# MIT2018-03: Setting mitigation for small longline vessels

## Development of an Adaptive Management tool for line setting: progress report
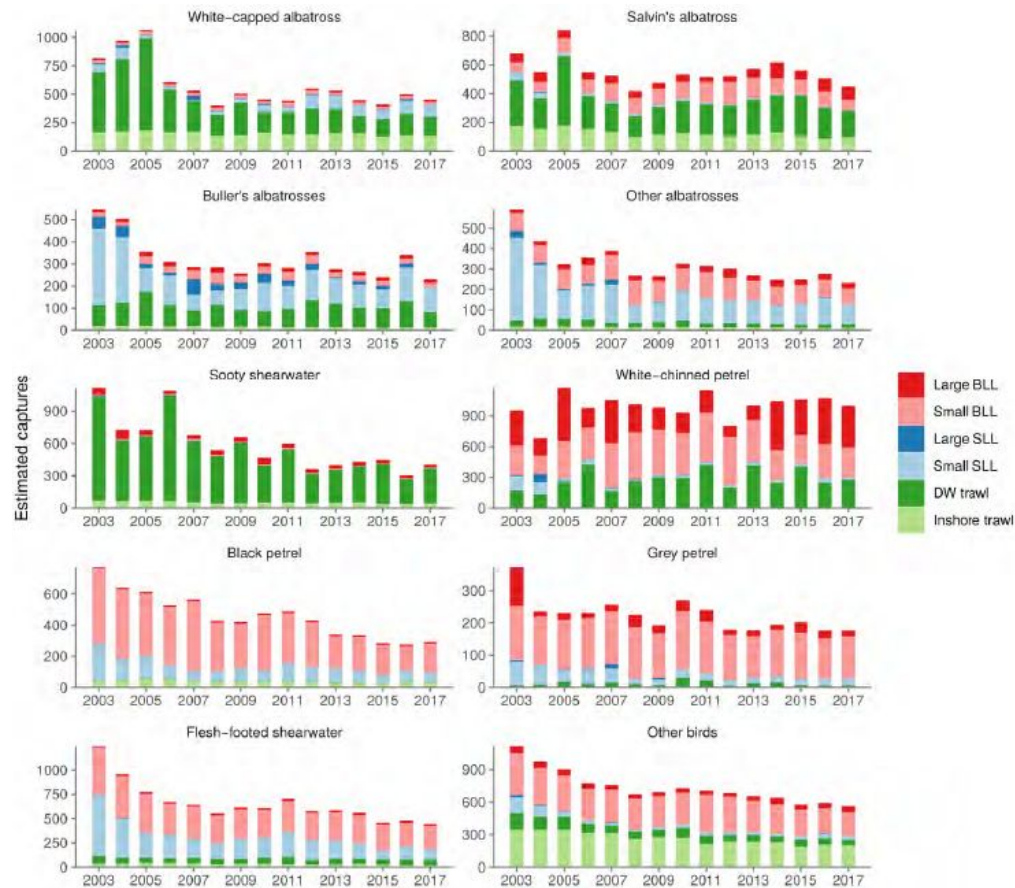
David Middleton, Brianna King, Oliver Wilson

# Rationale

Small vessel surface (SLL) and bottom longline (BLL) fisheries pose a risk to several seabird species



MPI AEBAR 2019, Figure 8.7

# Nature of the risk (1)

- Risk arises due to seabirds foraging on baited hooks, particularly during line setting

- Mitigation focuses on limiting seabird access to hooks within diving depths



Flesh-footed shearwater (both images).      Photos: RR

From Friesen *et al.* 2017. Diving & foraging behaviour of petrels & shearwaters. Final report for CSP project INT2015-04.

# Nature of the risk (2)

- Deep dives are possible
  - e.g. Rayner et al recorded a maximum of 66.5m for flesh footed shearwaters

- But most dives are shallow
  - Bell (2016), 1673 dives of black petrels
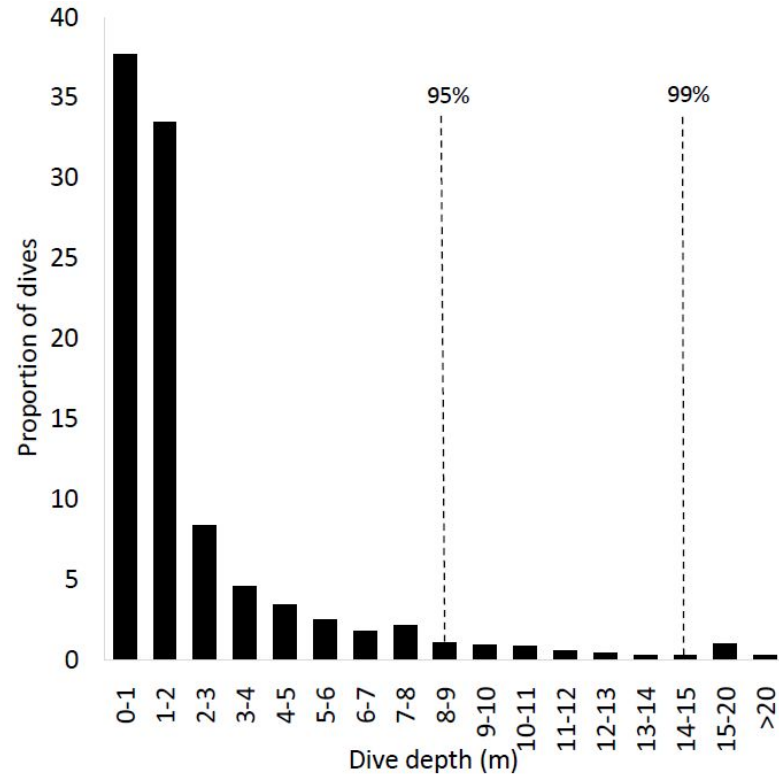


From Bell, E.A. 2016. Diving behaviour of black petrels (*Procellaria parkinsoni*) in New Zealand waters and its relevance to fisheries interaction. *Notornis* 63 (2): 57-65.

# Statutory mitigation requirements

- Surface longline
  - Fisheries (Seabird Mitigation Measures – Surface Longlines) Circular 2019
  - Applies to any commercial fisher when setting surface longlines
  - Requires use of hook shielding devices or a streamer line, and either setting at night and/or use of a prescribed line weighting regime
  - Streamer line specifications vary depending on the length of the vessel

- Bottom longline
  - Fisheries (Seabird Mitigation Measures – Bottom Longlines) Circular 2018
  - Applies to commercial fishers using bottom longlines
  - Requires the use of a streamer line while setting on vessels >= 7 m overall length, line specifications that vary depending on the length of the vessel
  - Requires night setting unless a defined line weighting regime is followed
  - Restrictions on offal discharge

# Longline sink rates

- Regulations specify a 'one size fits all' approach to weighting regimes

- Actual sink rates vary, e.g.:
  - Target species
  - Gear configuration
  - Oceanographic conditions
  - Setting speed
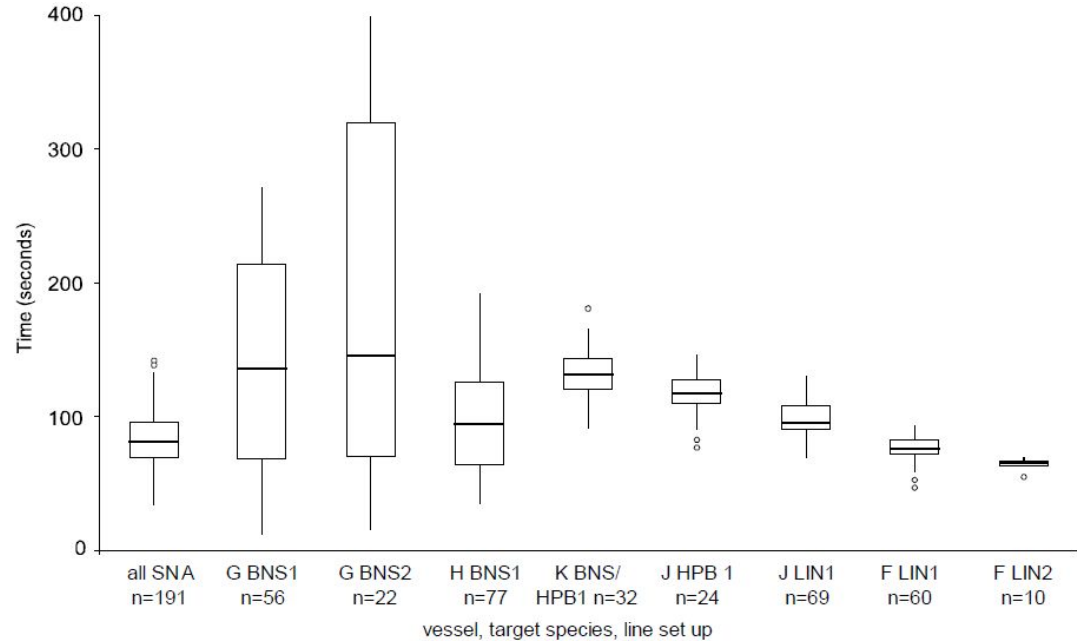


From Goad, D. 2011. Development of mitigation strategies: inshore fisheries. Final report for CSP project MIT2010-01

# Project goal

To provide fishers with 'real time' information on realised line sink rates to allow adaptive management of fishing practices to mitigate the risk to seabirds within a trip

# Approach

- Routine deployment of time-depth recorders on longline sets
  - Zebra-Tech 'Wet Tags'

- Collect data from a large number of sets to better understand variation

- Provide fishers with data on sink rates to facilitate on water adaptation



Original version

Revised version

# Wet Tags

- Long battery life (> 5 years)
- Automatic recording when immersed (pressure sensor)
- Bluetooth data download
- 5 s sampling interval
- Original logging interval 1 to 24 hours (mean depth/temperature)
- Modified firmware:
  - Record at 5 s interval to depths of 20 m
  - Record at 1 min interval when deeper than 20 m
- Using 150 m maximum depth version to provide greatest resolution
- 1.5 m activation depth

# Project progress

- 10 initial sensors with revised firmware
- Two test trips, ongoing use on one vessel
- Email data submission
- *Addressed issues with data download*
- Revised firmware, updated app
- Updated wet tags received for deployment on 9 BLL and 9 SLL vessels
- *COVID-19 hiatus*
- Dispatch to vessels
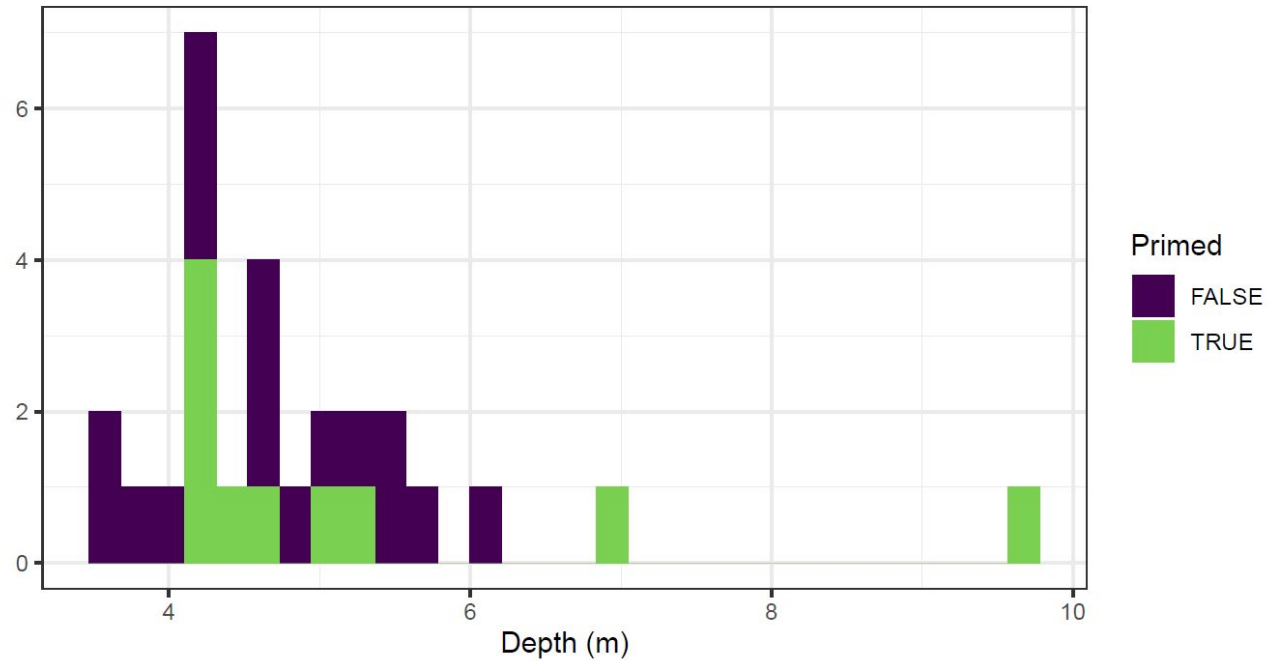- **Routine data collection**
- **Adaptive management app**

# Initial at-sea testing

- September 2019
- 9 tags deployed on three sets
- Tested 'priming'
- Developed data processing
  - 10 min threshold to identify 'real' deployments
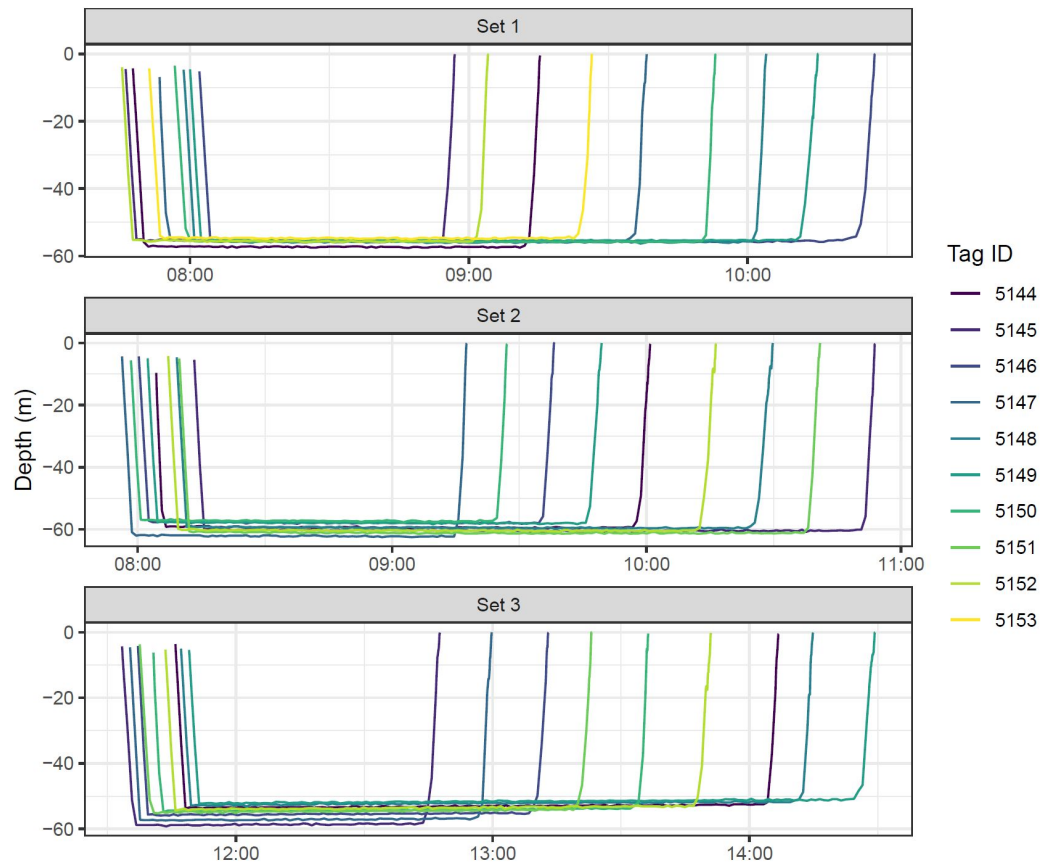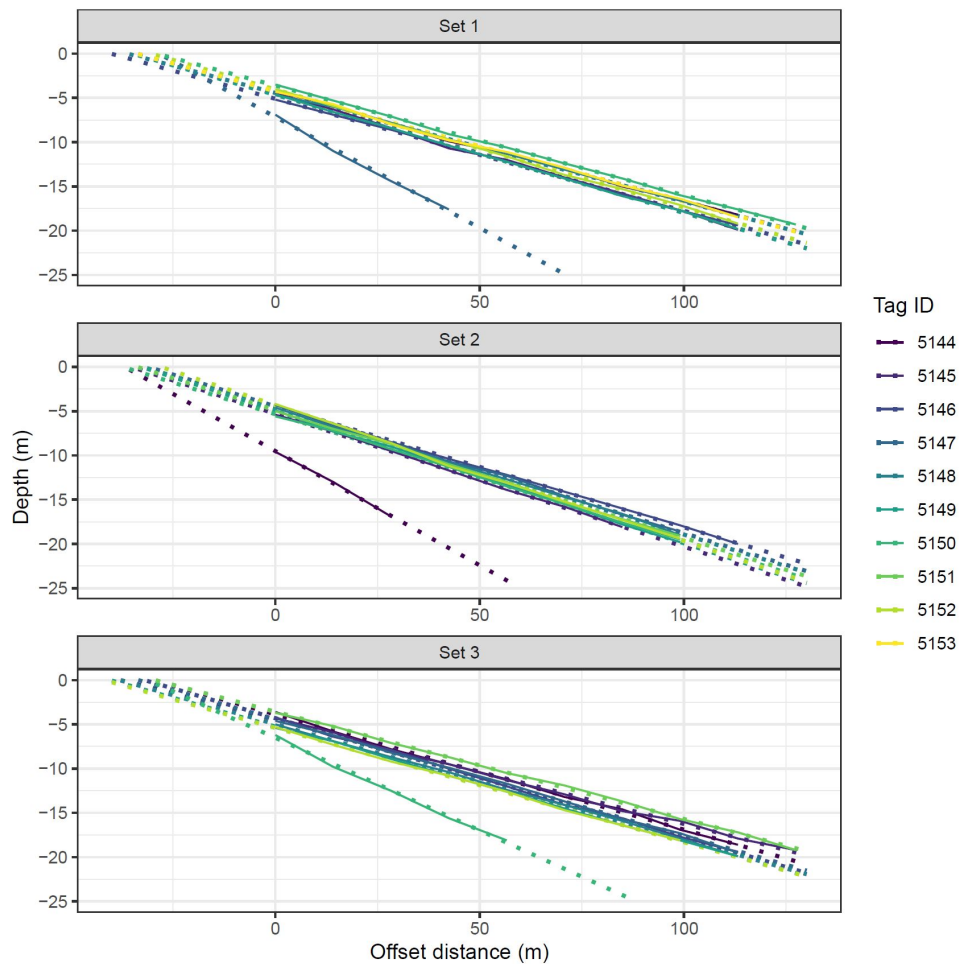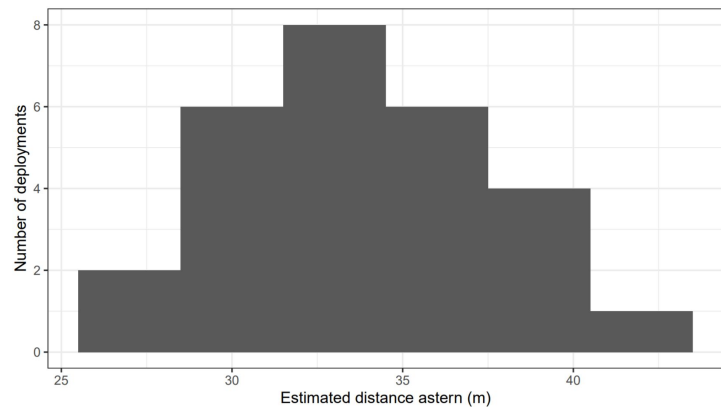
# First depth recording

# Sink rates (in top 20m)

| | | | | Deployment order on line | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Set | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 0.380 | 0.385 | 0.348 | 0.355 | 0.713 | 0.351 | 0.342 | 0.380 | 0.355 |
| 2 | 0.409 | 0.397 | 0.392 | 0.426 | 0.730 | 0.434 | 0.411 | 0.403 | 0.423 |
| 3 | 0.331 | 0.372 | 0.380 | 0.344 | 0.595 | 0.366 | 0.375 | 0.372 | 0.362 |
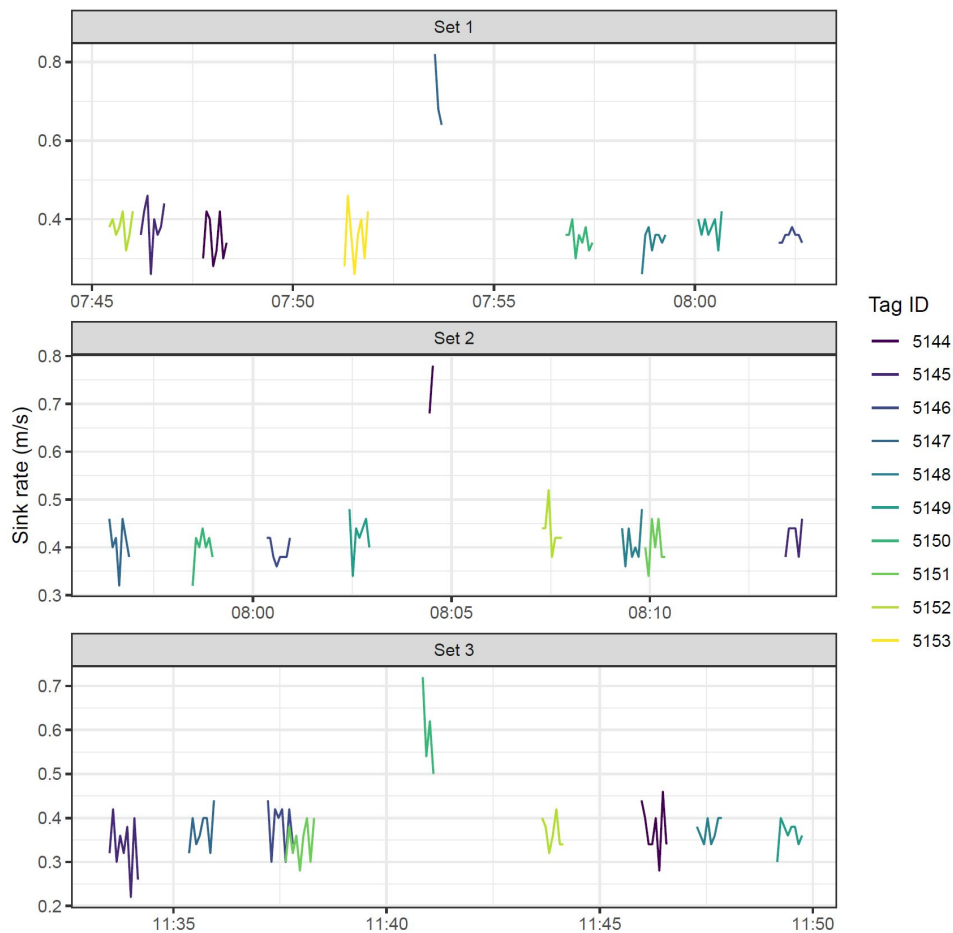
# Depth vs distance astern

# Estimated depth at 50 m astern

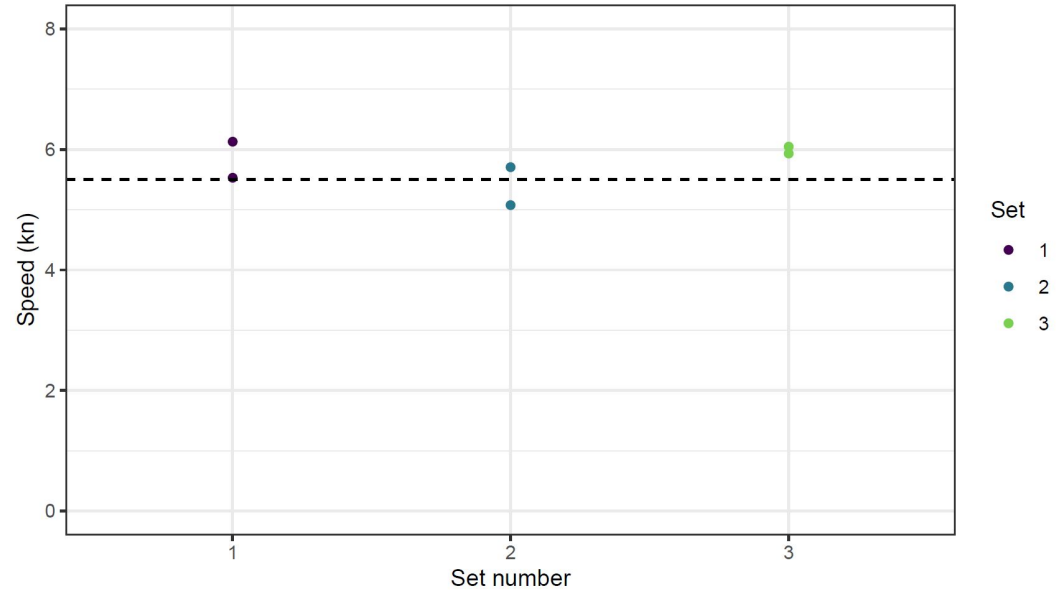Interested in depth of hooks when the line moves outside the area covered by the streamer line

Two methods:

- Linear model of depth vs distance
- Apply mean sink rate to time taken to travel 50 m
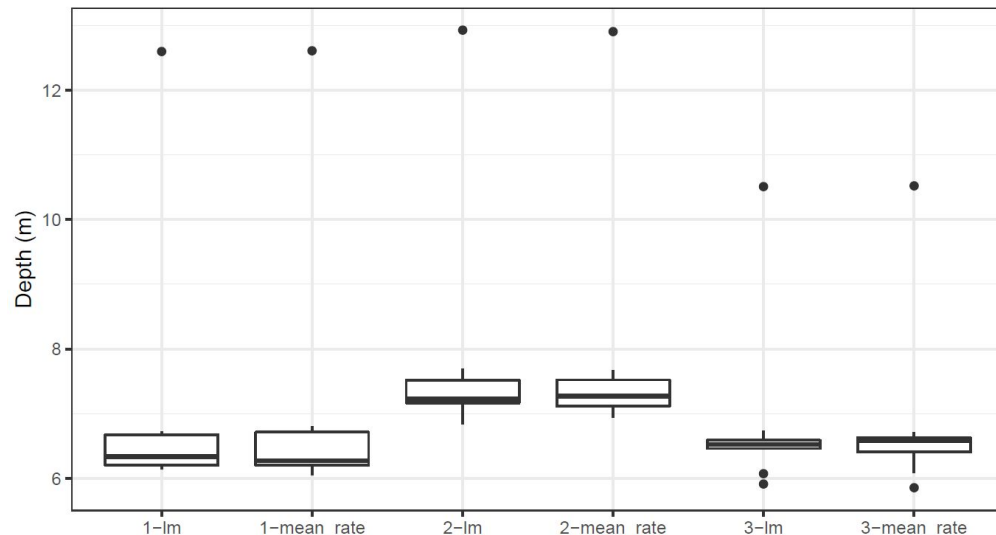
# Setting speed

- Assumed 5.5 kn

- Some variation evident in estimates from VMS data during setting
  - 5 min interval
  - Assumed straight line between positions
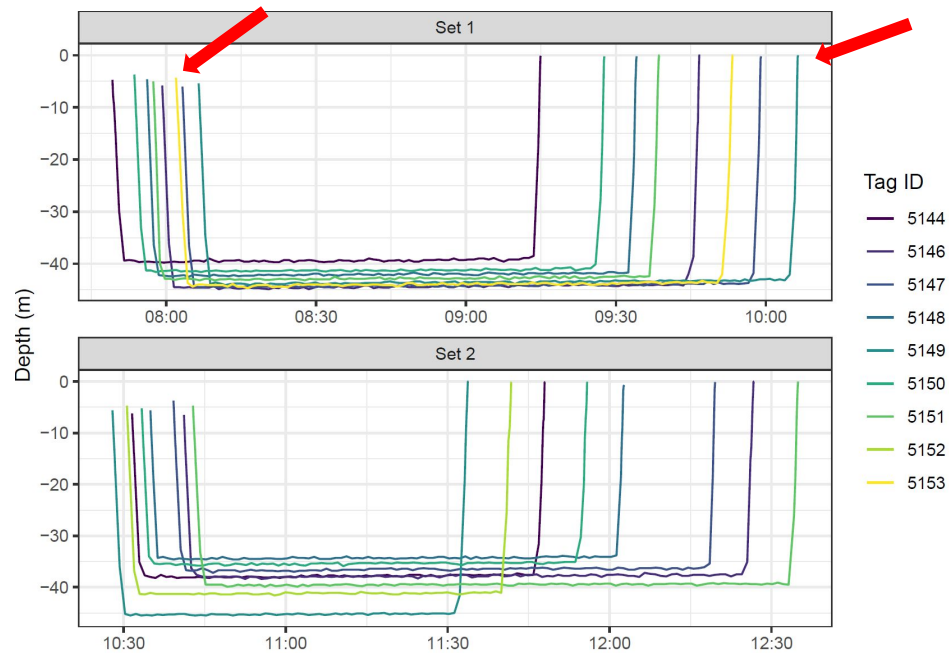
# Follow up testing

- Focussed on verifying assumptions relating to initial sink rate
  - Impact of delay in Wet Tag initial data recording
  - Reasonableness of constant sink rate assumption

- Paired deployments of Wet Tags and CEFAS G5 data storage tags (2 sets)

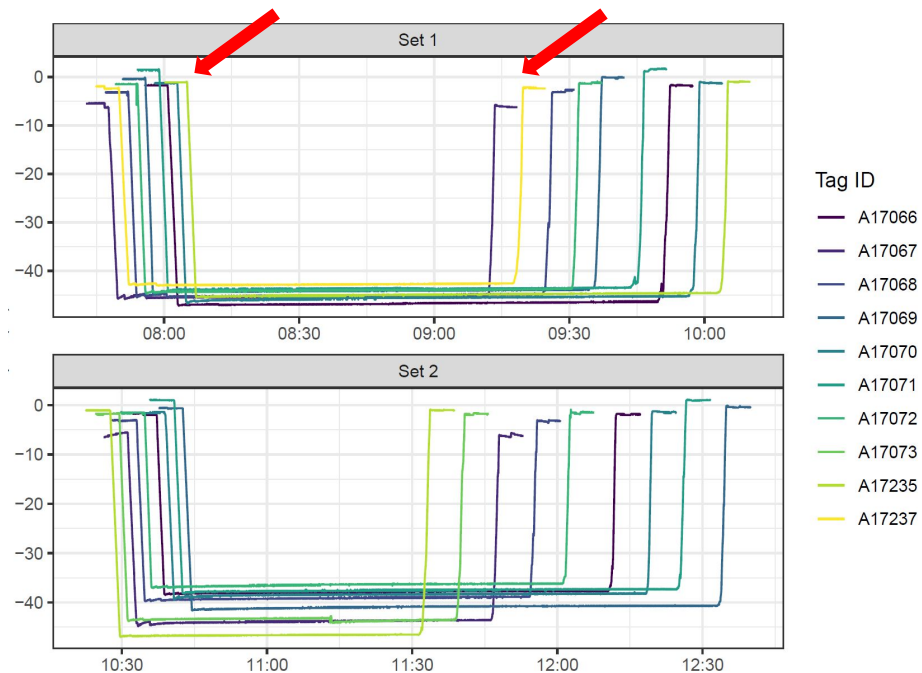- G5 tags recorded at 1 s interval from 06:30 to 17:00



CEFAS Technology G5 Data Storage Tags
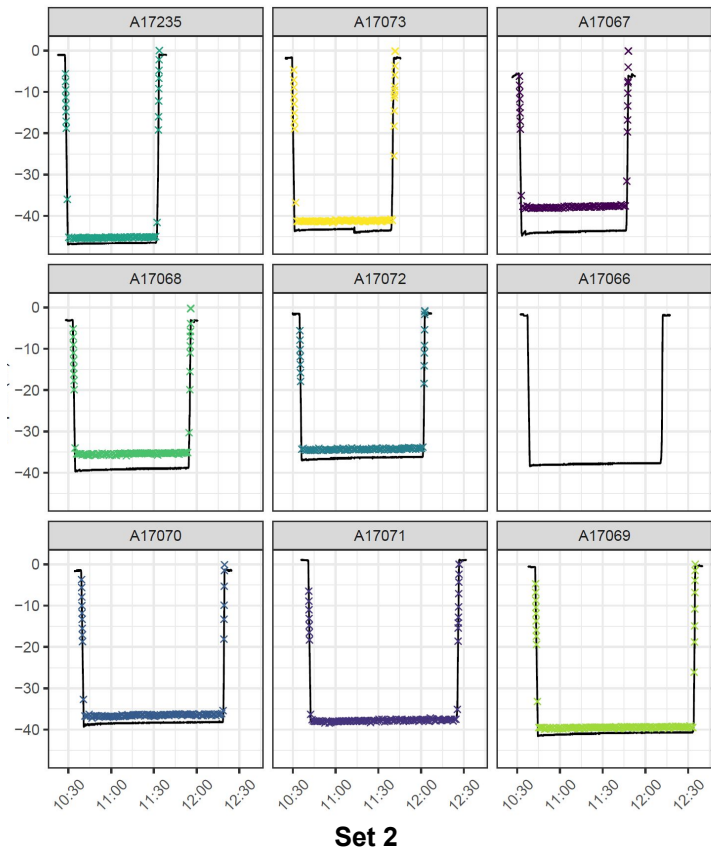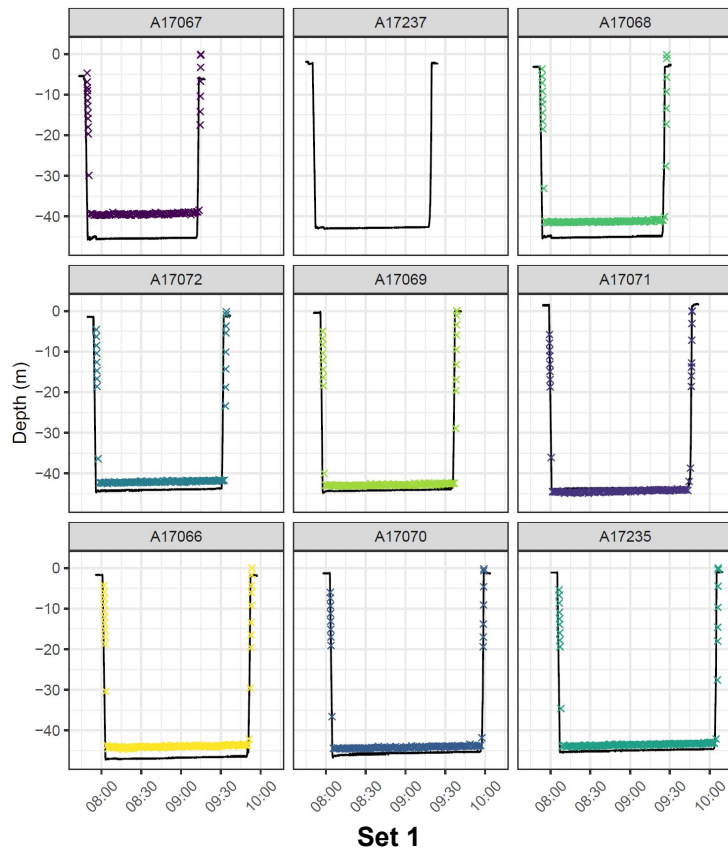
# Raw profiles



**Wet Tags**

**CEFAS DSTs**

# Identification of tag pairs

Match tag data based on time

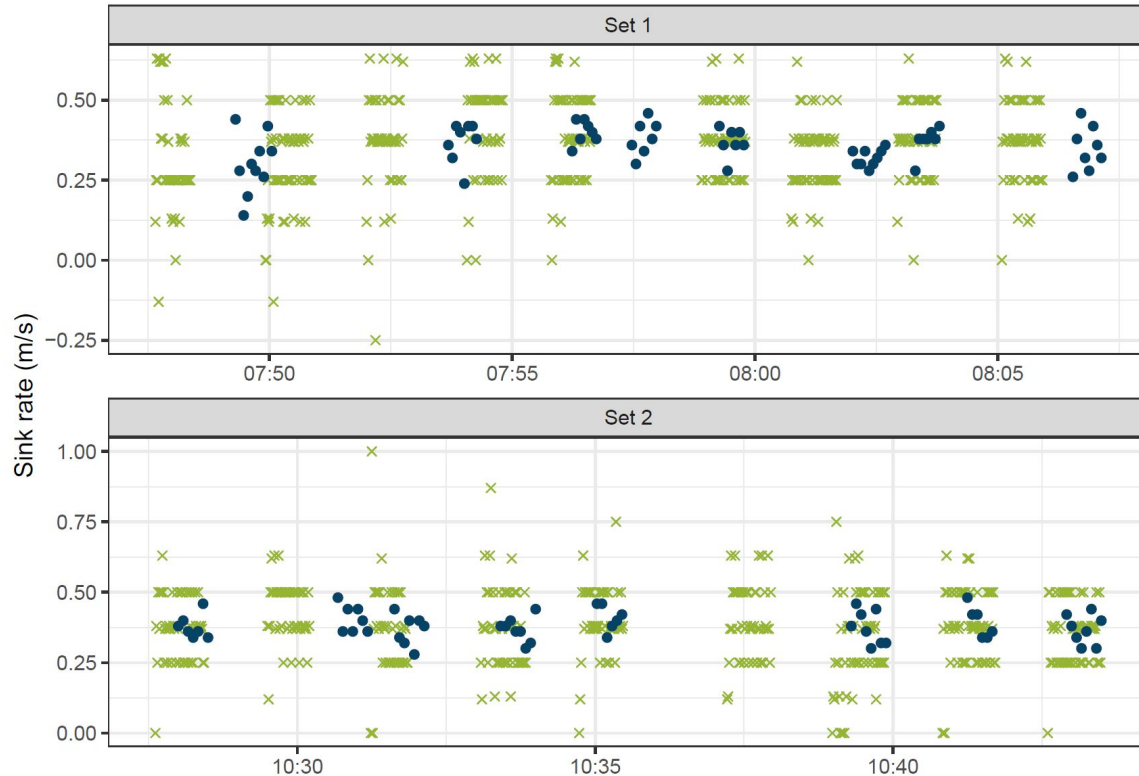Black lines = CEFAS DST
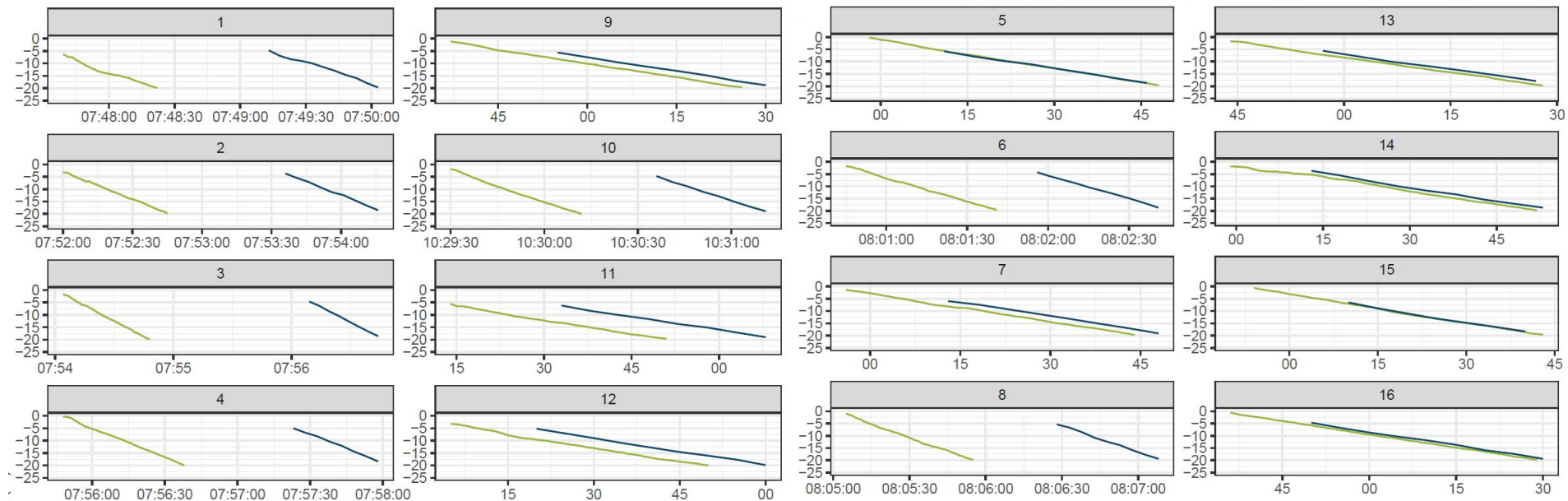
Coloured points = Wet Tags

# Sink rates from different tag types



Green crosses = CEFAS DSTs

Blue points = Wet Tags

# Depth vs time for different tags



Green lines = CEFAS DSTs          Blue lines = Wet Tags

# Conclusions (to date)

- Wet Tags are suitable for measuring longline sink rates
- Assumption of a constant sink rate is reasonable
- Sink rates vary within a set (proximity to weights etc.)
- For initial trip typical sink rates 0.3 to 0.4 m/s; equivalent to 6 to 8 m at 50 m astern
- Mid-line sink rate ~ 0.7 m/s; equivalent to 10 to 13 m at 50 m astern

# Next steps

- Deployment on 9 BLL and 9 SLL vessels
  - 3 vessels, 9 tags per line
  - 6 vessels, 3 tags per line

- Tags deployed each set

- Data emailed to central DB

- App giving real time feedback to fishers

- 30 September completion
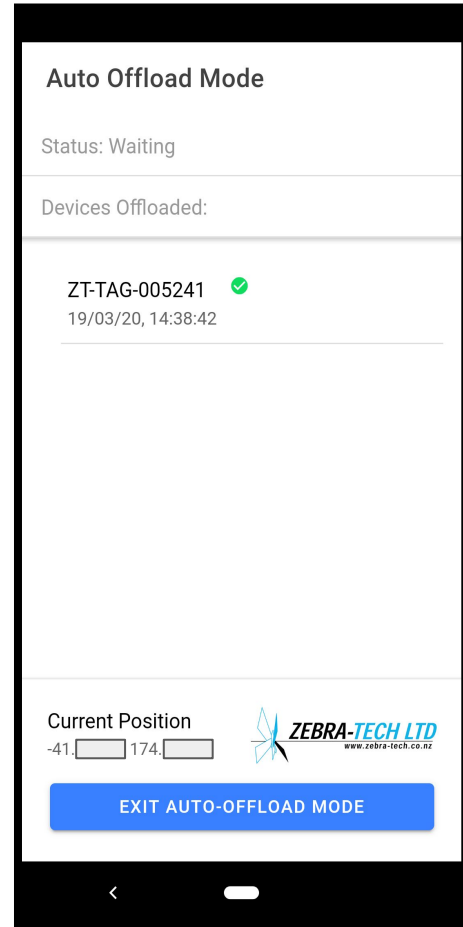
# Acknowledgements

- Department of Conservation (funding, CEFAS TDR loan, patience)
- Zebra-Tech Ltd (sensors, download app)
- Wild Fish NZ Ltd (initial testing)

https://xkcd.com/2055/