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Agenda Item 5.1

Agreement on the Conservation
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Characterisation of subsurface float configurations used by New Zealand small vessel demersal longliners

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SUMMARY

As part of investigations to develop seabird bycatch mitigation strategies in small vessel demersal longline fisheries in New Zealand, data was collected on the configuration and performance of subsurface float configurations. This included describing line sink profiles through the use of time depth recorders. This paper summarises the characterisation relevant to the use of different float configurations. Float-rope length and float associated weights were also manipulated in order to investigate the influence on sink rates, and results are presented. Extending float ropes produced faster and more even sink profiles, reducing sink times for fishing configurations where the line is floated above the seabed.

Caracterización de las configuraciones de los flotadores subsuperficiales utilizados por palangreros demersales pequeños en Nueva Zelanda

RESUMEN

Como parte de las investigaciones que buscan desarrollar estrategias de mitigación de la captura secundaria de aves marinas en pesquerías con palangre demersal de Nueva Zelanda donde operan barcos pequeños, se recolectaron datos sobre la configuración y el rendimiento de las configuraciones de los flotadores subsuperficiales. Dichos datos incluyeron las descripciones de los perfiles de hundimiento de las líneas mediante el uso de registradores de tiempo y profundidad. Este informe resume la caracterización pertinente para el uso de distintas configuraciones de flotadores. Además, se manipularon las pesas de los flotadores y el largo de la soga a fin de estudiar cómo influyen en las tasas de hundimiento; los resultados obtenidos están incluidos en el presente documento. La extensión de la soga de los flotadores dio como resultado perfiles de hundimiento más rápidos y uniformes, lo que redujo el tiempo de hundimiento para las configuraciones de pesca en las que la línea flota sobre el lecho marino.

Caractérisation des configurations de flotteurs profonds utilisés par les petits palangriers de fond en Nouvelle-Zélande

RÉSUMÉ

Dans le cadre de recherches visant à développer des stratégies d'atténuation de captures accessoires d'oiseaux de mer dans les pêcheries de petits palangriers de fond en Nouvelle-Zélande, des données ont été recueillies relativement à la configuration et à la performance de configurations de flotteurs profonds. Il s'agissait, entre autres, de décrire des profils d'immersion de palangre à l'aide d'enregistreurs de profondeur-temps. Le présent document résume la caractérisation découlant de l'utilisation de différentes configurations de flotteurs. La longueur de ralingue de flotteurs et les poids des flotteurs ont eux aussi fait l'objet de manipulations afin d'étudier l'influence des vitesses d'immersion. Les résultats sont d'ailleurs disponibles. La pose de ralingues de flotteurs a généré des profils d'immersion plus rapides et plus équilibrés, réduisant les temps d'immersion dans les configurations de pêche où la palangre est immergée au-dessus du fond marin.

1. INTRODUCTION

This paper summarises aspects of the study reported by Pierre et al (2013) that are relevant to subsurface floats and seabird bycatch. It may be desirable for fishers to 'float' longlines above the seabed for a number of reasons including: targeting species of fish which feed off the seabed (e.g. bluenose), reducing bait loss to benthic invertebrates, and reducing the chance of longlines getting stuck on 'foul' or rugged ground. In many cases floats can be used in conjunction with a weight, however at times floats are attached directly to the longline, between weights.

The full study reported by Pierre et al (2013) also included consideration of a range of other factors related to seabird bycatch in New Zealand small vessel demersal longlingers. The full report is available online: http://www.doc.govt.nz/our-work/conservation-services-programme/csp-reports/2012-13/reducing-seabird-bycatch-in-inshore-bottom-longline-fisheries/.

2. METHODS

Primary data collection undertaken during this study was carried out by experienced government fisheries observers. Observers were briefed in detail prior to their deployments, and debriefed after returning from each voyage. The duration of observers' time on vessels was determined by each skipper's willingness to host them, and the potential for modifying and improving mitigation approaches. Bottom-longline vessels were selected for inclusion in the current project based on a number of criteria, including the target fish species, the port of departure, the location and timing of fishing activities, the interest in bycatch reduction approaches, and the willingness and capacity to host observers. Observers recorded a number of variables including gear characteristics and setup.

Longline sink rates were recorded using six to 12 time-depth recorders (TDRs, Starr-Oddi DST centi-TD, including a time stamp). Protocols for deploying TDRs were developed from previous research in bottom-longline fisheries (Goad et al. 2010, Goad 2011). TDRs were programmed, using SeaStar software, to record data for the period 30 minutes before to 45 minutes after the expected longline shooting time. Before deployment, TDRs were located in a container of seawater and recorded data every 30 seconds. Water in the container was changed at least every 10 minutes. From the earliest possible shot time and the expected time of the end of the shot, TDRs sampled every second. While the line soaked, TDRs sampled every 10 minutes. Finally, TDRs were programmed to sample once every 24 h for 2040 days if the line was lost.

Information collected before and after TDRs deployment included water depth, tidal flow and direction, weather including atmospheric pressure, wind speed and direction, swell height and direction, and vessel course. For each TDR, the TDR number, position on the line, time it left the vessel, and time it entered the water were recorded. Gear setup was also recorded in detail for each longline deployed with TDRs, including vertical and horizontal distances between the backbone at the stern and the water surface, the dimensions and order of hooks, weights and floats, snood spacing, length, diameter, material and breaking strain, and lengths of float and weight ropes used. TDRs were clipped onto the longline at setting. After hauling, TDRs were downloaded using Sea Star.

The positions of TDRs on longlines was varied, depending on the aspect of the line set that was of interest in each trial (see below). We aimed to place TDRs towards the centre part of lines, i.e., away from the larger end weights or grapnels. On sets targeting snapper, the end weights reached the seabed prior to TDR deployment. Gear targeting bluenose, which involves fishing in deeper water, was often still sinking at completion of the set. Therefore, TDR deployments commenced at least two full sections into the set – typically 100 hooks into a 300- to 800-hook set.

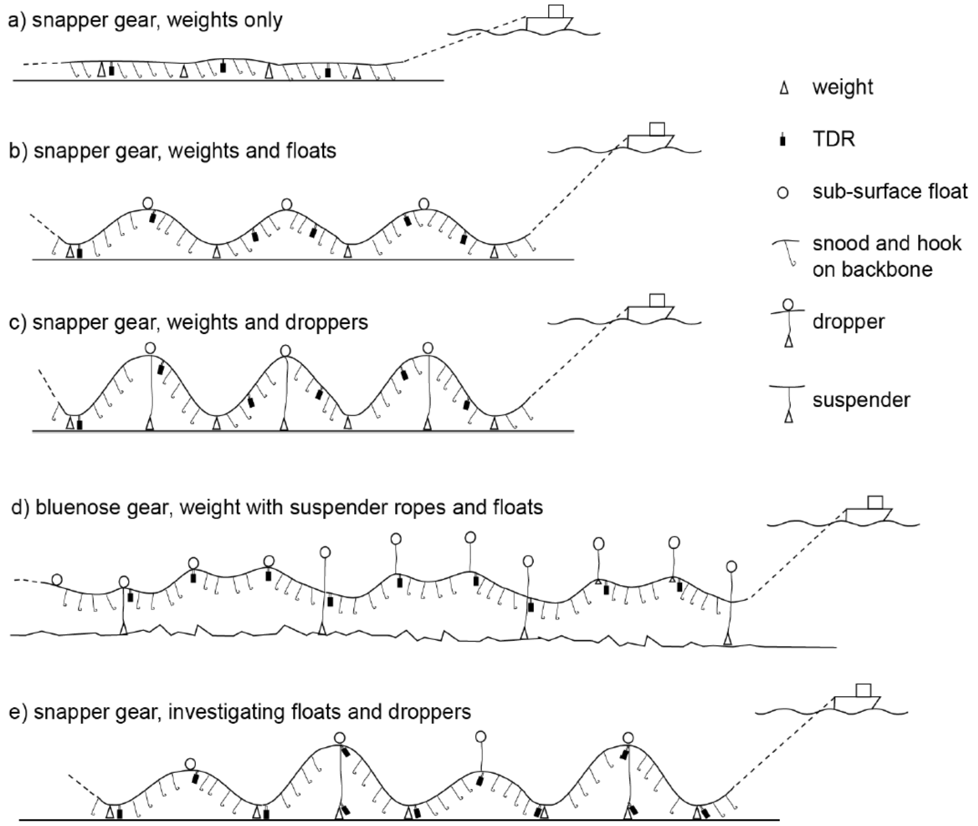

Figure 1. Position of time-depth recorders (TDRs) on bottom longlines, relative to hooks, weights and floats to investigate sinking rates in snapper (*Pagrus auratus*) and bluenose (*Hyperoglyphe antarctica*) target fisheries. This figure appears as Figure 1 in Pierre et al (2013).

Floats attached directly on longlines between weights may reduce the sink rate of the longline backbone and consequently the attached hooks (though if proportionally heavier weight is used to offset the buoyancy of the float then it may sink at the same rate). Extending float-ropes may increase sink rates for the depth commensurate with the length of the float rope (Goad et al. 2010, Goad 2011). Investigation of new mitigation measures in this study included extending the length of ropes used on subsurface floats.

On one vessel targeting snapper, the effect on sink rate of extended subsurface float-ropes was measured on five sets using TDRs. Normal practice for this vessel included the use of one float, or very occasionally two floats between (typically) 2 kg steel weights. The purpose of this setup was to keep hooks slightly off the sea bed. The vessel used two 60 mm diameter setnet floats tied together and clipped directly onto the longline. Ropes were added to the floats, initially with a total length of 3 m, and then 5 m. For the experimental floats, extra buoyancy was added by using one or two extra setnet floats offset by a small weight (0.1 - 0.2 kg) at the clip attached to the backbone of the longline. The addition of extra buoyancy and weight facilitated the extension of the longer float-ropes. Ten or 12 TDRs were deployed on each line, on sections with and without longer float-ropes.

Longer float-ropes were also trialled on two vessels targeting bluenose. On the first vessel, ropes were extended from 0.4 m to 5 m and trialled on eight sets. Extended ropes were trialled on normal - sized (diameter of 150 mm) floats for one set in which two floats were placed between 6 kg concrete weights. Larger floats (two floats 100 mm in diameter) with a 0.2 kg weight at the clip were trialled on a further seven sets, again using concrete weights. For these seven sets repeated line setups were three floats, 6 kg of weight, three floats, 6 kg, three floats, 12 kg (two sets), three floats, 12 kg (one set), three floats, 6 kg, two floats, 12 kg (three sets) and three floats, 12 kg, two floats, 6 kg (one set). Six or seven TDRs were deployed on each line on sections with and without longer float-ropes, aiming to cover all float and weight positions equally over the trip, with and without longer float-ropes.

On the second vessel, two sets were sampled, both with two floats between 6 kg steel weights. On both the sets, ropes were extended from 0 m to 5 m in length. On the first of these two sets, longer ropes were used with the vessel’s normal-sized 150 mm diameter floats. On the second set, 5 m ropes with larger floats (two floats 100 mm in diameter) and a corresponding 0.2 kg weight at the clip were used. Twelve TDRs were placed on each line: three on a normal section (with floats directly on the backbone), followed by six along two sections with longer ropes, and then three on a normal section.

Data collected by TDRs were downloaded at sea. A correction to the raw TDR data was applied, following similar methods to those in Goad et al. (2010). This correction comprised two parts. First, an offset was applied such that TDR readings were 0 m at the sea surface. Second, readings of surface temperature were corrected because TDRs take some time to acclimatise to a change in temperature, and use temperature readings when converting pressure readings to a depth.

The time TDRs left the vessel was used as a start time to determine the time that TDRs took to reach a given depth. Similarly, vessel speed was used as a multiplier to estimate the distance astern TDRs reached a given depth. On one vessel the times recorded on deck were not synchronised to the TDR clocks and so a single correction was applied across all times, based on other information recorded at the set and TDR temperature records. This resulted in slightly less accurate start time, within an estimated error of 2 seconds.

3. RESULTS

On the vessel targeting snapper, the modified gear setup involving float-ropes extended to 3 m in length, and where 0.1 to 0.2 kg weights were associated with floats, delivered increased sink rates compared to when shorter float-ropes without associated weights were used (Figure 2). Subsequently, the arrangement of float-ropes extended to 5 m, combined with four setnet floats and a larger weight at the clip, showed a more pronounced increase in sink rate (Figure 3).

There was no evidence from TDR records at fishing depth to suggest that line behaved differently on the bottom with the longer float-ropes. However potential differences were difficult to identify as movement of the line was generally caused by fish.

On the vessels targeting bluenose, float rope extensions were associated with increased sink rates with some line setups. On vessel P, TDRs beside floats tended to sink with a linear profile. However, due to several TDRs failing after the first set it was difficult to compare like for like when trialling float-ropes. TDR records did not show any increase in sink rate when using longer float-ropes, except during the one set sampled with three floats to a 12 kg weight. During this set TDRs were placed on a normal section, followed by a longer ropes section, and those on the section with longer ropes did show a slight increase in sink rate for all three positions (Figure 4).

On vessel Q, longer float-ropes were trialled on two sets targeting bluenose. An increase in sink rate was seen for both sets, most noticeably with the larger floats and a corresponding small weight at the clip (Figure 5).

Float-ropes did tangle around the backbone on several occasions, resulting in lost time during hauling. However tangles were generally resolved quickly and because the floats stayed on the surface they were less problematic than dealing with tangled weights. Having ropes wound directly around the floats made them easier to handle both at the set and the haul. Skippers on all three vessels were interested in the idea of separating the float from the backbone from a fishing point of view, and on several sets good catches were taken around the floats.

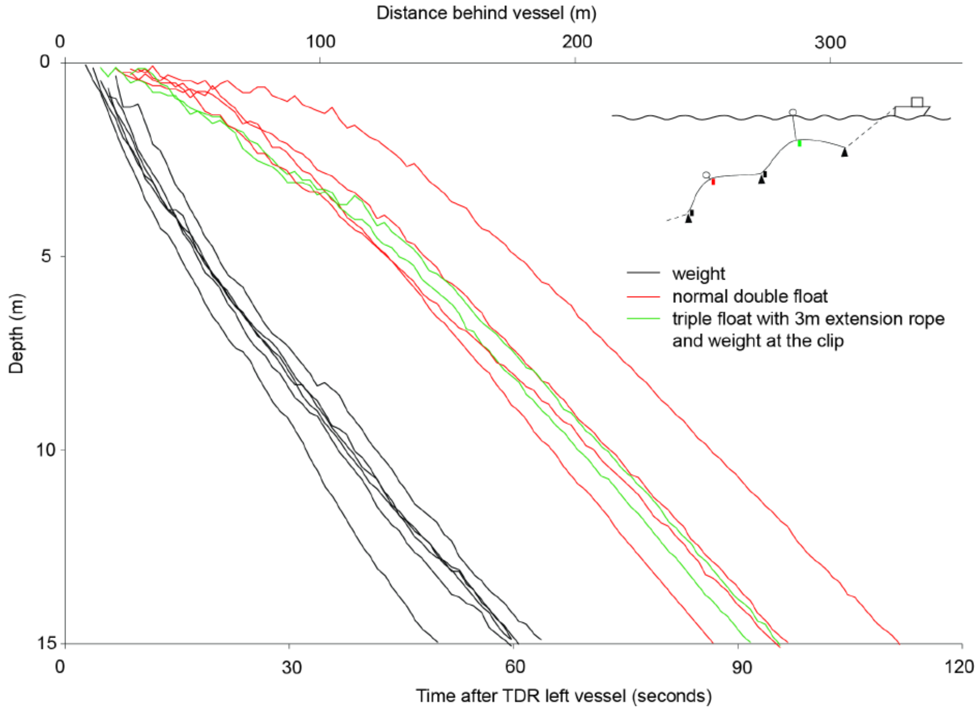

Figure 2. Time and distance versus depth for time depth recorders (TDRs) deployed on a single line beside weights, floats directly on the line and floats with 3 m rope. This figure appears as Figure 20 in Pierre et al (2013).

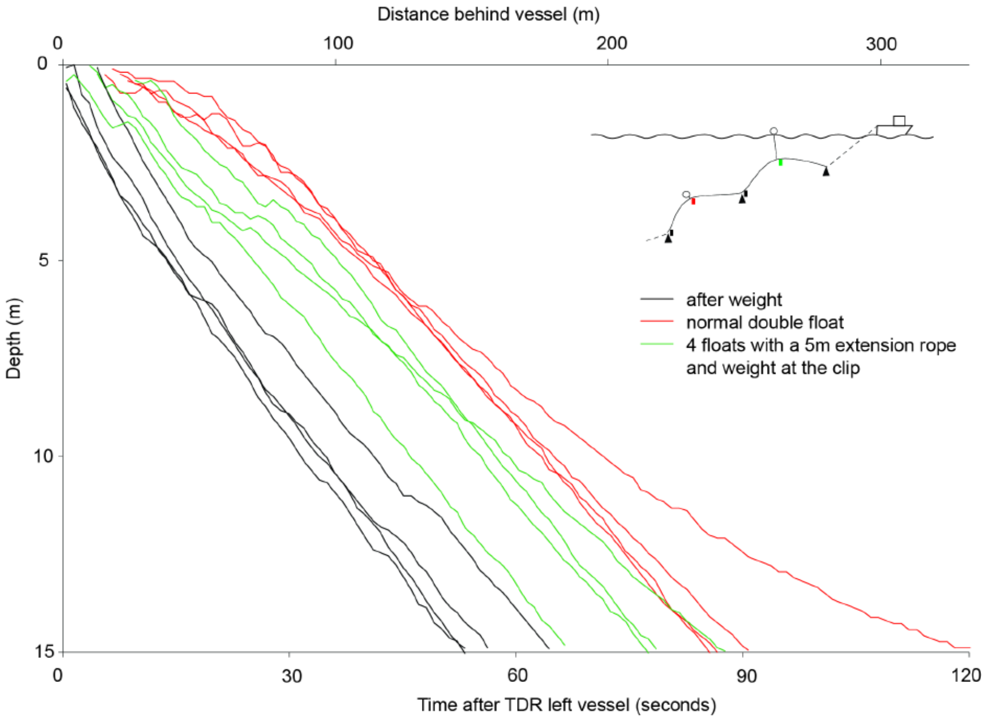

Figure 3. Time and distance versus depth for time depth recorders (TDRs) deployed on a single line beside weights, floats directly on the line and floats with 5 m rope. This figure appears as Figure 21 in Pierre et al (2013).

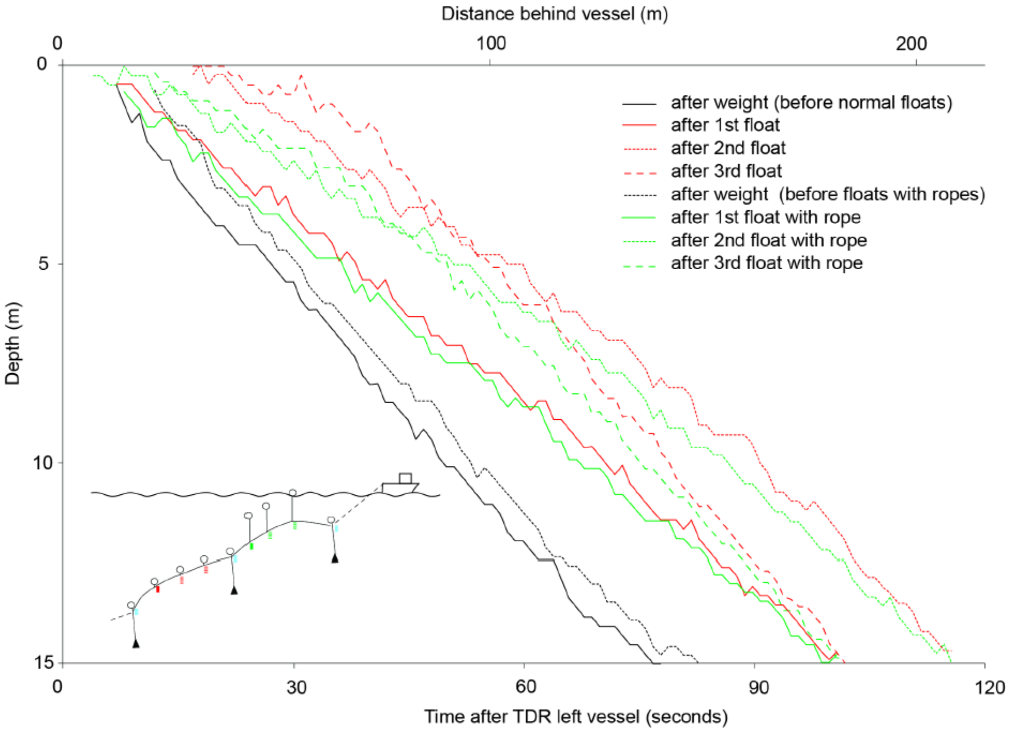

Figure 4. Time and distance versus depth for TDRs deployed on a single line beside weights, floats directly on the line, and floats with a longer rope. Data from vessel P. This figure appears as Figure 22 in Pierre et al (2013).

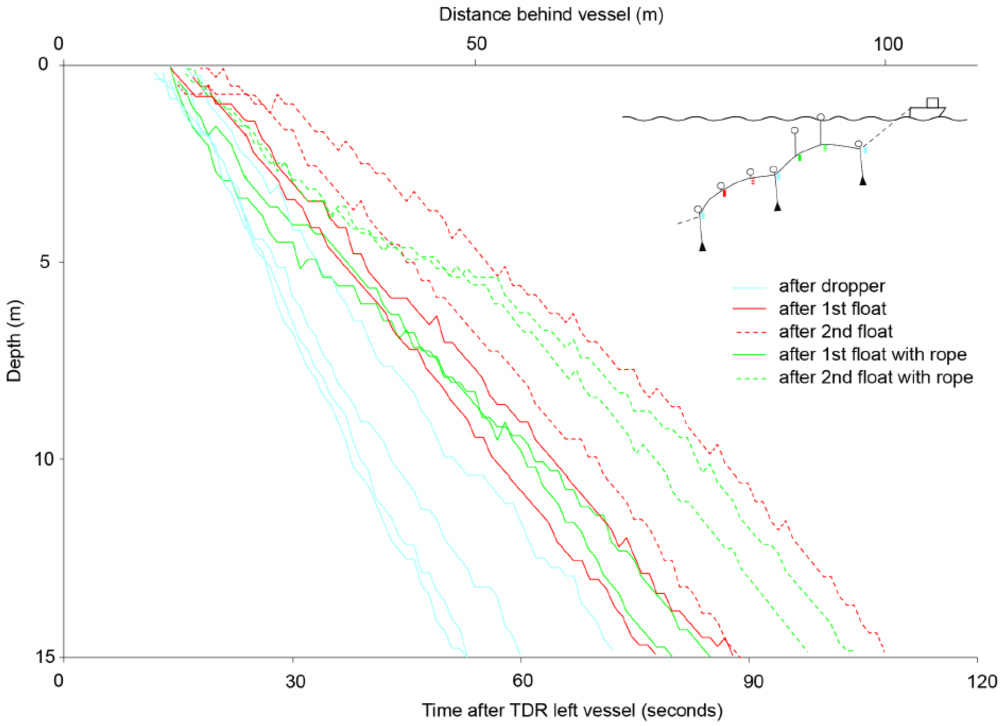

Figure 5. Time and distance versus depth for time depth recorders (TDRs) deployed on a single line beside weights, floats directly on the line, and floats with a longer rope. Data from vessel Q. This figure appears as Figure 23 in Pierre et al (2013).

4. CONCLUSION

Extending float ropes produced faster and more even sink profiles, thereby allowing sink times to be reduced when 'floating' longlines above the seabed.

REFERENCES

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