MIT2023-07 Novel seabird bycatch mitigation for floated demersal longline fisheries

Project Objectives:

1. To identify potential novel options to mitigate seabird bycatch in floated demersal longline fishing gear.
2. 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.

Department of Conservation
Te Papa Atawhai

New Zealand Government

September 2023

Project scoping

1. Recap on recent research.

2. Recommendations from MIT2022-02.

3. Discussion on
   - Priorities
   - Additional ideas
   - Recommendation refinements

Department of Conservation
Te Papa Atawhai

New Zealand Government

September 2023

Reducing sink times to depth in the small vessel manual baiting demersal longline fishery targeting species such as ling and bluenose.

D. Goad, Z. Olsen

DOC CSP Technical Working Group 8 June 2023 (available online)
Summary at TWG 5 September 2023
Contract reference: MIT2021-03B
Prepared by Vita Maris

Methods summary

Reviewed current gear setups (PSRMPs)

Tested a series of gear configurations in use and faster sinking alternatives

Also trialled: hooks / no hooks

monofilament nylon and rope backbone

increased line tension

with / against tide

Tested sink time to 6 m for TDRs placed half and three-quarters of the way after a weight (approximately the slowest sinking hook)

Also tori lines: 100 m aerial section

7.3 m high pole

various drag options

Tori lines

Need much more drag at lower speeds

Series drag options performed better

- More consistent drag
- Best compromise enough drag without being too long / bulky

Figure 13. Tori line aerial and drag sections

Table 1. Summary of tori trials

Drag section description	Speed (knots)	Min aerial extent (m)	Max aerial extent (m)	Min drag (kg)	Max drag (kg)
18 m 32 / 52 mm rope with 8 cones, 30 m 9 mm + 30 gillnet floats	3.0	95	105	12	15
	2.5	75	100	10	13
	2.3	70	75	8	9

Overall results summary

Our benchmark was a 70 m tori at 3 knots (or 100 m at 4 knots).

60 m spacing: 6 or 9 kg weights ok, usually only 1 float anyway.

120 m spacing: 9 kg weights ok, but needed: heavier weights (15kg), or modified floats for 3 float setups.

180 m spacing with 3 floats: Required: modified floats (12 kg weights), or 15 kg weights and 2 fm ropes.

150 m spacing: 15 kg weights, 3 floats ok

240 m spacing: about the limit with 4 fm modified floats, 4 float setup

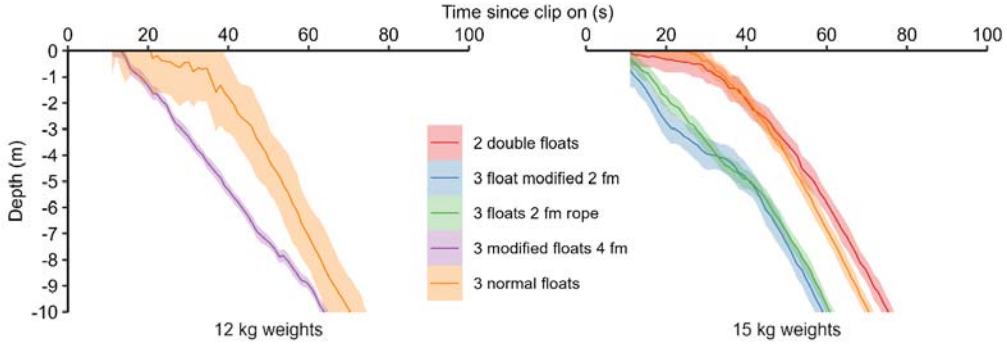


Figure 14. Depth over time for TDRs placed on last float for configurations with 180 m weight spacing

Conclusions

Results should be useful for fishers and liaison officers, and hopefully improve compliance

Should be broadly applicable across the fleet, noting potential influence of other variables e.g. backbone, tension etc.

Options for fishers:

- Shoot with tide
- Improve tori lines
- Larger weights (and / or reducing spacing maybe)
- Modified floats / increased tension likely necessary for weight spacings > 150 m

Regulations are achievable

But not sure of trade-offs in a fishing context

(time, catch rates, modified float practicality)

Recommendations

Trial legal gear setups during a normal fishing trip (catch rates / practicality / trade offs).

Check PSRMPs to ensure that all gear configurations in use are recorded, with a vessel-derived sink time to five metres.

Collate and review vessels' sink rate data (target vessels that need to improve sink times).

Use the information presented here to support fishers both generally,

for example in port-based workshops, and individually, for example on fishing trips.

Improve tori lines. Include tori (drag) specifications on PSRMPs.

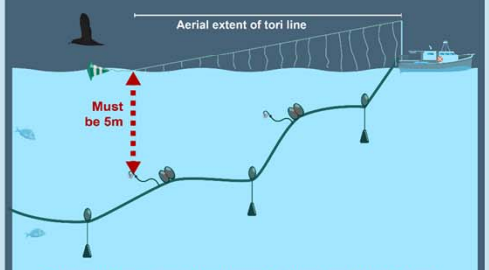
Train and brief observers to audit PSRMPs and provide feedback to fishers .

Expecting fishers (and observers?) to measure the sink time to depth for the slowest hook is probably unreasonable. The regulations could be simplified, especially as 5 m is arbitrary.

Presenting results to fishers

Keep seabirds from accessing hooks

New Regulations (August 2021)



The regulations require the slowest sinking hook to be at least five metres deep before the end of the tori line aerial extent.

During high-risk periods tori line aerial extent must always reach at least 50 m.

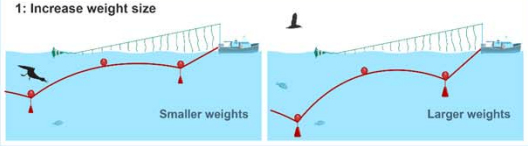
Three guiding principles to improve tori line aerial extent

1. Increase the height of your tori pole
2. Increase drag to hold up longer tori lines
3. Make aerial sections lightweight so they are easier to hold up
   The recommended aerial section of tori line is 3 mm dyneema with light streamers.

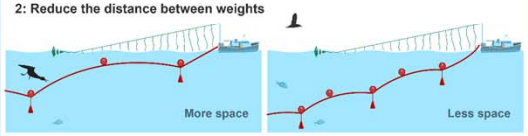
If this still doesn't provide enough aerial extent, reduce weight spacing and / or use larger weights.

Seven guiding principles to help sink your line closer astern

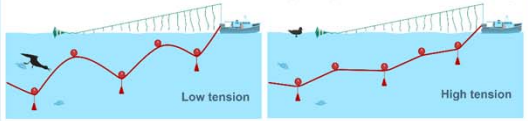
1: Increase weight size



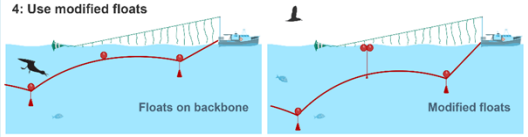
2: Reduce the distance between weights



3: Increase line tension *More tension on the line speeds up sink rate for hooks between weights*



4: Use modified floats



5: Increase line weighting on rope backbone
Larger diameter and rope backbones sink slower, so require more weight.

6. Reduce setting speed
Hooks will sink closer to the boat and reduce the aerial extent required.

7. Set with the tide
Lines set into the tide will sink slower

Tables for estimating required tori line aerial extent (m)

Look up different gear set-ups in the tables below to estimate the tori line aerial extent required to protect hooks up to a depth of 5 m.

Tori aerial extent required : Green = recommended < 70 m Orange = difficult to achieve Grey = not recommended

Gear setup			Tori aerial extent	
spacing	weight	floats	3 knots	4 knots
60 m	6 kg	0	49	65
60 m	6 kg	1	57	76
60 m	9 kg	0	57	76
60 m	9 kg	1	46	61
120 m	6 kg	0	88	117
120 m	6 kg	1	102	136
120 m	6 kg	2	109	145
120 m	6 kg	3	136	181
120 m	9 kg	0	56	75
120 m	9 kg	1	66	88
120 m	9 kg	2	77	103
120 m	9 kg	2 modified	57	76
120 m	9 kg	3	88	117
120 m	9 kg	3 modified	54	72
120 m	12 kg	0	56	75
120 m	12 kg	1	59	79
120 m	12 kg	2	77	103
120 m	12 kg	3	80	107
120 m	12 kg	3 modified	63	84
120 m	15 kg	2	63	84

Gear setup			Tori aerial extent	
spacing	weight	floats	3 knots	4 knots
150 m	15 kg	1	59	79
150 m	15 kg	3	69	92
180 m	12 kg	1	82	109
180 m	12 kg	2	100	133
180 m	12 kg	2 modified	66	88
180 m	12 kg	3	83	111
180 m	12 kg	3 modified	68	91
180 m	15 kg	3	91	121
180 m	15 kg	2 double	97	129
180 m	15 kg	3 modified (2fm)	74	99
240 m	15 kg	3 modified	60	80
300 m	15 kg	4 modified	71	95

Numbers will vary between boats so this should only be used as a guide.
These guidelines are based on trials conducted with a free-wheeling hydraulic drum with 6 mm mono backbone, lead weights,150 mm diameter hard floats, weights on 3.6 m rope droppers. Lines set into the tide, and with rope backbones, will sink slower

Modified floats consisted of two 150 mm floats on 4 fathom (7.2) m ropes (unless stated otherwise), with a 1.3 kg lead weight at the clip.

Tori line drag sections require thick rope and / or multiple cones, especially at low speeds.

Potential mitigation research proposals arising from MIT2022-02 social research report

#	Recommendation	Potential research project
1	Engage with hāpuka and bluenose fishers on a way forward	Further testing of mitigation options on this gear type. (weighted floats, etc.)
2	Consider solo fishers who are not able to meet the 50-metre aerial extent	Further testing and refinement of tori lines suitable for slow setting speed
3	Engage with fishers on deploying a streamer line in a strong following tide	Further testing and refinement of tori lines in these conditions (see also #7)
6	Engage with fishers on safety risks with tori lines at night or in rough weather	Investigate safety risks and identify potential solutions to the risks
7	Engage with fishers on how to have the streamer line protecting the baits at all times, even in a crosswind	Further testing and refinement of tori lines in these conditions (see also #3)
8	Continue research into underwater bait setters and line suppressors	Planned under MIT2023-06
11	Engage with fishers on how to reduce tangles with mitigation gear	Assess mitigation specifications with respect to likelihood of tangling
12	Engage with fishers on issues with heavier weights	Assess sink rates for a range of different configurations (e.g. more lighter weights vs heavier weights)
14	Address difficulties with implementing bottle tests	Testing and refinement of materials and protocols for bottle tests
15	Consider whether official sink rate tests need to be recorded via other methods (rather than bottle tests by fishers)	Further development of an adaptive management tool for line setting (MIT2018-03)
17	Continue engaging with fishers on workable hauling mitigation device solutions	Planned under year 2 of MIT2022-01

Department of Conservation
Te Papa Atawhai

New Zealand Government

September 2023