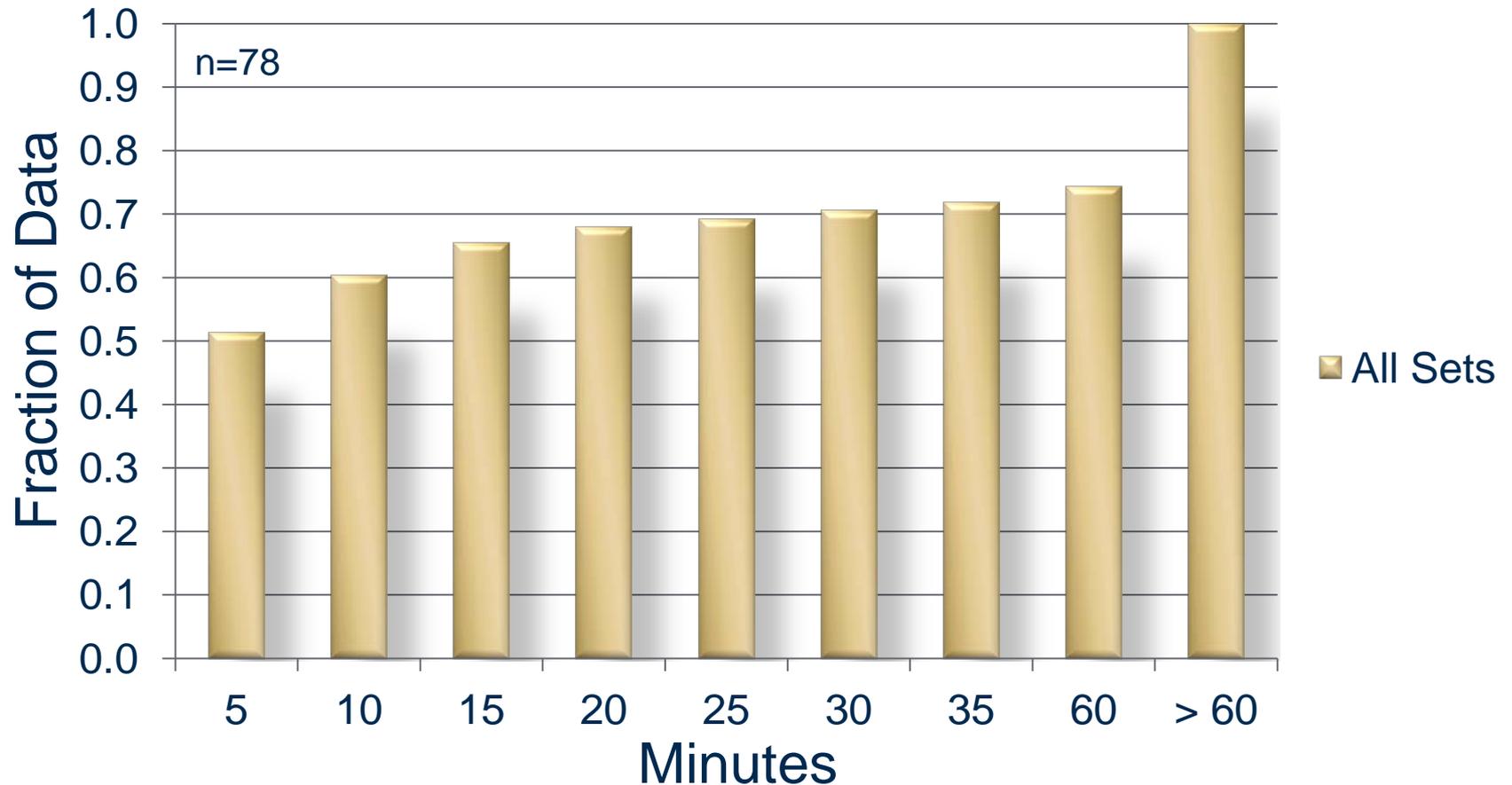
n=47



■ Live
■ Dead

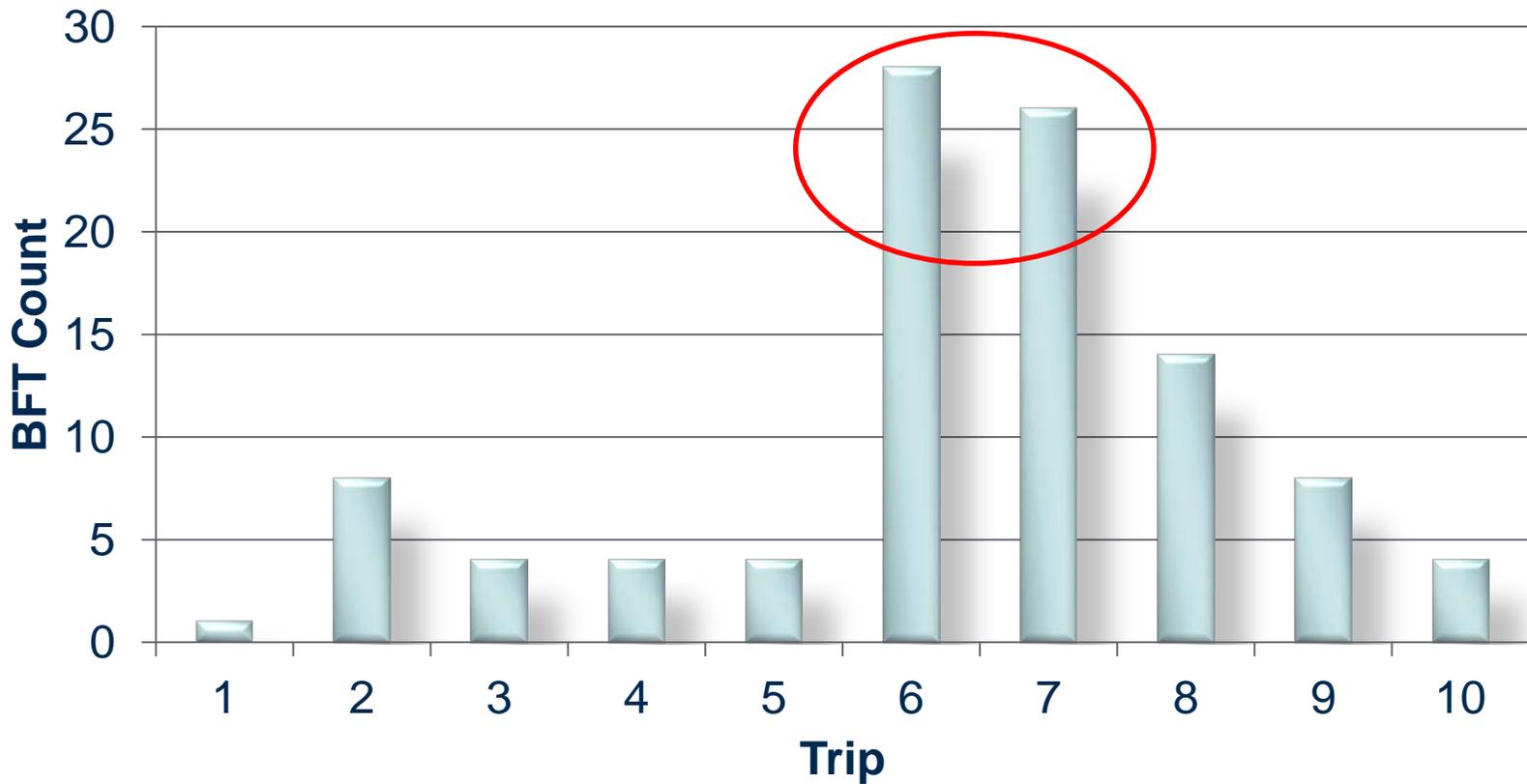


Straightened Hook Interaction Times (quartile plot)



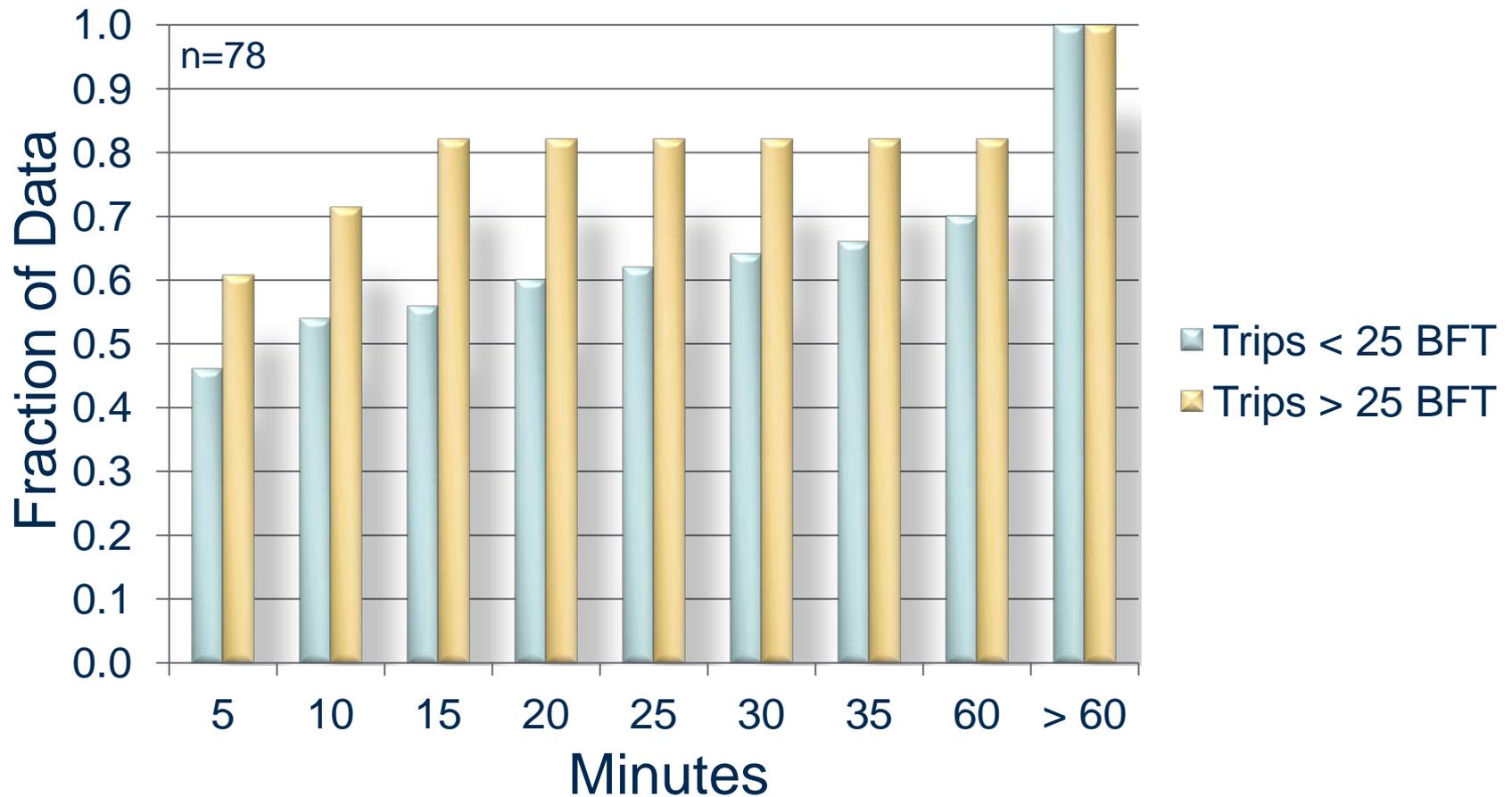


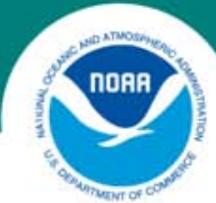
BFT Count by Trip





Straightened Hook Escape Times (quartile plot)





PSAT Tagging

34 Yellowfin
30 Bluefin

The screenshot shows a web browser window displaying a NOAA Fisheries Service article. The browser's address bar shows the URL: http://www.nmfs.noaa.gov/stories/2012/08/08_08_12tuna_popup_t. The page header includes navigation links for NOAA HOME, WEATHER, OCEANS, FISHERIES, CHARTING, SATELLITES, CLIMATE, RESEARCH, COASTS, and CAREERS. The main content area features the NOAA Fisheries Service logo and a navigation menu on the left. The article title is "Satellite Tag to Reveal Adventures of Giant Bluefin Tuna", dated August 8, 2012. The article text describes the tagging of a giant bluefin tuna in the Gulf of Mexico and the use of a Pop-up Satellite Archival Tag (PSAT) to track its movements. It includes an image of a bluefin tuna and a PSAT tag. The article also mentions that the tag popped up on July 23, 2012, and that researchers in Miami, Florida, calculated its location. A caption below the tag image reads: "Pop-up Satellite Archival Tag (PSAT) used to tag and track large highly migratory species." The article concludes with a section titled "Find Tiny Tag in Big Ocean—Mission Impossible?" and a note that Florida scientists immediately circulated information on the tag's location to local researchers.



Summary

Updated bluefin reduction estimate for weak hooks is 46%, $p=0.0007$

No significant reduction in yellowfin tuna or swordfish

Significant increase in white marlin and roundscale spearfish (45.7%, $p=0.0178$)

The majority of the escapes with weak hooks take place with 5 minutes of becoming hooked



Special Thanks to:

NOAA Fisheries Pelagic Observer Program

NOAA Fisheries, Harvesting System Team

Pelagic longline vessel captains, crew, owners