

# Cruise Report ZDLK3-10-2022

## Patagonian toothfish (*Dissostichus eleginoides*) tagging



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# ZDLK3 - 10 - 2022



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## Table of Contents

Summary .....	1
1. Introduction.....	1
1.1. Cruise aims and objectives .....	1
1.2. Vessel .....	1
1.3. Personnel and responsibilities.....	1
2. Methods .....	2
2.1. Cruise itinerary .....	2
2.2. Tagging protocol.....	3
3. Results .....	4
3.1. Tagging .....	4
4. Discussion.....	6
5. References.....	6

## Summary

Research cruise ZDLK3-10-2022 was conducted aboard the *CFL Hunter* between 24<sup>th</sup> October to 11<sup>th</sup> November 2022. The primary objective was to tag 800+ Patagonian toothfish. Routine scientific observation protocols were also carried out as detailed in Observer Report 1346 (FIFD, 2022). Overall, 825 conventional tags were deployed on Patagonian toothfish ranging from 63 to 152 cm total length, with the calculated weight of toothfish tagged and released totalling 8,414 kg. On average, 55 fish were tagged per line.

## 1. Introduction

The tagging programme for the Falkland Islands toothfish commenced in 2016, aiming to improve our understanding of toothfish movement patterns within the region. The initial goal of tagging 3000 fish was achieved during four tagging research surveys onboard the longliner in 2016-2018 (Randhawa and Lee 2016, Randhawa *et al.* 2017, Farrugia and Keningale 2018, Farrugia *et al.* 2018). In addition to surveys, Fisheries Observers have been tasked to tag an average of 25 toothfish per week during their trips onboard the longliner. However, the tagging programme has largely been reliant on dedicated research surveys; in their absence, the number of tagged toothfish declined considerably in 2019-2020. In response, a 4-year extension of the tagging programme has been recommended (Lee and Skeljo 2020) and followed up by renewed tagging effort in 2021 (Skeljo and Pearman 2021) with a goal of tagging ~1000 longline-caught fish annually, i.e. one fish per tonne of TAC.

During this tagging trip, a single observer undertook tagging during the first line hauled after each set. This was to increase the likelihood of fish survival through a reduction in the soak time. Tagging was also undertaken on a second line if required and if fish condition was considered suitable. The second observer undertook routine observer protocols as detailed in Observer Report 1346 (FIFD, 2022).

### 1.1. Cruise aims and objectives

The aim of the survey was to tag a minimum of 800 Patagonian toothfish to meet the annual objectives of the toothfish tag-recapture programme. The specific objectives were to:

- Tag at least 50 toothfish per day to ensure even coverage of the target areas, allowing for fish suitability.
- Collect catch composition and biological data from the Patagonian toothfish longline fishery according to routine scientific observer protocols.

### 1.2. Vessel

- CFL Hunter (ZDLK3), registered in the Falkland Islands.

### 1.3. Personnel and responsibilities

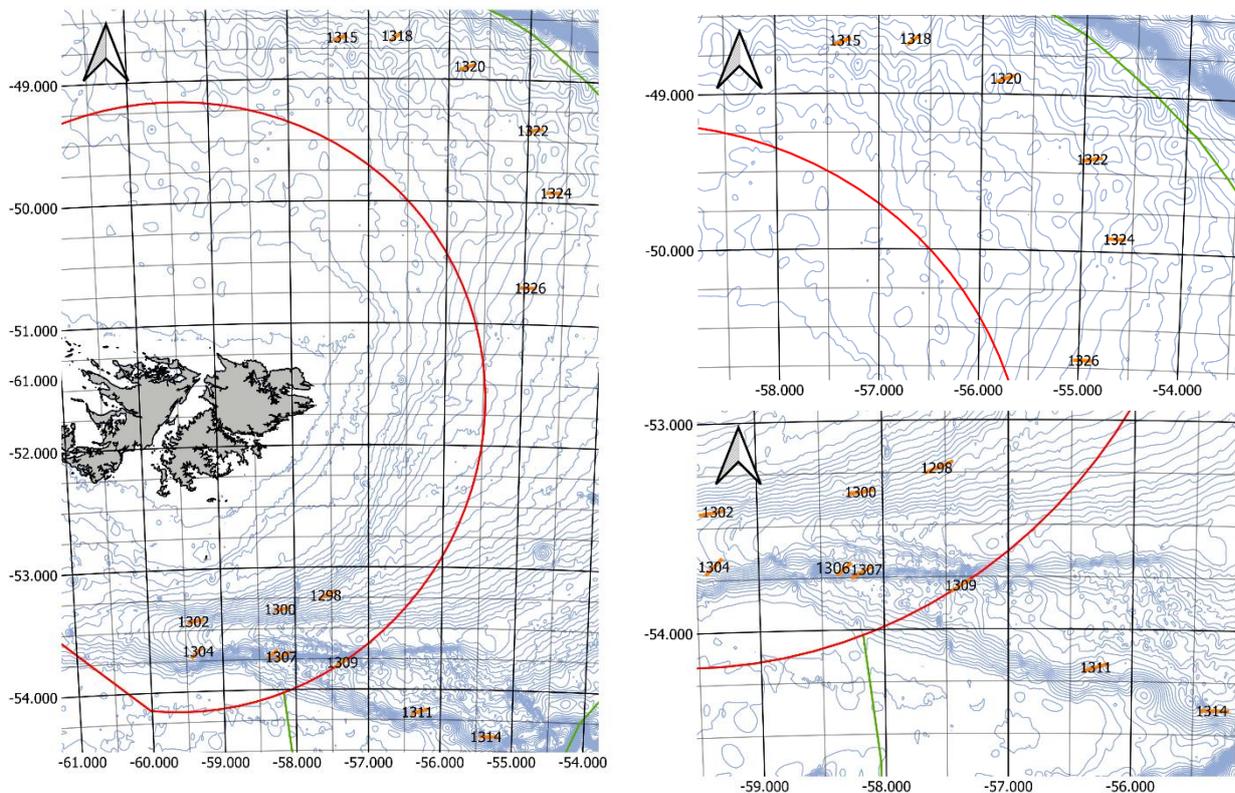
- Rebecca Nicholls (FIFD, Scientific Fisheries Observer): toothfish tagging, biological sampling, data entry, tagging report.
- Michał Raczyński (FIFD, Scientific Fisheries Observer): toothfish tagging, biological sampling, data entry, observer report.

## 2. Methods

### 2.1. Cruise itinerary

The *CFL Hunter* departed Stanley on 24<sup>th</sup> October 2022 and steamed south to the first station, following the route set for the cruise (stations 1298-1311; Figure 1). On the 2<sup>nd</sup> November the vessel steamed back to Stanley and then to the Northern sites (stations 1315-1326). Sperm whales were sighted in close proximity to the vessel on 31<sup>st</sup> October, 1<sup>st</sup> November, 4<sup>th</sup> November, and Pilot Whales spotted on the 1<sup>st</sup> November, though none were seen interacting with the fish during capture or release.

In total, 15 lines were tagged during the cruise, nine in the north, six in the south. Generally, the vessel would set between two and three lines a day before returning to the first line for hauling. Tagging was prioritised to be undertaken during the first station of each day, starting from the beginning of the line. Two lines were targeted on 29<sup>th</sup> October 2022 (Stations 1306 and 1307) due to low numbers of suitable fish for tagging on each line.



**Figure 1.** Itinerary of the ZDLK3-10-2022 research cruise.

## 2.2. Tagging protocol

The tagging station was set up in the dry section of the factory, at the far end of the umbrella cleaning table. The station was pre-prepared with the bolt cutters to remove hooks, a tape measure, the tag board with tags ready to be deployed, the tag applicators, and a scribing board. A tag holding board was used, allowing each pair of numbered tags to be prepared in advance in ascending order (usually the night before). Tags were kept together ready to be inserted into the tag applicators. Once a toothfish was brought on board, it was assessed for tagging suitability according to the criteria set by Lee *et al.* (2022). Large toothfish that were lifted onboard without support were not tagged due to the potential for spinal damage. If the weight was supported by the umbrella, then the condition of the fish was considered suitable for tagging. If deemed unsuitable, the fish was forwarded to the factory for processing.

Suitable toothfish were slid from the hauling bay to the tagging station. The remaining hooks were removed using bolt cutters, with minimum injury to the fish. Fish were then measured and tagged with two (small = 75 mm, large = 80 mm) external spaghetti-dart tags containing the same unique identification number. A sharp, hollow applicator was used to insert the two tags into the dorsal musculature below and on either side of the posterior dorsal fin rays, ensuring that the barb of the tag was locked behind a pterygiophore. The tagged fish were then carried to the hauling bay and returned headfirst into the water. The likely fate of the fish along with any notable observations (e.g. attacks by seabirds) were recorded for future reference.

Weighing of the fish did not take place, as recommended in Skeljo and Pearman (2021). Weights of fish are difficult to read at sea making them unreliable for use in future analyses. Further, the removal of this aspect of the protocol lessens the time that the fish was out of water thus reducing stress and the potential risk for mortality upon release. A scribing board was used to write down the tag numbers and fish length. Using a few longline weights as a barrier against the fish sliding from the hauling bay into the tagging station proved useful, especially in rough weather.

As many fish as possible were tagged during the initial stages of each station. However, when large numbers of fish were suitable for tagging, the number of tags deployed was controlled to ensure equal coverage across the defined fishing area as opposed to having a high concentration of tags in one area.

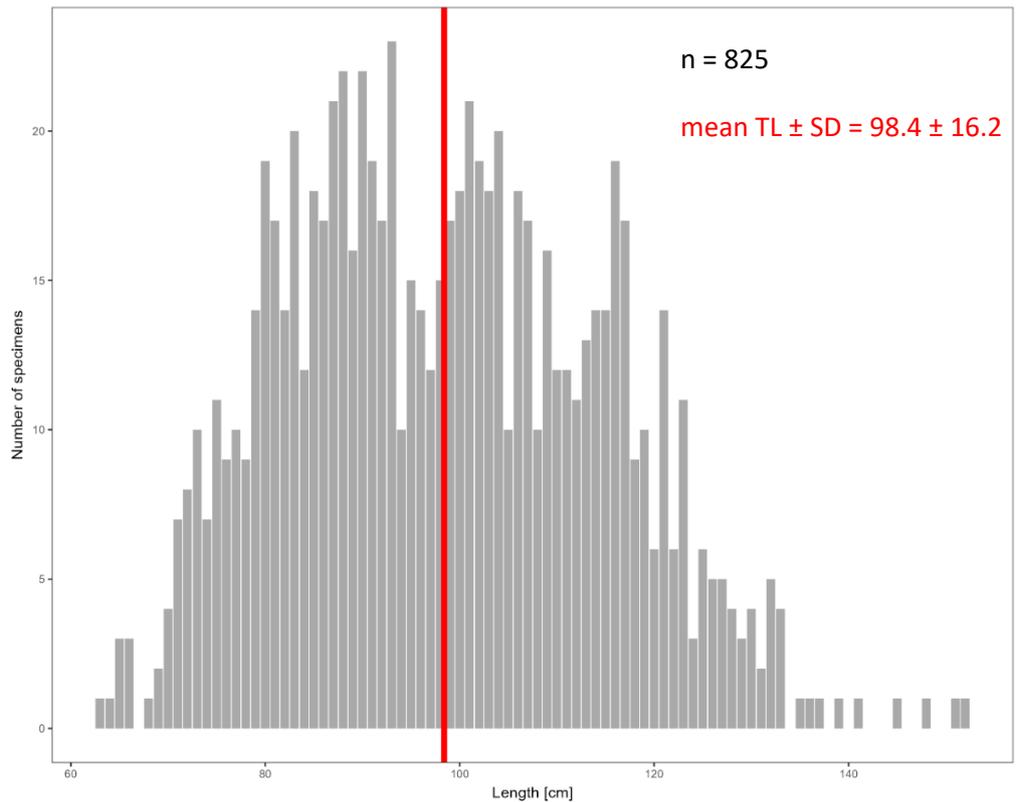
### 3. Results

A total of 825 toothfish were tagged on 15 lines during the ZDLK3-10-2022 research cruise (Table 1). Of these, 419 toothfish were tagged in the south, and 406 in the north. The number of tagged toothfish varied between the lines from 31 to 108 (mean  $\pm$  sd,  $55 \pm 24.9$ ). The low numbers of suitable toothfish retrieved for tagging on lines 1306 – 1311 was likely due to poor weather conditions. Tagging on station 1314 and 1315 was stopped early to ensure the tagging objective (800 fish) could be spread across the targeted fishing areas. The average soak time of tagged lines was 10 hours 22 minutes.

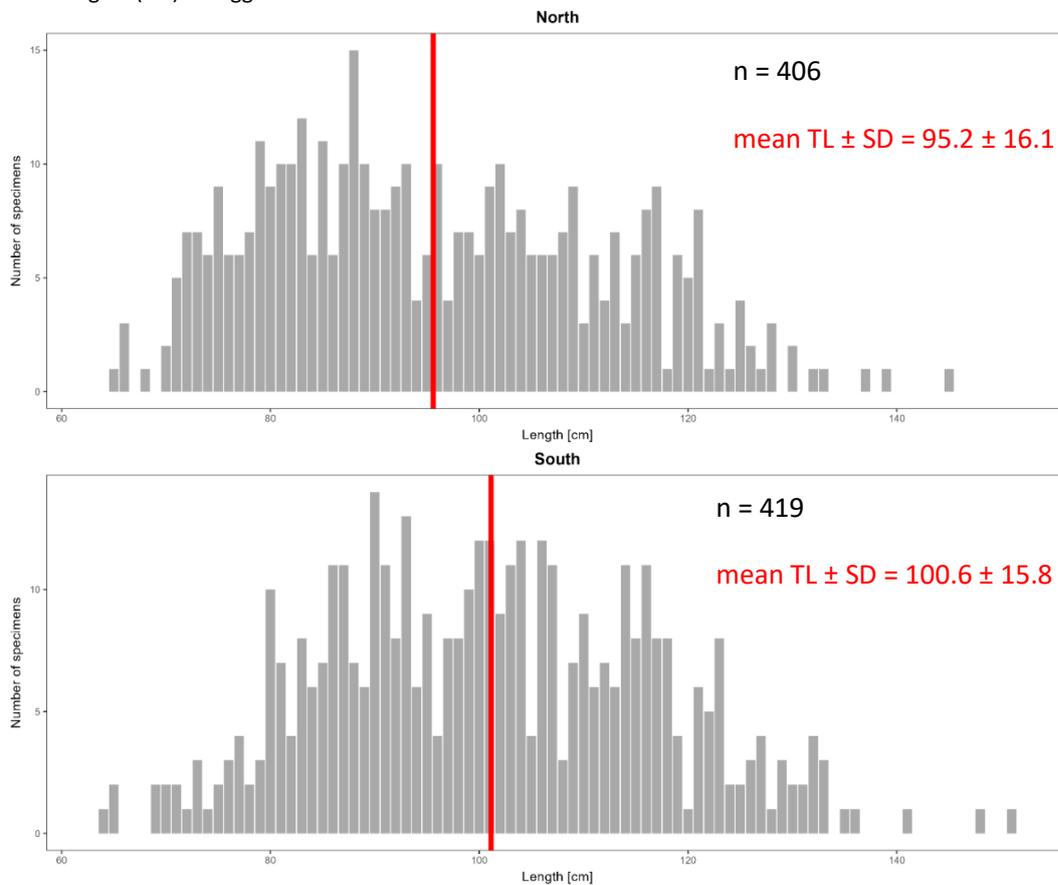
**Table 1.** Tagging information by area and station. The mean length of the tagged toothfish ( $\pm 1$  standard deviation) and the length range are shown. Both the calculated tagged weight and the catch weight (tagged + processed + discarded toothfish weight) are provided; the proportion tagged is expressed in terms of weight, i.e. as the ratio of the tagged weight and the catch weight. Soak time was calculated as the difference between the set end time and the mid-point between the haul start and end times.

Station	Number of tags	Mean length (cm) $\pm$ sd (cm)	Length range (cm)	Calculated Tagged weight (kg)	Catch weight (kg)	Proportion tagged	Soak time (hours, minutes)
1298	108	107.9 $\pm$ 15.0	65 – 151	1427.8	3445	0.41	10 h 12 m
1300	44	100.8 $\pm$ 13.2	77 – 123	467.0	1448	0.32	10 h 10 m
1302	55	104.8 $\pm$ 15.6	64 – 133	668.8	1550	0.43	10 h 20 m
1304	50	90.8 $\pm$ 11.1	70 – 114	382.1	943	0.41	10 h 26 m
1306	16	103 $\pm$ 15.4	80 – 136	184.5	849	0.22	8 h 55 m
1307	24	108.2 $\pm$ 19.0	73 – 133	329.8	1017	0.32	12 h 41 m
1309	31	96.1 $\pm$ 21.0	65 – 152	312.0	1290	0.24	11 h 26 m
1311	37	101.4 $\pm$ 15.3	70 – 135	407.6	1218	0.33	9 h 19 m
1314	54	92.8 $\pm$ 8.3	79 – 121	431.9	2612	0.17	10 h 50 m
<b>South Total</b>	<b>419</b>	<b>100.6<math>\pm</math>15.8</b>	<b>65 - 152</b>	<b>4611.5</b>	<b>14371</b>	<b>0.32</b>	
1315	100	99.6 $\pm$ 15.6	66 – 130	1049.3	3833	0.27	9 h 42 m
1318	60	84.5 $\pm$ 11.3	66 – 123	370.8	631	0.59	8 h 14 m
1320	63	96.3 $\pm$ 13.9	72 – 137	589.3	1367	0.43	10 h 14 m
1322	68	97.8 $\pm$ 14.5	72 – 145	670.5	1731	0.39	10 h 29 m
1324	60	93.3 $\pm$ 17.7	63 – 139	533.4	633	0.84	11 h 15 m
1326	55	99.3 $\pm$ 18.5	65 – 133	588.7	1596	0.37	11 h 15 m
<b>North Total</b>	<b>406</b>	<b>95.2<math>\pm</math>16.1</b>	<b>63 - 145</b>	<b>3802.0</b>	<b>9791</b>	<b>0.39</b>	
<b>Grand Total</b>	<b>825</b>	<b>98.4<math>\pm</math>16.2</b>	<b>63 – 152</b>	<b>8413.5</b>	<b>24162</b>	<b>0.35</b>	

The length of tagged toothfish ranged from 63 to 152 cm (mean TL  $\pm$  sd =  $98.4 \pm 16.2$  cm) (Table 1, Figure 2). The total sampled fish ranged from 54 to 187 cm (mean TL  $\pm$  sd,  $75.5 \pm 34.0$  cm) (FIFD, 2022). Variability in the length-frequency distribution was evident between the north (mean TL  $\pm$  sd =  $95.2 \pm 16.1$ cm) and south (mean TL  $\pm$  sd =  $100.6 \pm 15.8$ cm) sampling areas (Figure 3). A two-sample t-test indicated a significant difference in the mean length of fish sampled in the north and south areas ( $t=-4.955$ ,  $df=820.94$ ,  $p < 0.001$ ).



**Figure 2.** Length frequencies of toothfish tagged during the research cruise ZDLK3-10-2022. Vertical red lines denote mean total lengths (cm) of tagged fish.



**Figure 3.** Length frequencies of toothfish tagged during the research cruise ZDLK3-10-2022, partitioned by sampling area. Vertical red lines denote mean total lengths (cm) of tagged fish.

## 4. Discussion

A total of 825 conventional tags were deployed across the study area, exceeding the aim to tag 800 toothfish during the cruise. The target was to tag 50 toothfish per line, as set by the 2021 research cruise (Skeljo and Pearman, 2021). During the survey, an average of 55 fish were tagged per line, exceeding the target (50+ fish per line). However, this number was highly variable and required controlling to ensure coverage across the full extent of the target area. During some lines, the 50 fish target was not achieved and tagging was required on a second line to achieve this objective. This appears to be consistent with previous tagging cruises. Specially, the lower numbers per line achieved during the 2021 cruise (37 individuals) was attributed to the selection of specific locations for camera deployments. These areas were not necessarily coincident with good fishing grounds and therefore resulted in lower numbers of toothfish caught for tagging. While camera deployments did not take place during the current cruise, lower tagging numbers on specific lines was attributed to poor weather conditions. We suggest a target of 50+ fish per line as a suitable objective for future tagging surveys. This is consistent with the February 2018 cruise (Farrugia and Keningale, 2018), although less than the average (63 toothfish per line) achieved during the November 2018 cruise (Farrugia, 2018).

The average tagged line soak time for this cruise was 622 minutes, less than the 963 minutes average of the 2021 research cruise (Skeljo and Pearman, 2021) but longer than the 550 minutes average of 2018 research cruise (Farrugia, 2018). Although previous findings suggested the soak time did not impact the suitability of the condition of the toothfish (Skeljo and Pearman, 2021), a re-analysis to include data across all cruises could be of interest.

The outcomes for tagged fish seemed generally favourable, with toothfish reported swimming downwards a few seconds following release. However, there were some incidents where seabirds were reported attacking tagged toothfish before they could swim down beyond their reach. Such occurrences, may potentially cause damage to the fish, impacting survivability. Additionally, sightings of sperm whales were made near the vessel during tagging activities. Although these were not seen actively feeding on the fish, predation of tagged toothfish may have occurred on their descent.

Overall, following recommendations from previous cruises, this tagging cruise is deemed a success.

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