Novel seabird bycatch mitigation for floated demersal longline fisheries

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DOC CSP Technical Working Group June 2024

Contract reference: MIT2023-07A

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Background

Mitigation standards introduced 2019.

NPOA 2020 implementation plan.

Regulations changed 2021.

Switched to an ‘outcome-based’ input control on demersal longline weighting, requiring five metres depth at the end of the tori line aerial extent.

Previous work tested a range of setups in use, and faster sinking alternatives, without hooks, to provide advice to fishers.

This project trialled status quo gear setups versus faster sinking alternatives that sank to five metres at the end of the tori line.

Project Objectives

To identify potential novel options to mitigate seabird bycatch in floated demersal longline fishing gear.

To test one or more novel bycatch mitigation option(s) identified for floated demersal longline operations and assess the feasibility and practicality of commercial implementation.

(Conservation Services Programme Annual Plan 2023/24)

The fishery

Hand-baited hooks are clipped onto backbone, between floats and weights in various configurations

Depth above seabed is controlled by: the length of rope between weight and backbone, and float and weight configuration

Gear setup: **Ling -** just off the seabed (clean ground) weight, float, weight

Bluenose - higher off the seabed, “semi-pelagic”, “floating”, weight+float, float, float, float, float, weight+float.

Hapuku, Bass, Red Snapper - between these two extremes

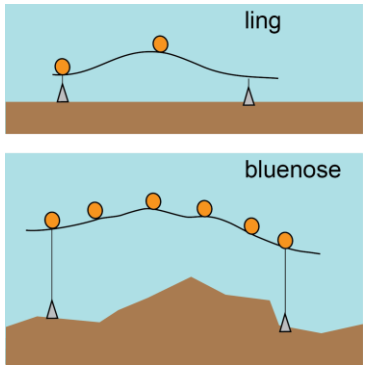


Figure 1. Examples of gear setup

Figure 2. Shooting a downline, prior to clipping on hooks

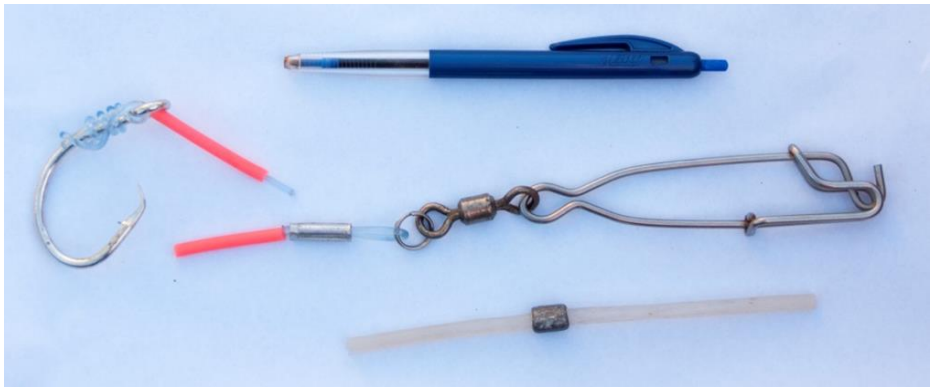


Figure 3. Typical gear

Methods 1

Technical Working Group reviewed previous work in conjunction with suggested proposals arising from the social research project MIT 2023-03.

Decision taken to test recommendations from MIT2021-03B in a fishing context.

Undertook at sea trials on two vessels:

Vessel A. Predominantly ling target, large weight spacings
6 mm monofilament and 8 mm rope backbone
19 m - typical of larger vessels in fleet
From Lyttelton

Figure 4. Vessel A

Vessel B. Mixed target; bluenose, hapuku / bass / red snapper
5 mm, 3 mm and 2.2 mm monofilament backbone
15 m – typical of ‘crossover’ vessels
From Totara North

Figure 5. Vessel B, credit Marine Traffic

Methods 2

Maximised tori line aerial extent

Sank gear faster: **“Modified floats”** allow line to sink to the length of the rope then equivalent to a single float.

Larger weights

Closer weight spacing

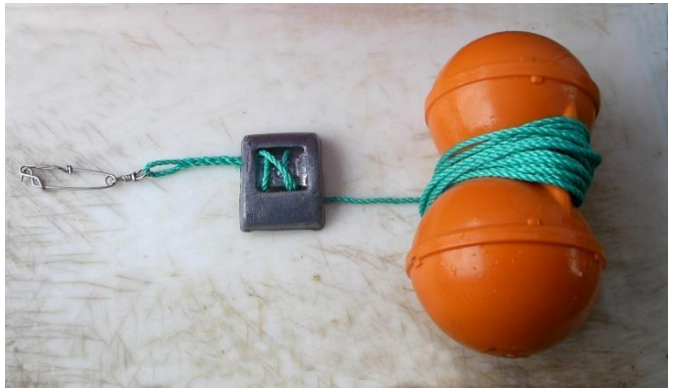


Figure 6. Modified float ready for deployment

Measured sink times to depth and depth at end of the tori line using CEFAS G5 Time Depth Recorders (TDRs).

Compared workability, practicality, and catchability of faster sinking gear setups versus status quo.

Results - Tori lines

Took a new tori line on board both vessels and trialled them prior to fishing:

Vessel A – used the new one

8.3m high poles, 90 m aerial extent, 3.5 knots

Vessel B – similar design and performance to their tori line (used their one)

7 m high pole, 70 m aerial extent, 3.5 knots

Both skippers planning further improvements

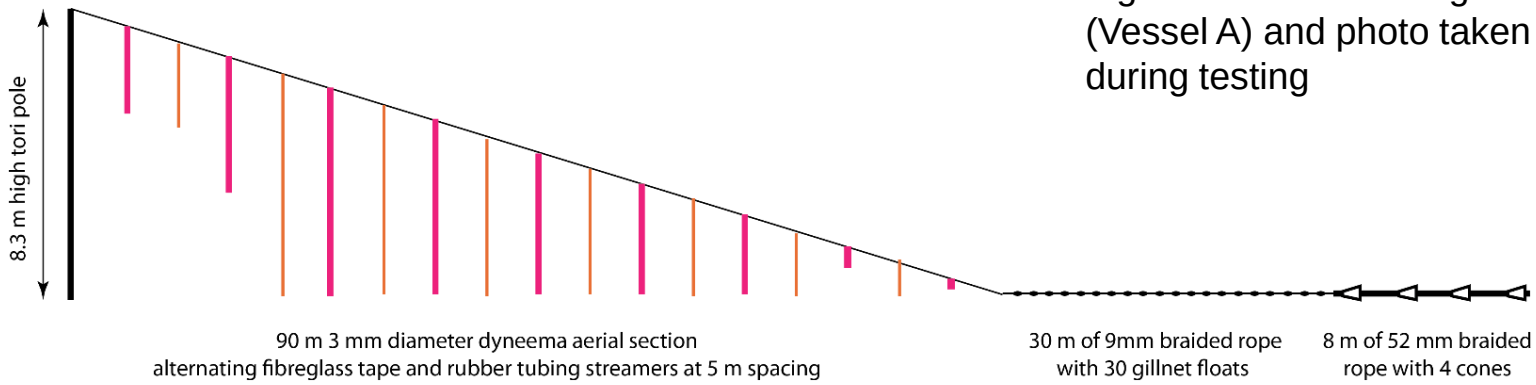


Figure 7. Tori line design (Vessel A) and photo taken during testing

Results – Trip summaries

Vessel A. 7 fishing days, 3 sets a day with TDRs on one rope and one mono set

First two days changing gear setup to improve times to depth, followed by more routine data collection.

13 sets targeting ling and 2 targeting bluenose

Vessel B. 5 fishing days, 1 or 2 sets a day

Straight into routine data collection on half of gear as just replaced single floats with modified floats.

1 set targeting school shark, 6 sets targeting bluenose, and 2 sets targeting hapuku / red snapper.

Results – Gear modification Vessel A

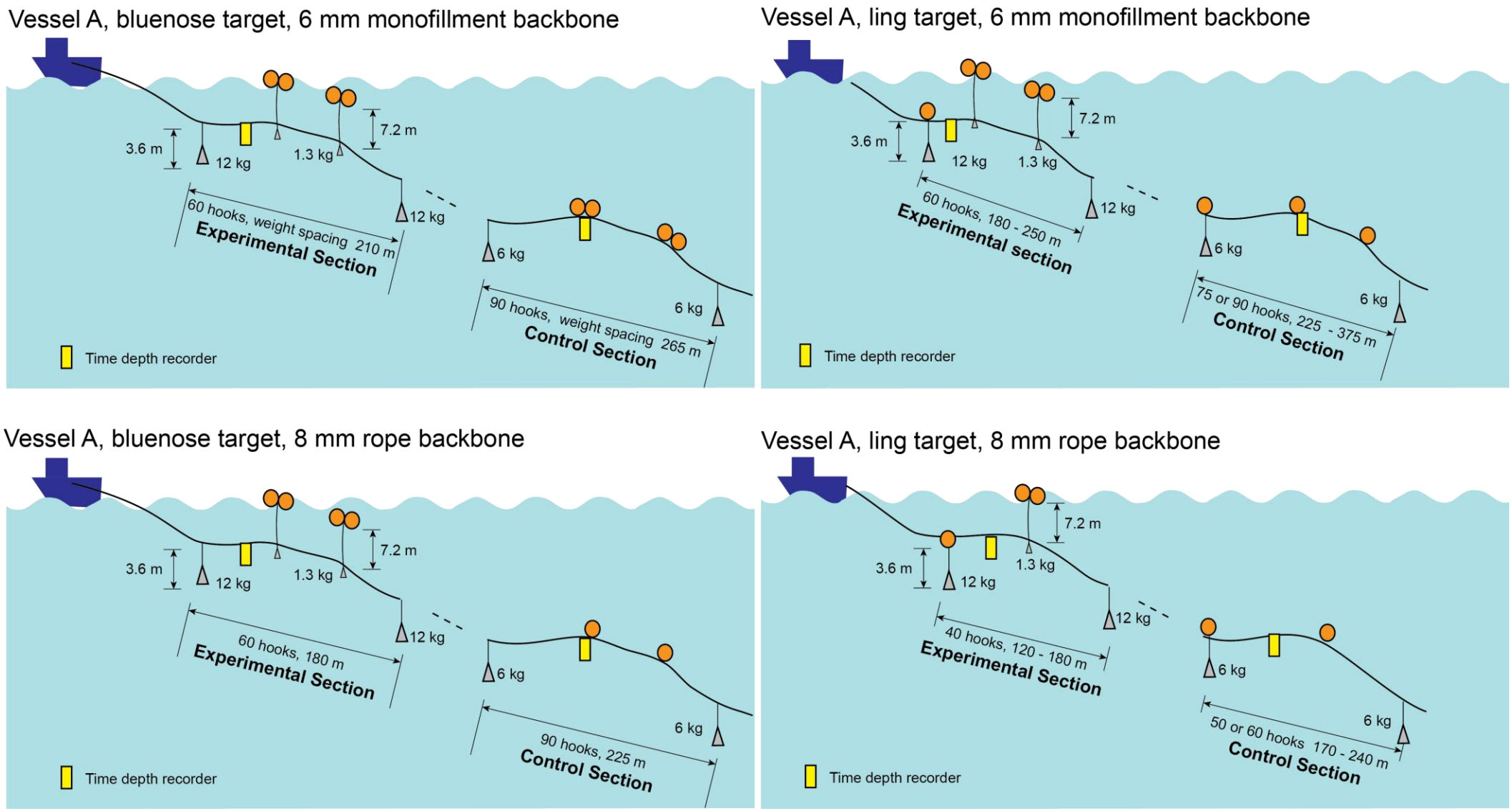


Figure 8. Diagram showing gear modifications made on Vessel A, by target species and backbone type

Results – Depth profiles Vessel A

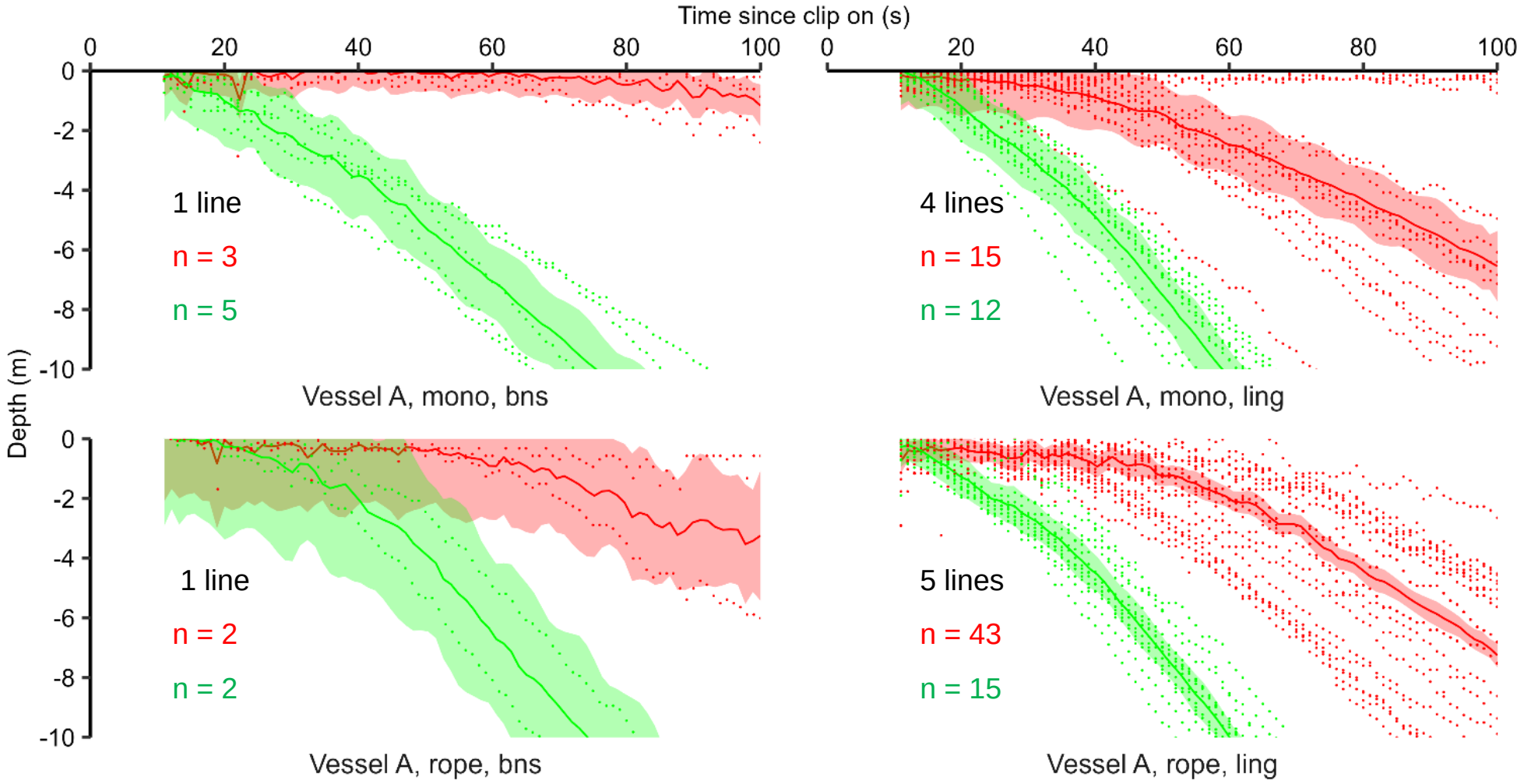
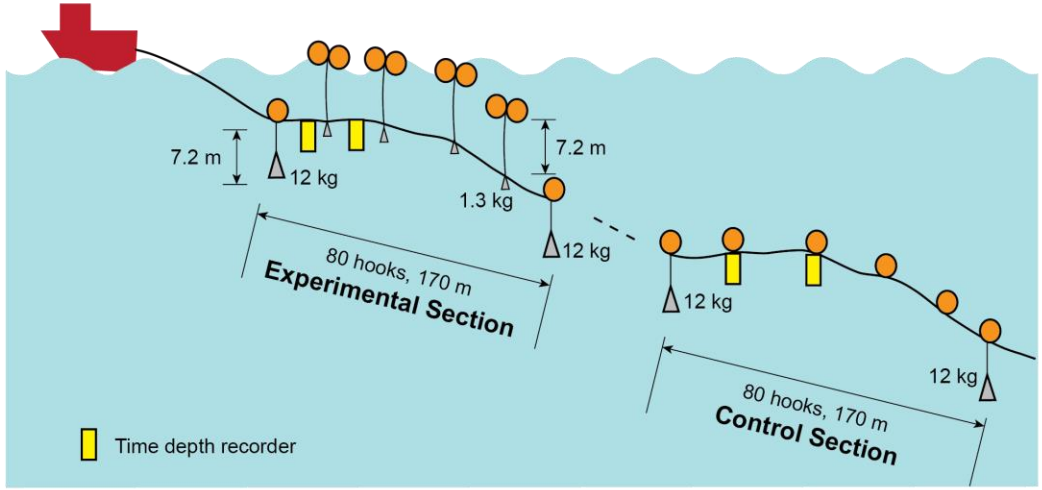


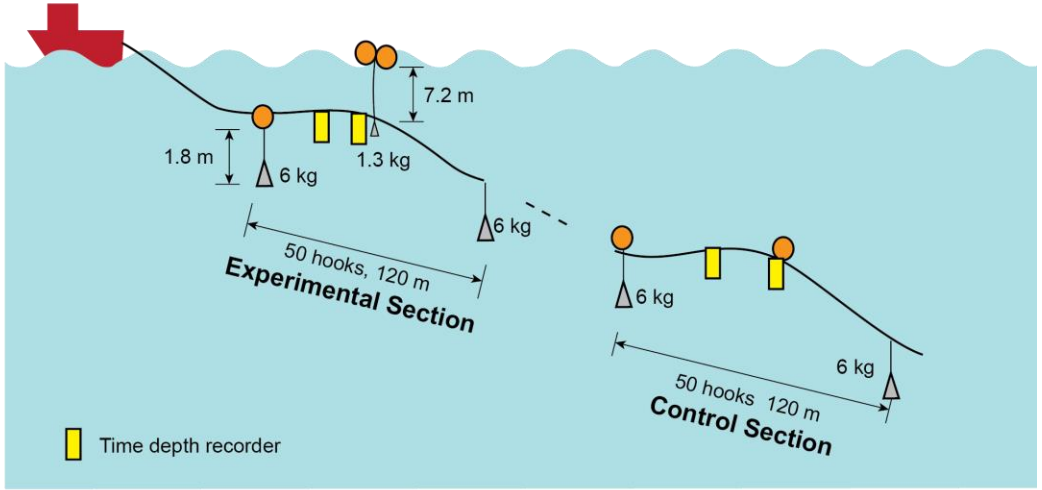
Figure 9. Depth over time for TDRs deployed on control (red) and experimental (green) sections on Vessel A, by target and backbone type. Points show individual records with lines plotting smoothed mean depth and shaded areas showing +/- s.d..

Results – Gear modification Vessel B

Vessel B, bluenose target, 5 mm monofillament backbone



Vessel B, red snapper target, 3 mm monofillament backbone



Vessel B, schoolshark target, 5 mm monofillament backbone

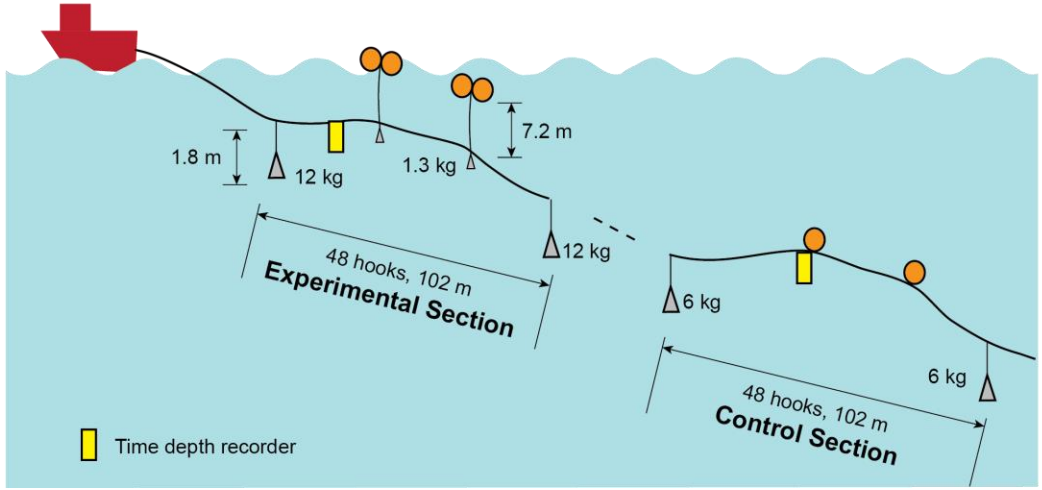


Figure 10. Diagram showing gear modifications made on Vessel A, by target species.

Results – Depth profiles Vessel B

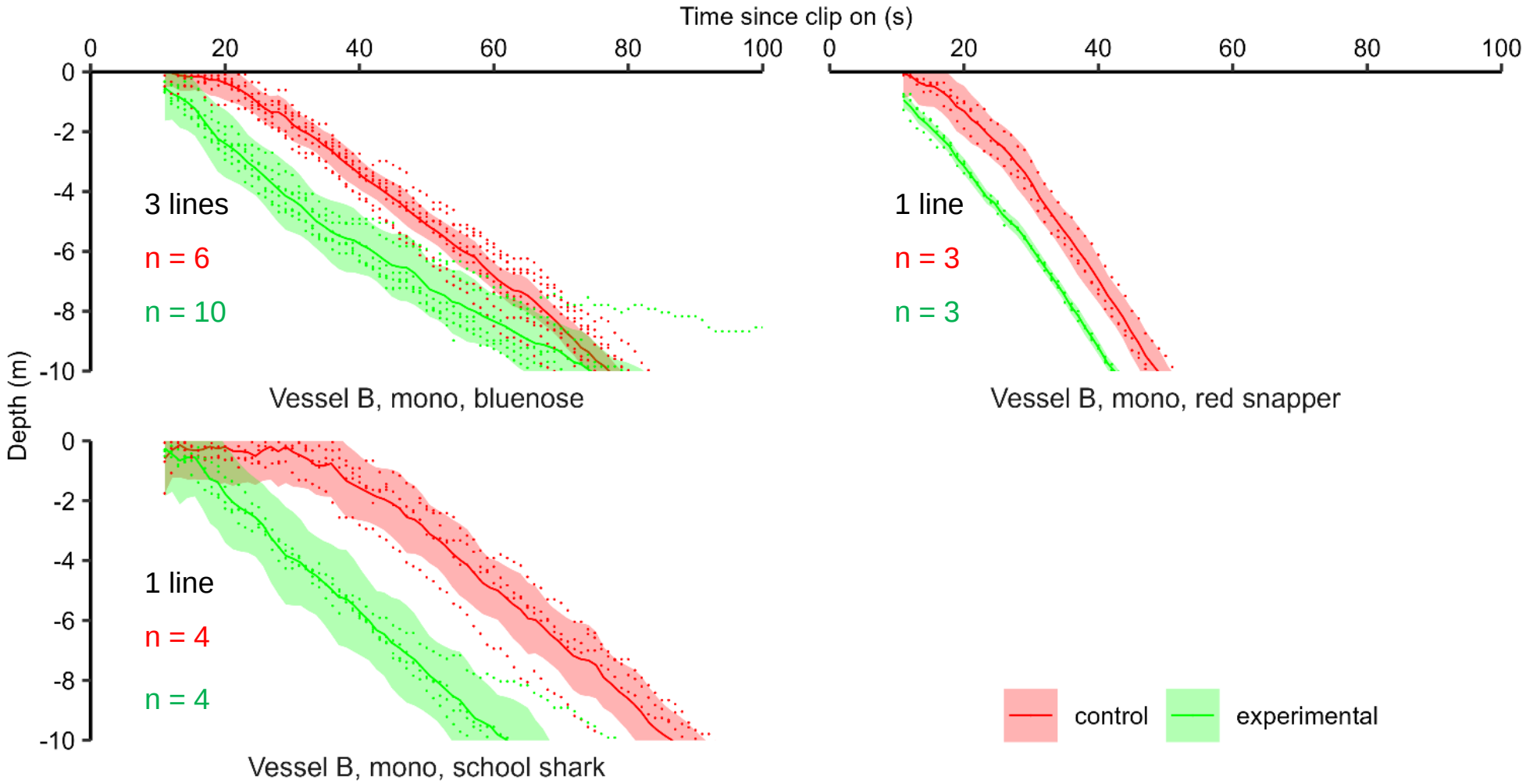


Figure 11. Depth over time for TDRs deployed on control and experimental sections on Vessel B, by target. Points show individual records with lines plotting smoothed mean depth and shaded areas showing +/- s.d..

Results – Catch comparison Vessel A

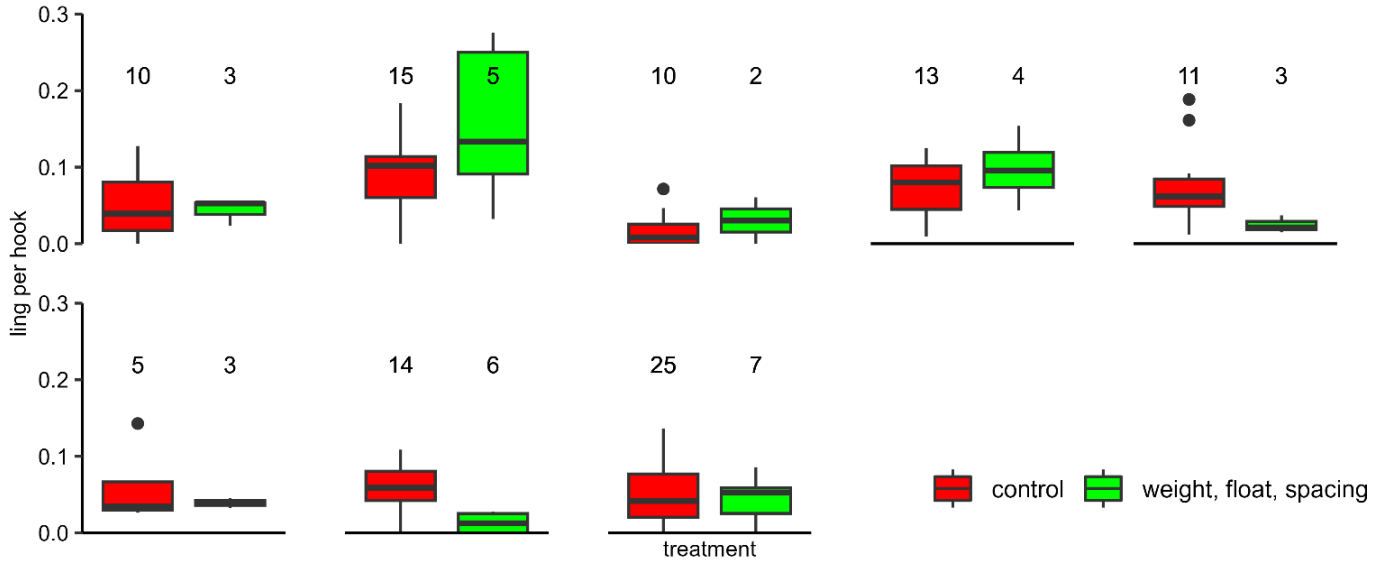


Figure 12. Catches of ling on rope lines from Vessel A, by line and treatment (control vs increased weight size, closer weight spacing and modified floats). Numbers above boxes show number of line sections in each treatment.

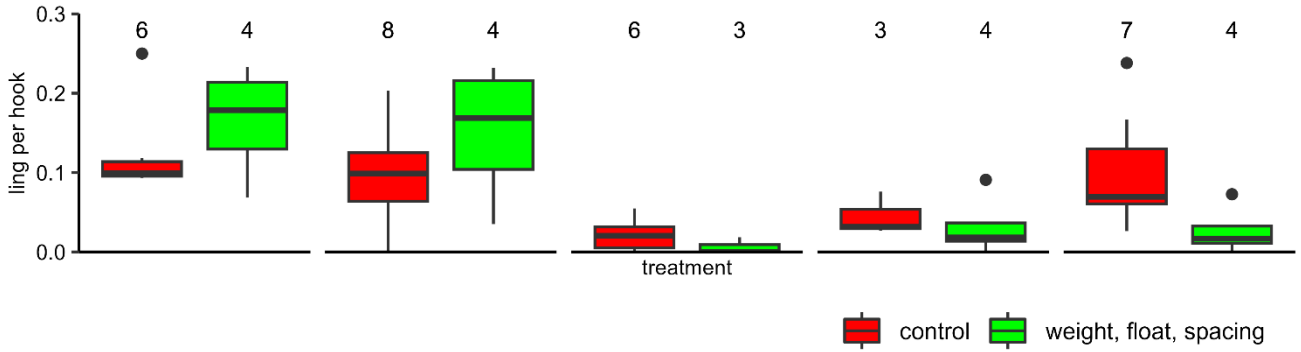


Figure 13. Catches of ling on monofilament lines from Vessel A, by line and treatment (control vs increased weight size, closer weight spacing and modified floats). Numbers above boxes show number of line sections in each treatment.

Note – lower catches in latter sets on experimental gear (and higher bait returns) indicates that it may have been too floaty.

Results – Catch comparison Vessel B

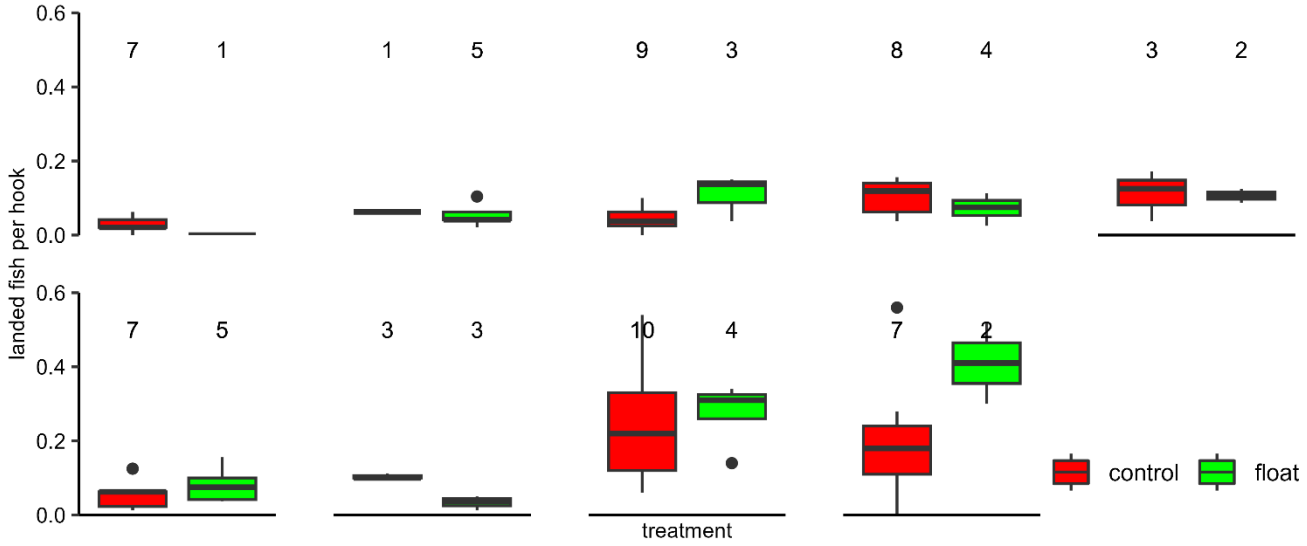


Figure 14. Catches of all fish on Vessel B, by line and (control vs modified floats). Numbers above boxes show number of line sections in each treatment.

Catches were often patchy on both vessels, especially when fishing features and targeting marks. Sometimes some of the line just ‘misses’.

Skippers can still alter gear ‘floatiness’ to maximise catch rates whilst maintaining 5 m at the end of the tori line.

Results – Workability

165 modified float deployments

- 2 x tangles with mainline (due to catch up on seabed)
- 2 x floats didn’t fully unwind
- 1 x float in propellor

Skippers and crew generally unfazed by extra work / hassle (but may be different on different boats).

Could also have a separate bin of ropes and weights to add to floats – would give more flexibility, skippers may prefer this.

Likely don’t have to use modified floats on first float or two in a multi-float setup.

Conclusions / Recommendations

Five metres is achievable for floaty setups (whilst still catching fish).

For vessels that are struggling to meet the 5 m at the end of the tori line:

- Maximise tori aerial extent
- Use modified floats
- Use heavier weights
- Reduce weight spacing

Promote uptake using a vessel by vessel approach.

Get skippers measuring depth at end of tori line

- User friendly TDRs.

Acknowledgements

I would particularly like to thank the following people:

- Skippers and crew for unwavering help, can do attitudes, and good company.
- Igor and Tiffany at DOC, for help and support.
- Zac Olsen.
- Tim at Stark Bros Ltd.

Funding was from the Department of Conservation, through CSP project MIT2023-07A and levied from the following stocks: BNS1, 2, 3, 7, 8, LIN1, 2, 3, 5, 7.