Engineering By-catch solutions for large whales – what have we learned?

OR→

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March 19-20, 2009

Vertical lines and whales, a perspective from physical experiments

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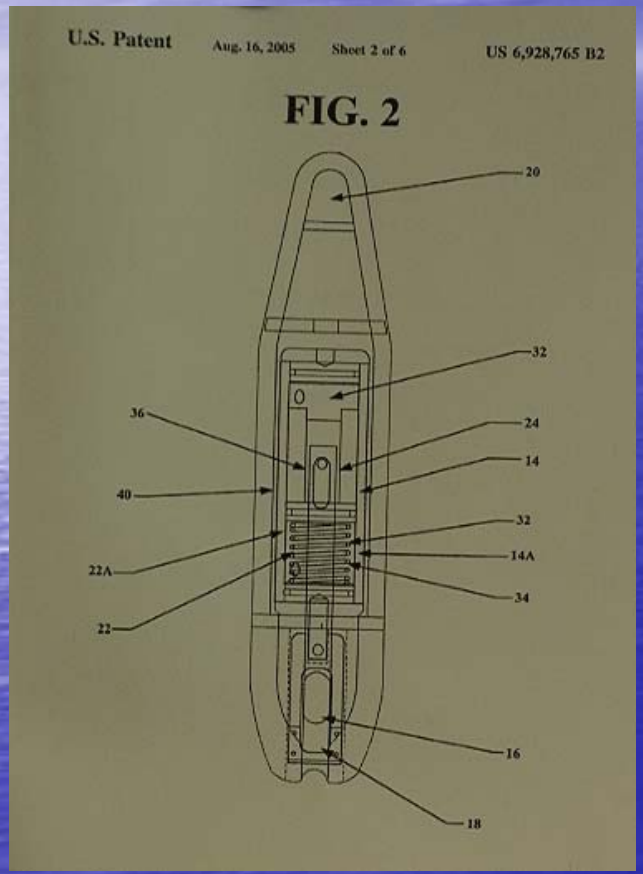
Overview of Presentation

- Three projects
- TTLC evaluation: 2006
- Flipper – line interaction : 2007
- S-K TTLC study: 2008/2009

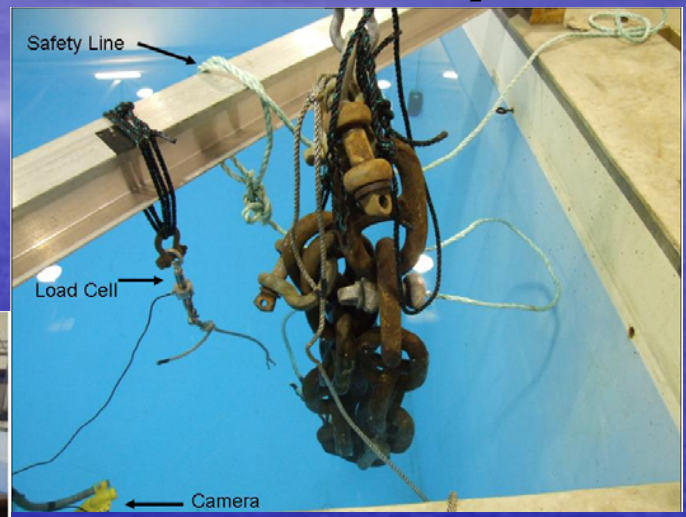
Time Tension Line Cutters

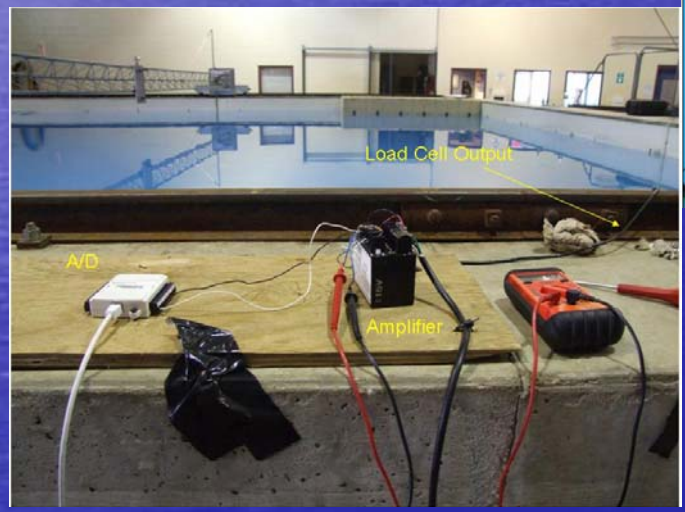
- TTLC workings
- Measurement and load setup
- Testing
  - Static tests
  - Dynamic tests
  - Cold tests

TTLC workings



Measurement and load setup





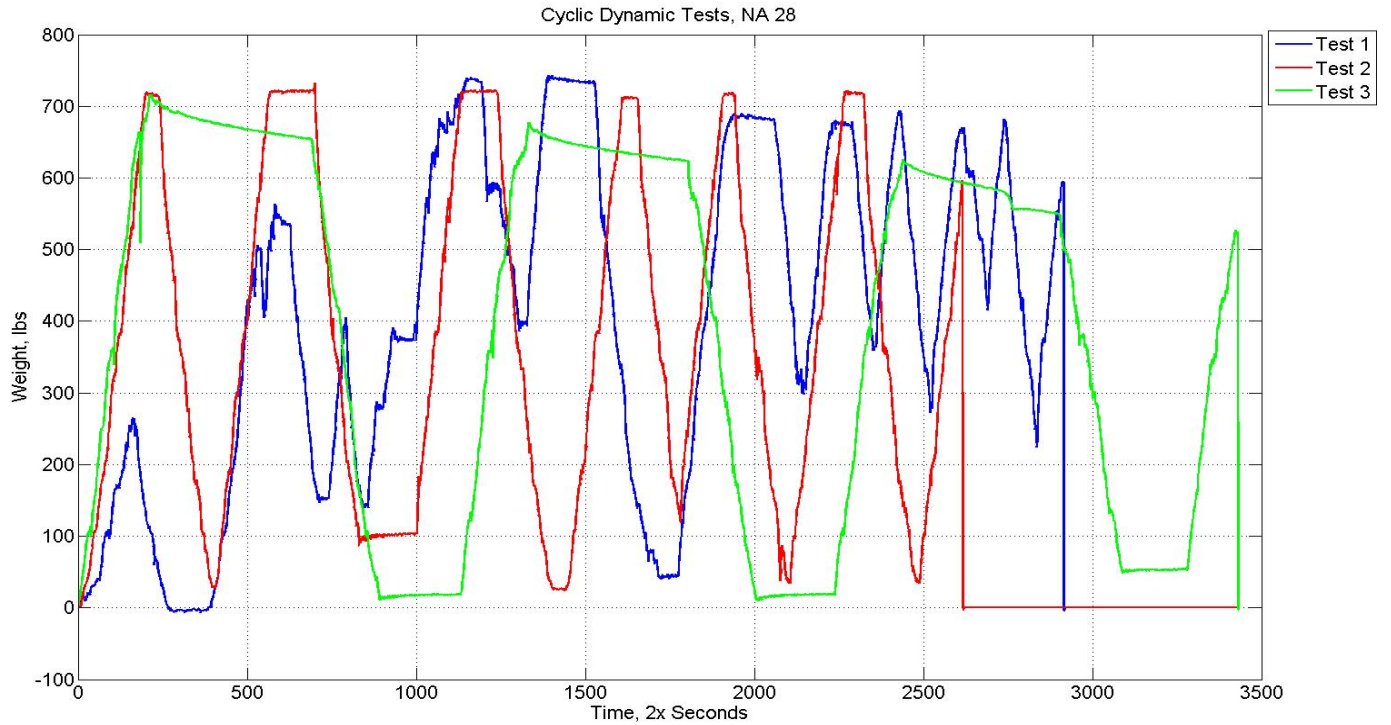
Static load repeatability tests

Six units tested for repeatability at static load

All six units showed consistent times

S/N	NA 7	NA 10	NA 15	NA 20	NA 24	NA 28
Time, Test 1	3.41	1.8	11.71	11.16	1.425	19.55
Time, Test 2	3.78	1.85	12.15	12.54	1.81	19.23
Time, Test 3	3.68	1.88	14.3	11.71	1.28	20.32

Cyclic Dynamic test. NA 28



NA 28	Total time	Break time
Test 1	24.3	19.96
Test 2	21.8	16.7
Test 3	28.6	20.52

Cold tests: Ice Water & Refrigerator

S/N	NA NONAME	NA 20
Time, Static	0.96	8.75
Time, Cold	3.58	18.8
Time, warmed up	1.375	

S/N	NA 20	NA 28
Time, Static	Avg 12 min	Avg 20 min
Time, Cold	23.78	41.68

Summary: TTLC

TTLC behaved as expected, cut the line

Time to cut is extended when the TTLC are 'cold'

Blade needs a bit of attention

Flipper – line interaction : 2007

You built a what.....

Flipper – line interaction

- *Motivation*: Study line appendage interaction at ‘Full Scale’

Flipper – line interaction

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Motivation: The interaction of the gear with the bottom affects the tension in the lines

Flipper – line interaction

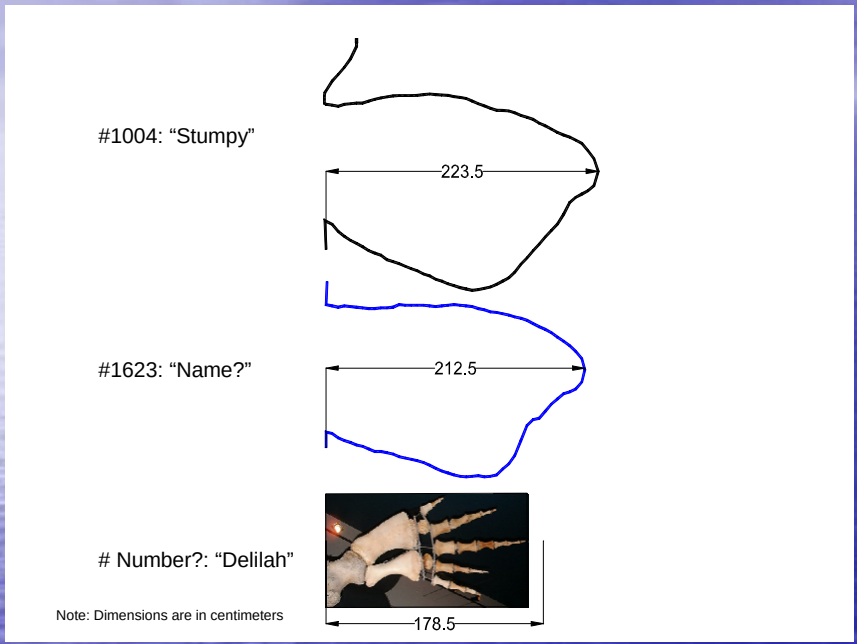
Motivation: Study line appendage interaction at ‘Full Scale’

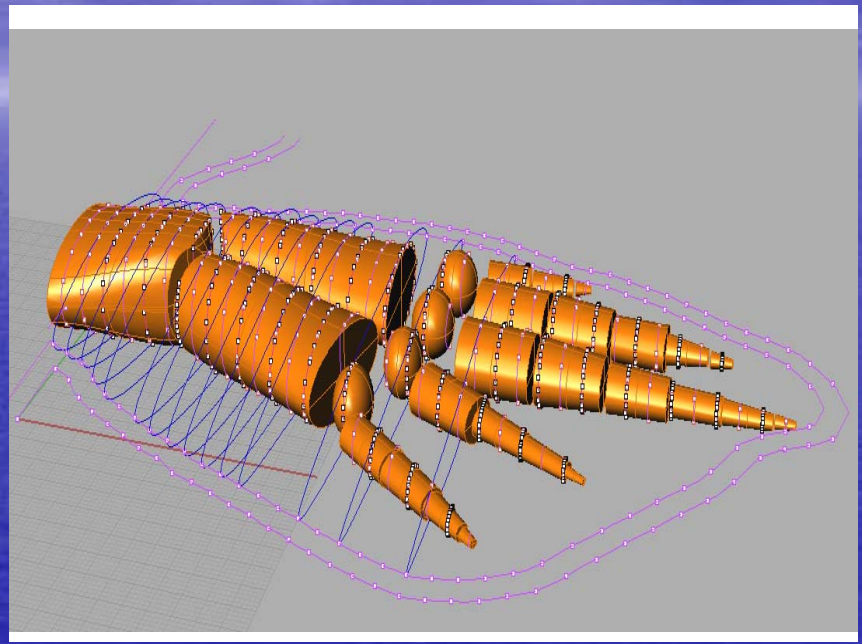
Motivation: The interaction of the gear with the bottom affects the tension in the lines

Motivation: Geometrically similar and kinematically similar experiments

Flipper – line interaction

Flipper – line interaction





Flipper – line interaction

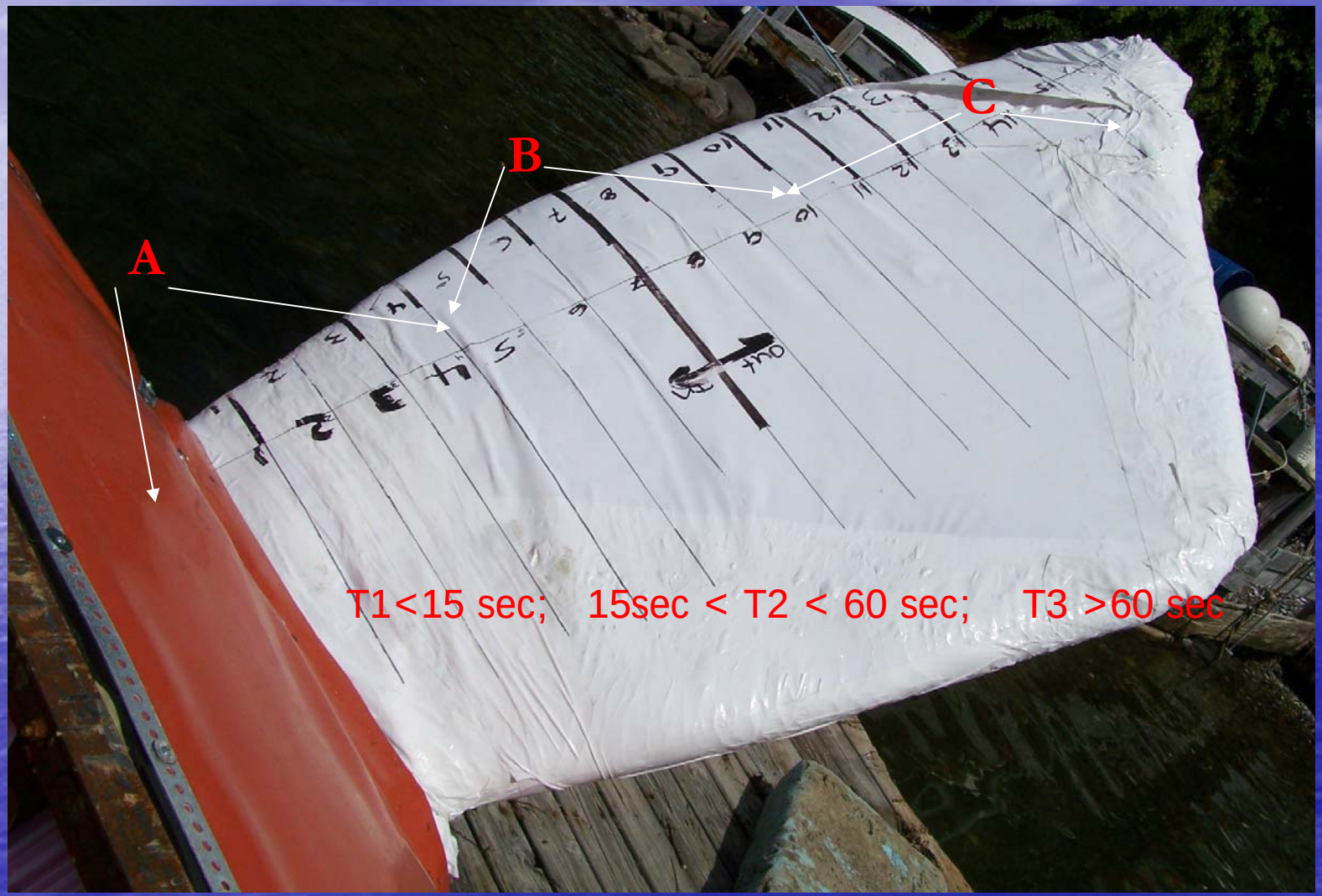
Flipper – line interaction

Flipper – line interaction

* **What happens to the line when it hits the flipper……..**
* **Depending on forward / aft position…**
* **Depending where along the flipper the line hit……**

Trial Summary
Zones: A-B-C **Angles:** A: Acute (forward); N: Normal; O: Oblique (rear)
Ropes: Poly Steel PS, Whale safe Rope WSR
Five traps: F **Three traps**: T

Flipper – line interaction



Flipper – line interaction

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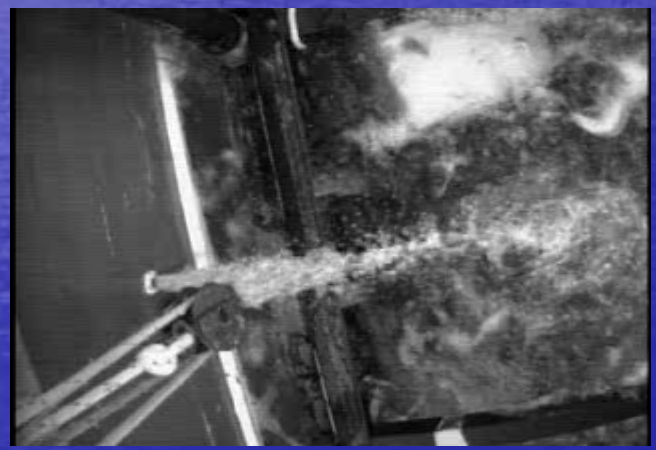
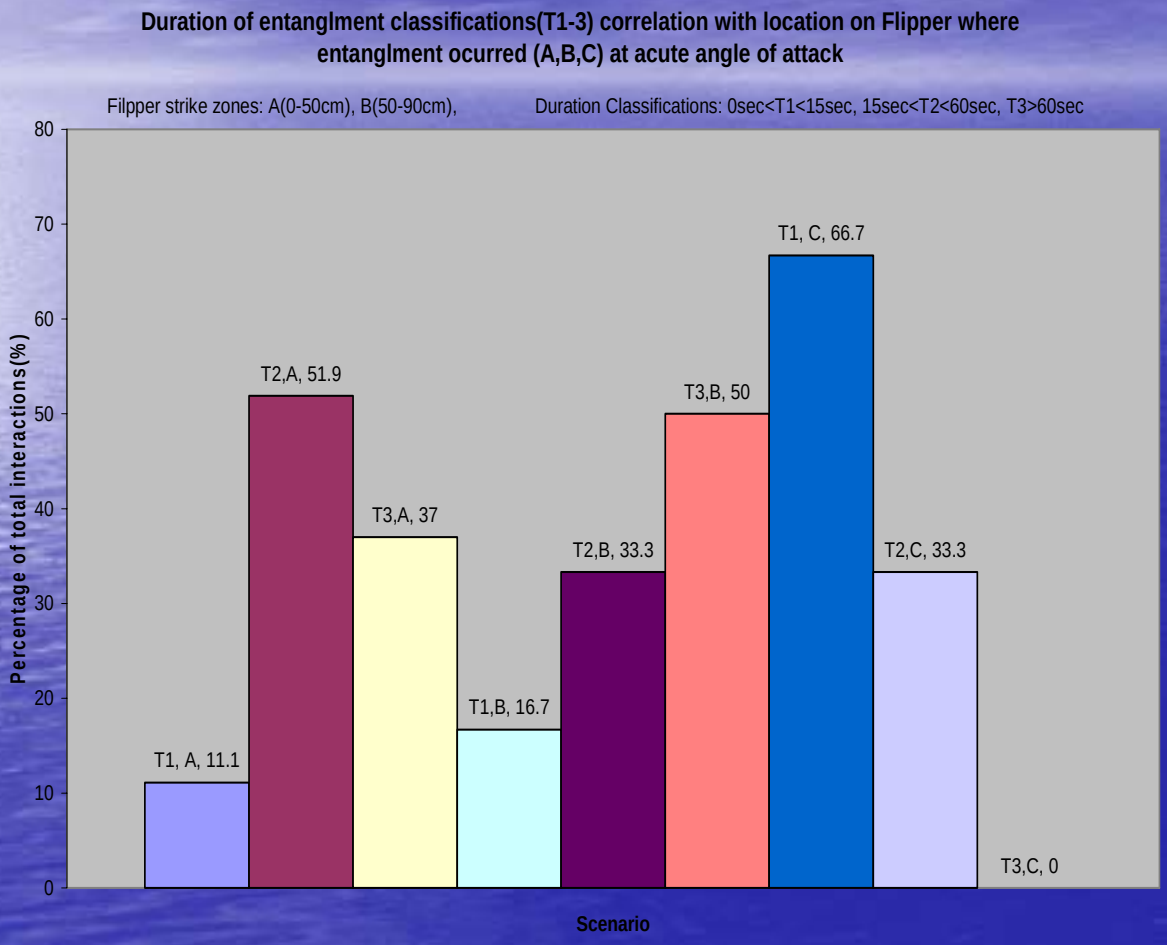
Flipper – line interaction



Flipper – line interaction



ACUTE Angle of Attack

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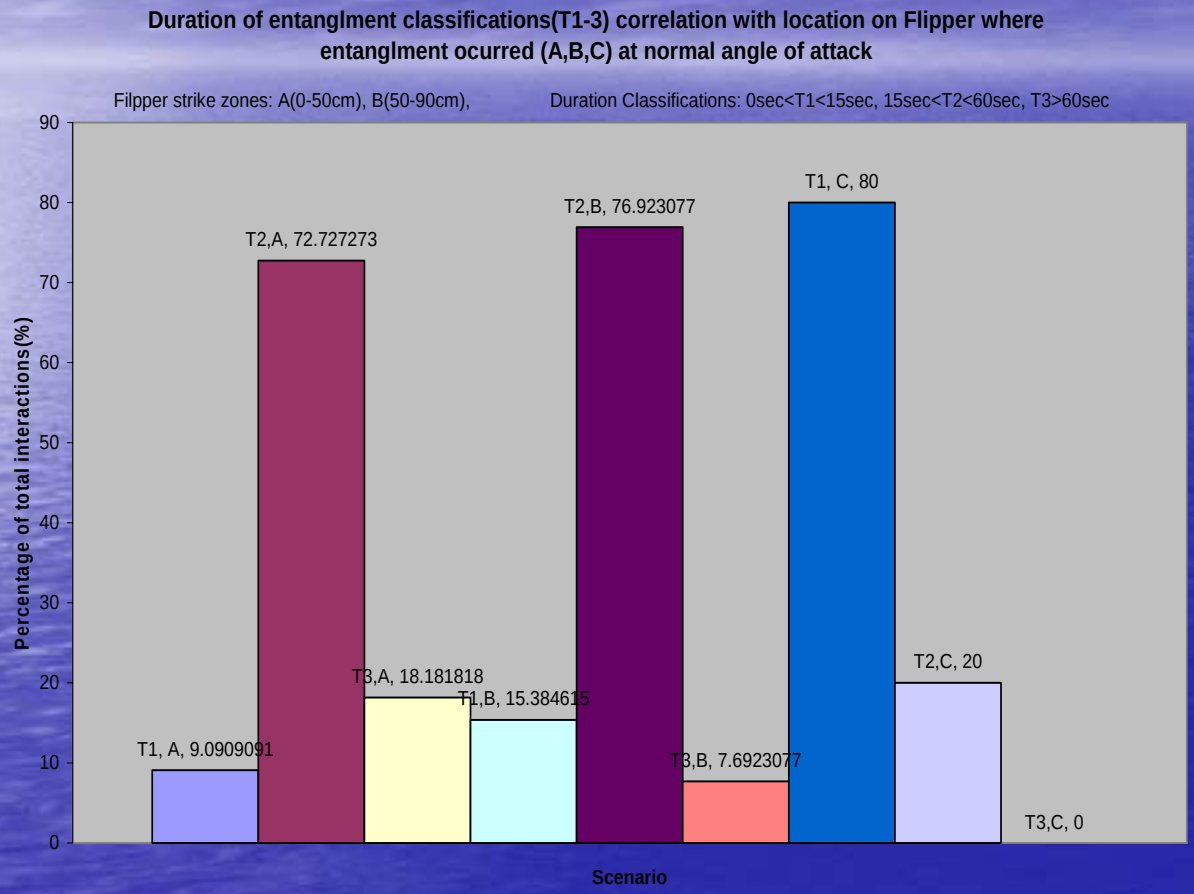
Flipper – line interaction



NORMAL Angle of Attack

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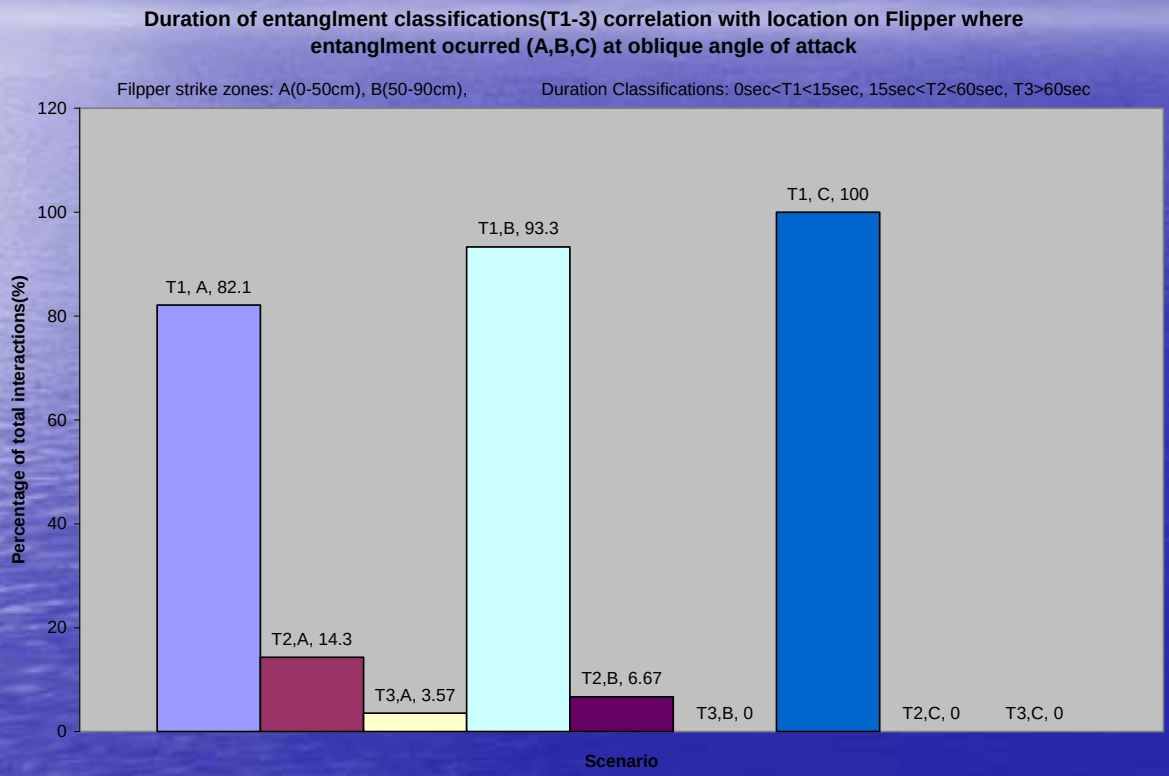
Flipper – line interaction



OBLIQUE Angle of Attack

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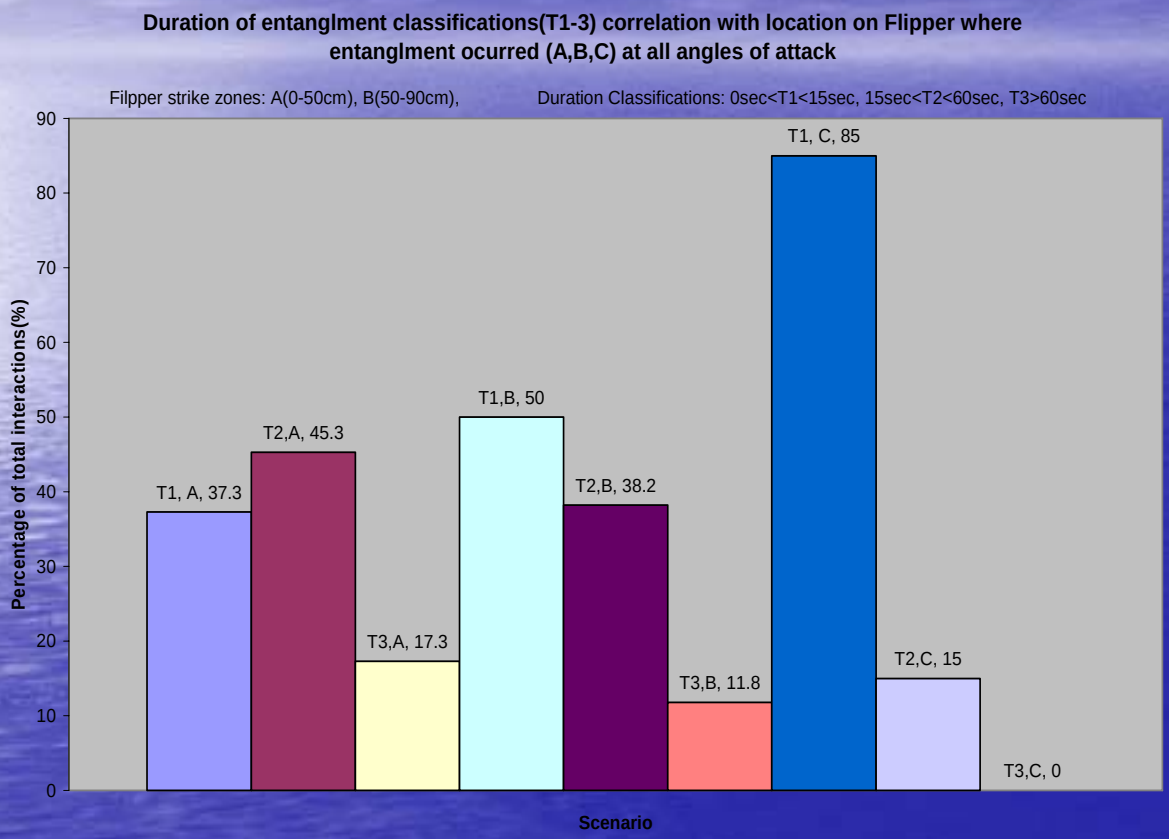
Flipper – line interaction



Summary of ALL angles

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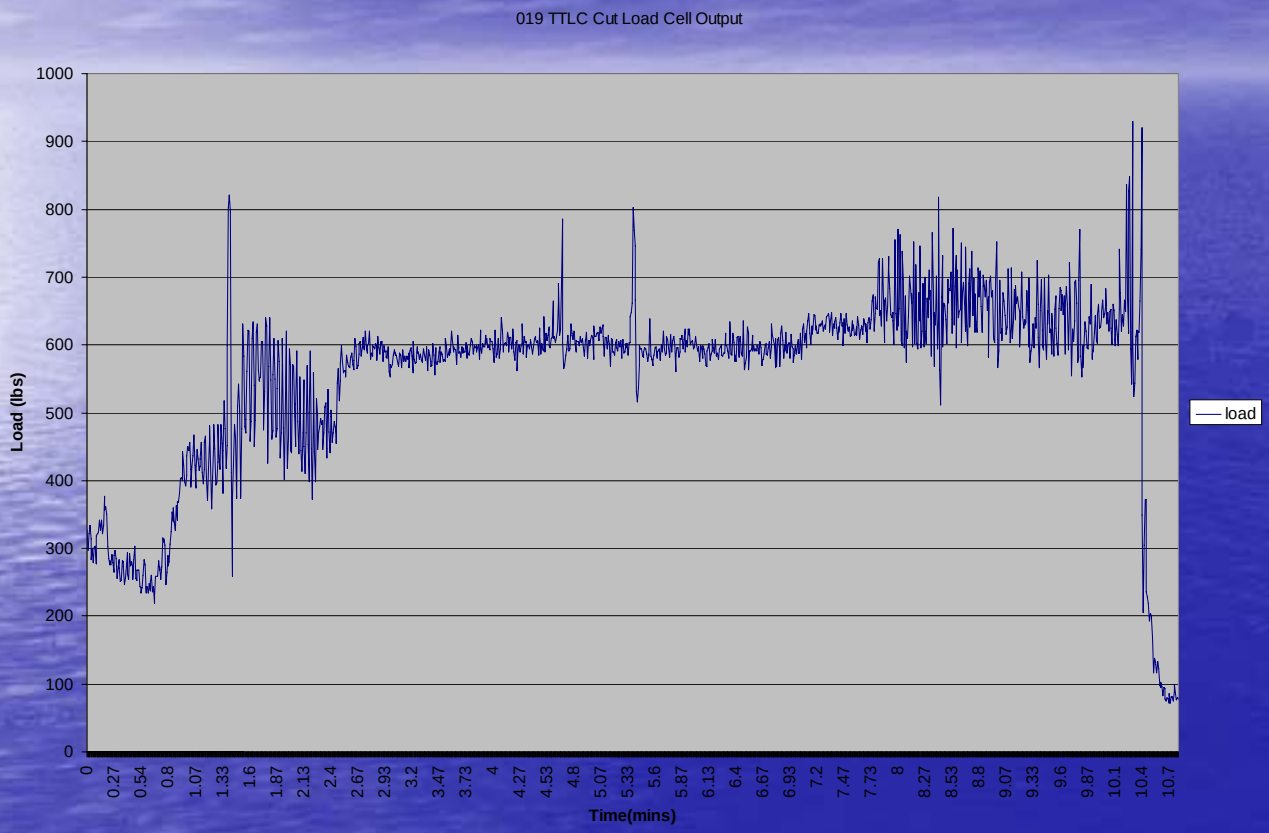
Flipper – line interaction



TTLC with WSR load vs. time

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Flipper – line interaction

Flipper – line interaction

Interesting observations

→Line/flipper interactions were as anticipated: for angles A & N the line would snag and stay on the flipper, especially if it hit inside 80 cm

→For hits beyond 80 cm the buoy would remain above the water until all the slack expired, then the buoy would release under the flipper

→For angle O the line mostly slid off the end of the flipper as the slack expired and the line gained tension

→The process was line type independent

S-K TTLC study: 2008/2009

S-K program priority on Right Whale Gear Entanglement Mitigation Research.

Project goal is to define the operational parameters of the Time Tension Line Cutter (TTLC) for use in the vertical lines of fixed fishing gear

The project has two main components: One is a pilot study with the fishing community and the second is more experimental

The *pilot program component* of this project will be designed to obtain data on the use of the TTLC from the fishing community and from periodic inspection and evaluation of the TTLC being used

The *controlled testing component* will address the issue of gear which could become entangled on a whale and how effective the TTLC will be on releasing the gear

S-K TTLC study: 2008/2009

TTLC Pilot Study Log

Vessel name: _____ Vessel operator: _____

Gear type: _____

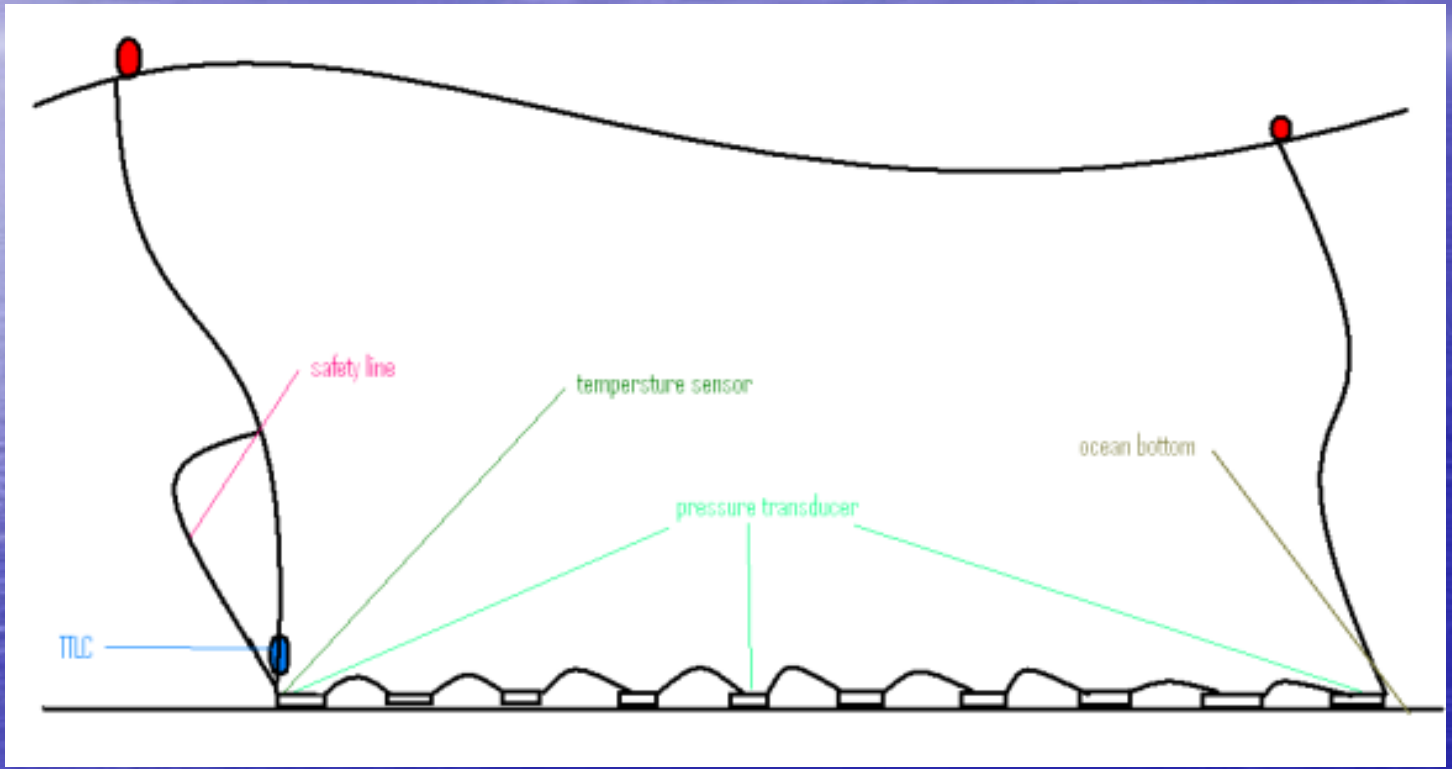
TTLC/Trawl #	# traps	Date/ Haul #	Depth (fm)	Bottom type	TTLC Band	Comments
1				M Sa Gr Rky	Gr Y R	

This is a work in progress……

S-K TTLC study: 2008/2009

- Experimental scheme
- 5-10-20 trap trawls
- Two different end-line lengths for each test scenario
- Different depths of water
- Different bottom types
- All trials were at 2 knots

S-K TTLC study: 2008/2009



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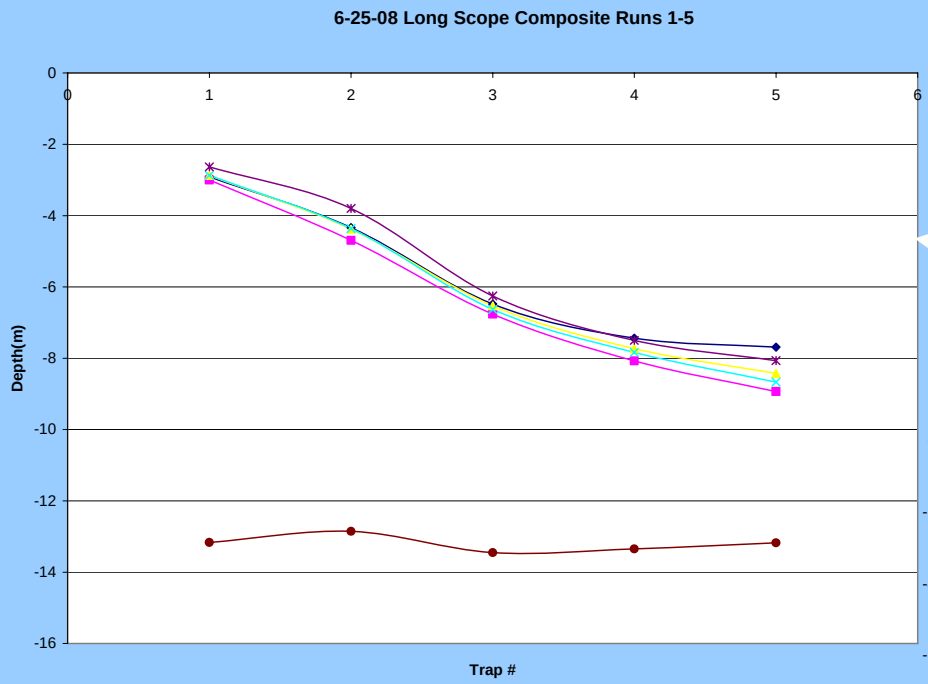

5 traps

Hard bottom, depth 45’ (13.7m)

Long: 108’, Short: 60’

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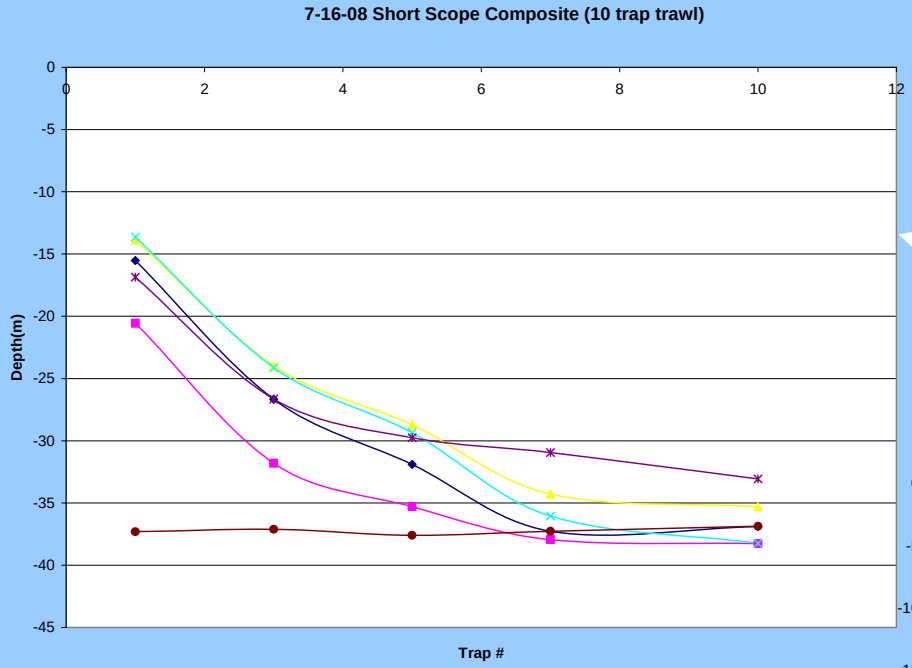
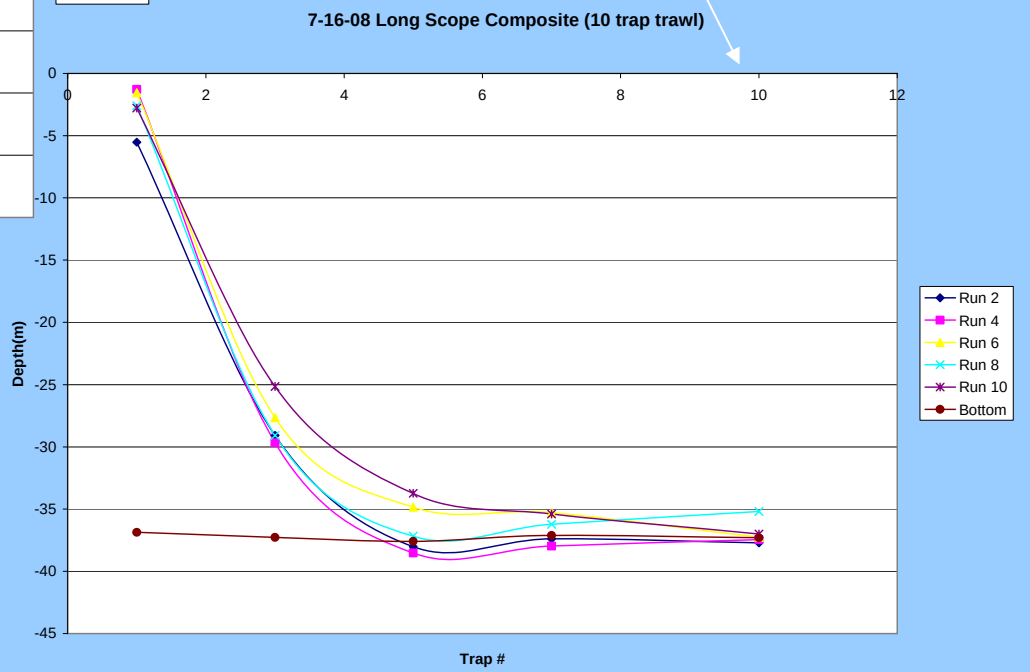
S-K TTLC study: 2008/2009



10 traps
Mud bottom, depth 240’ (73m)
Short: 330’ , Long: 600’



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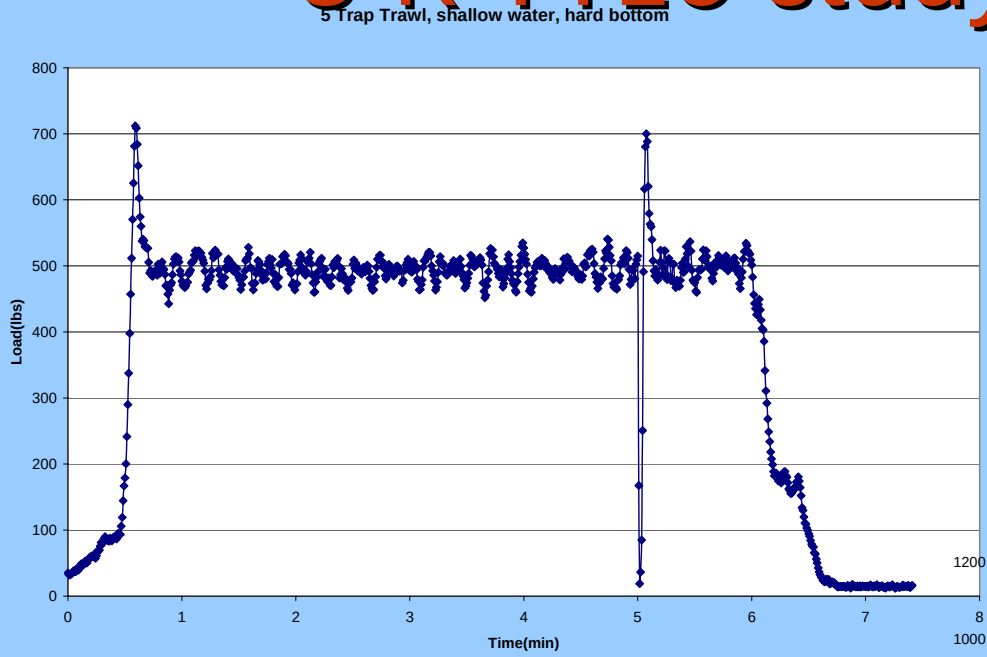
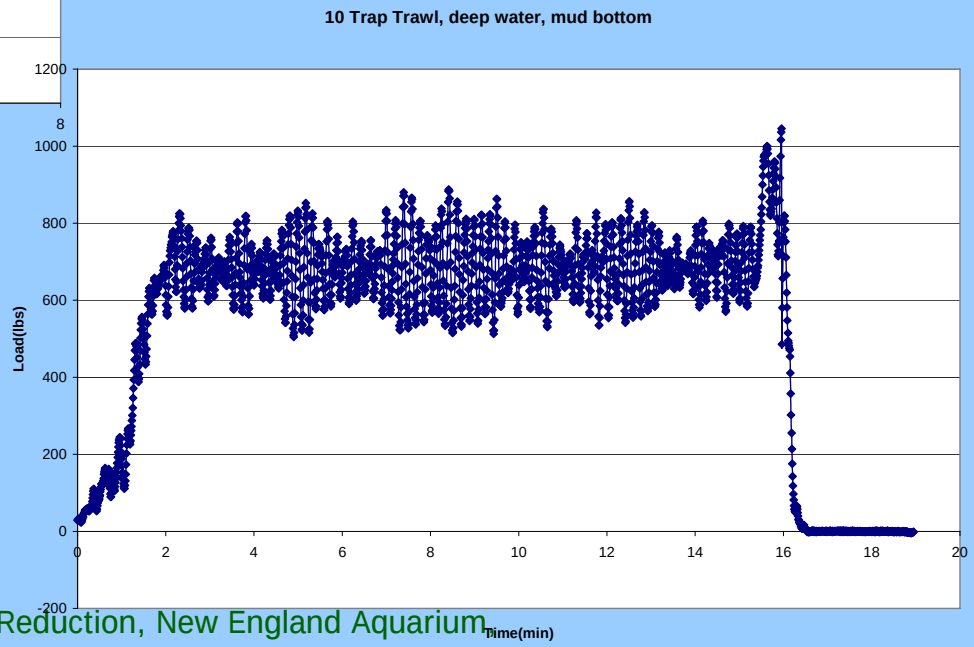
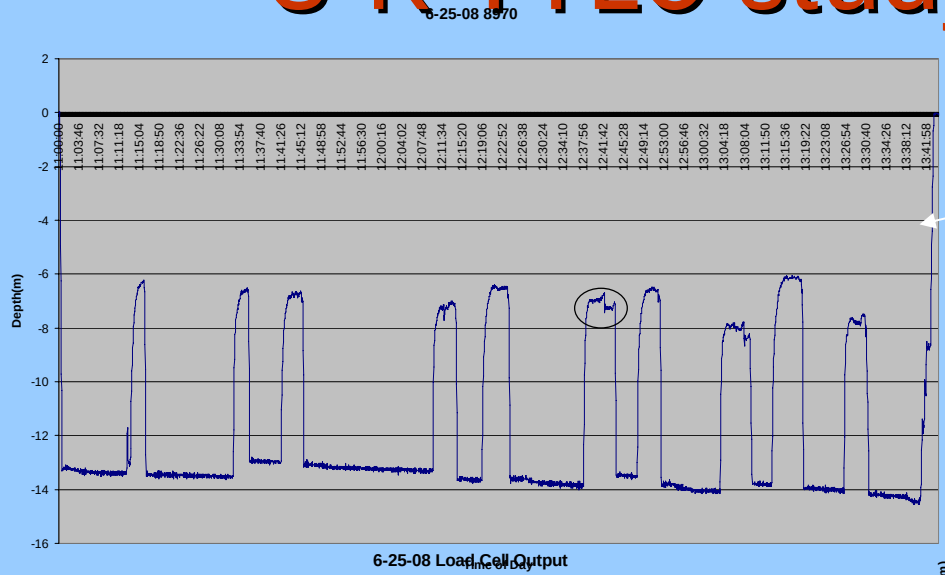
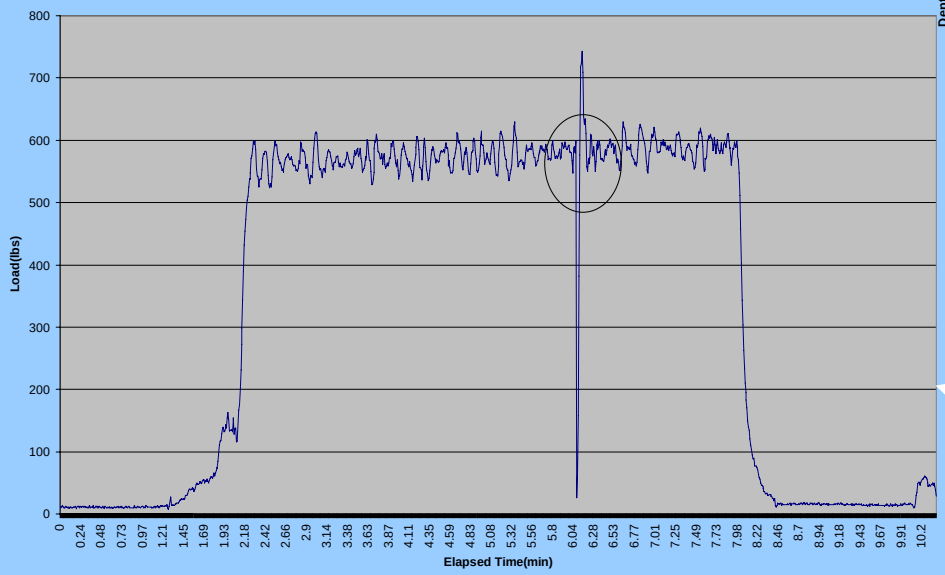


Representative plots of load vs. time for two bottom types and trawls



S-K TTLC study: 2008/2009

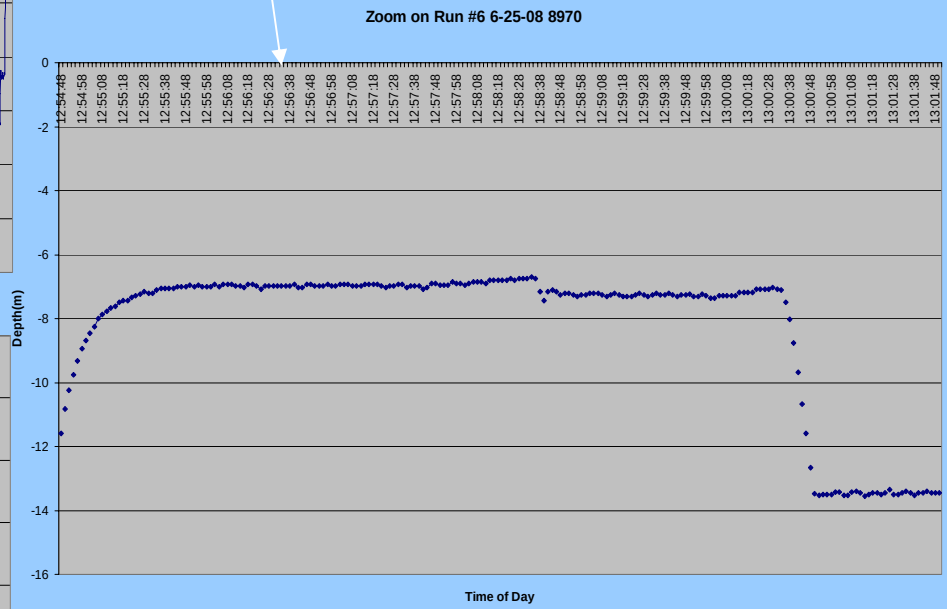




Depth (Pressure) vs. time for

a series of events and

a single event



Load vs. time

SUMMARY

- TTLC shows promise as a device which can mitigate the possibility of entanglement……it cuts the lie with no knots in relatively short time in cold environments
- The flipper – line experiments were line type independent
- The tension, load, in the vertical line when trawls are being towed is less then 1100 pounds
- The pilot study when it is finished should provide a perspective on the TTLC from a user perspective

THANKS FOR LISTENING,

QUESTIONS