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Description of the tagging process and the development of a cradle for optimum landing and measuring of large fish followed by the Spanish F/V Tronio

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Description of the tagging process and the development of a cradle for optimum landing and measuring of large fish followed by the Spanish F/V “Tronio”.

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ABSTRACT

From 2004, toothfish tagging is compulsory for all vessels participating in the New and Exploratory toothfish fisheries in the CCAMLR convention area. CCAMLR uses tagging programs to provide abundance estimates for fish stocks in data poor exploratory fisheries, to answer focused research questions and as integrated components in several stock assessments (Parker & Mormede. 2012). The CCAMLR Tagging Protocol (CM41-01, Annex 41-01/C) was developed to provide a guide to vessels on optimum processes when undertaking tagging operations and provides advice on landing of large fish emphasizing the importance of minimum handling of fish to prevent injury, time out of the water and increase the chance of fish survival. The Scientific Committee recommended that information be provided by Members describing the procedures used to train observers and crew to tag toothfish so that tagging practices could be reviewed (SC-CAMLR-XXXVI Report).

During the 2017/18 season the Tronio fished in Statistical Subarea 88.1 and Division 58.4.1 where the latter area required a tag rate of five fish per ton greenweight caught and also where the overall size of the fish exceeds 115cm. The tagging station on the FV Tronio is on the upper deck above the hauling station providing easy access to retrieve smaller fish directly from the hauling station and to operate the cradle over the side for landing larger fish. To optimise the use of the cradle a series of modifications were trialed to optimize the handling of the cradle, achieve rapid retrieval to minimize hauling downtime, minimize handling and time out of the water of the fish and use the cradle to release the fish. The modification achieved most of these objectives, with room for some further suggested alteration to further improve the system.

INTRODUCTION

From 2004, toothfish tagging is compulsory for all vessels participating in the New and Exploratory toothfish fisheries in the CCAMLR convention area. CCAMLR uses tagging programs to provide abundance estimates for fish stocks in data poor exploratory fisheries, to answer focused research questions and as integrated components in several stock assessments (Parker & Mormede. 2012).

The Scientific Committee recommended that information be provided by Members describing the procedures used to train observers and crew to tag toothfish so that tagging practices could be reviewed (SC-CAMLR-XXXVI Report). A description of the tagging process on board the Spanish FV Tronio is presented.

The CCAMLR Tagging Protocol (CM41-01, Annex 41-01/C) provides advice on landing of large fish emphasizing the importance of minimum handling of fish to prevent injury, time out of the water and increase the chance of fish survival. But also, survivorship rates may be higher when undertaken by experienced observers, using animals in good condition, when they could achieve a survivorship of 95% or more (Agnew 2005).

To tag a representative sample of the catch length distribution implies to tag proportionally the larger toothfish which increases the difficulty of the tagging process. The use of different tagging techniques depending on the size of the specimen might optimize their survivorship.

When landing large fish gaffs are not allowed, and the use of a handling aid, such as a landing net or a cradle is recommended. Recommendations described (Fenaughty, 2007), included using a “cradle” and a “stretcher” to minimise damage to a larger fish while tagging and measuring, and weighing.

During the last two seasons the *Tronio* worked on the development of a new cradle to land large fish, which aimed to:

- ✓ improve the design of the vessel’s existing cradle to be able to easily manoeuvre the fish from the line to the cradle in all weather conditions;
- ✓ rapidly recover the cradle back on to the deck with the fish;
- ✓ improve the design of the cradle to hold the fish in the correct position while it was being tagged inside the cradle; and
- ✓ use the cradle to lower and release the fish back into the water without a “fall” impact.

Tagging Process undertaken onboard the *Tronio*

The tagging station on the *FV Tronio* is on the upper deck above the hauling station (Figure 1). The position provided easy access to retrieve smaller fish directly from the hauling station and to operate the cradle over the side for landing larger fish.

The holding tank is close to the hauling station of the vessel with dimensions:

- Length - 2m
- Width - 72cm
- Depth outer edge 60cm/ middle 79cm [sloping downwards to centre]
- Fold out table - 2m x 45cm [L x B]
- Measuring compartment - 2m x 30cm x 20cm [L x W x D]

Additional facilities include:

- perspex measuring board in rectangular compartment to prevent fish sliding around. it could flip over on top of tank if more space needed;
- Blunt gaff available to retrieve fish out tank;
- fold out table for measuring skates;
- fold out rectangular section on holding tank to house measuring board;
- steel bar to attach harness in adverse weather conditions;
- holding compartment for tagging equipment;
- extra fold out table for measuring or stowing tagging equipment on;

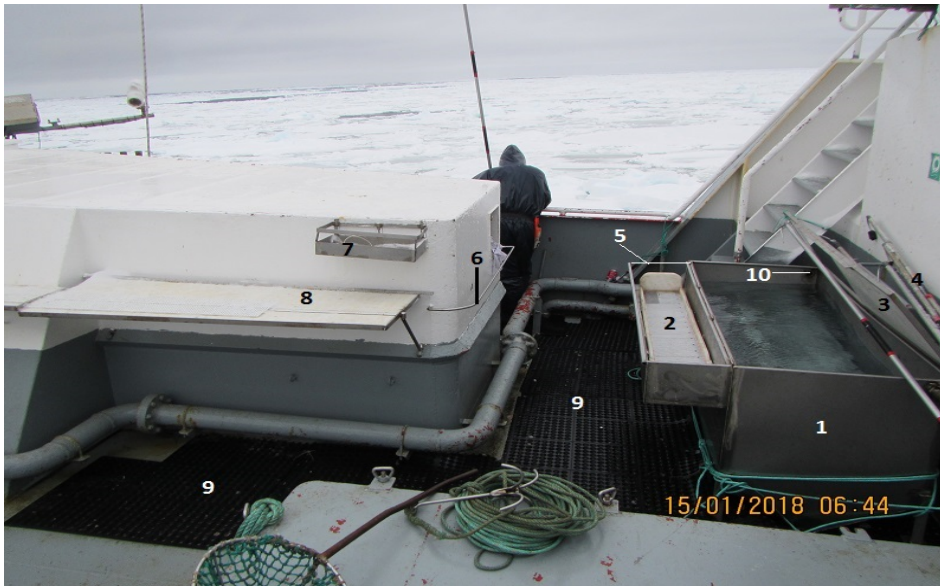


Figure 1 Tagging station on the Tronio

- non-slip rubber matting all around tag area for safety; and
- water outlet and hose on opposite ends for continuous flow of water through tank.

During the last season the Tronio fished in Statistical Subarea 88.1 and Division 58.4.1 where the tagging requirements for *Dissostichus spp.* were:

- one fish per tonne green weight, in accordance with CM 41-09 Paragraph 11 for Statistical Subarea 88.1 (SSRU's H, I, L); and
- five fish per tonne green weight for Statistical Division 58.4.1 CM in accordance with CM 41-11 Paragraph 11.

A total of 180 *Dissostichus mawsoni* were tagged in Subarea 88.1 with a tag overlap statistic of 81%

In Division 58.4.1 a total of 623 *D. mawsoni* and six *D. eleginoides* were tagged and the CCAMLR calculated tag overlap statistic was 71%. All the fish tagged in were landed using a cradle.

An assessment of the hook injury to the mouth (Figure 2) was used as a criteria to determine the size of fish that could optimally be raised up to the hauler with minimum injury. The assessment in (Figure 2) indicated that all fish over 115cm in length need to be supported by a landing aid out of the water.

Fish less than 115cm were raised up to the hauler on the line and then the whole fish was supported and lifted inboard by one of the crew. The snood was then cut and the fish transferred to the holding tank for further assessment before tagging. All fish larger than 115cm were landed using a cradle.



1 - Hook injury using cradle to lift fish out of the water



2 - Hook injury using cradle to lift fish out of the water



3- Hook injury using cradle to lift fish out of the water



4 - Hook injury using cradle to lift fish out of the water



5 - Hook injury raising fish on the line to the roller



6 - Hook injury raising fish on the line to the roller

Figure 2 Hook injury to the mouth observed between fish less than 115cm (1 to 4) and those larger than 115cm (5,6).

Standard Operating Procedures (SOP) followed for tagging using the cradle in Statistical Subarea 88.1 and Statistical Division 58.4.1

All the tagging was undertaken by the observers. The observer would advise the crew when to start the tagging operation. Smaller (<115cm) were placed in the holding tank (Figure 3), providing time to assess them for viability. It was noted that large fish in the holding tank usually remain relatively inert.



Figure 3 Fish held in the holding tank ready for tagging.

In Division 58.4.1 where the tag rate was five fish per ton and most of the fish were larger than 115cm, with the result that all tagging was carried out using a cradle to land the fish. Tagging operations started once the officer on watch notified the hauling crew, after every 5-7 fish hauled depending on the catch rates and sizes. The tag rates were constantly checked by the officer on watch and tag overlaps were updated daily by the observer. The crew member hauling the hook line would select the fish according to the number and size range conveyed from the officer in the bridge. This would be small, medium and large with quantities varying according to catch rates. Once a suitable fish was selected the observer would convey the message to the 2 or 3 crew that were always available to assist with the operation.

Fish retrieval with cradle

- Once fish were selected for tagging the hauler was stopped and fish kept below the surface. Note the fish were normally aligned properly with tail facing aft. This resulted in less handling when measuring and tagging as fish were already positioned correctly in cradle
- Cradle was lowered from alongside vessel with an open end in front facing the vessel and another open end on the left hand side facing up (Figure 4). The crew member alongside the vessel coordinated with the hauling crew and pulley operators when and where to position the net. Initially the crane was used but this changed to the pulley system once inside Division 58.4.1. The pulley system proved more effective and efficient.
- Fish were kept below the surface while the cradle was lowered into water (Figure 5).
- Guiding ropes attached to the ends and the middle of the cradle were used to position the cradle beneath the fish

- A crew member with sharp knife on a long pole was always on standby to cut the snood once fish was secured in the cradle



Figure 4 Cradle lowered using pulley system

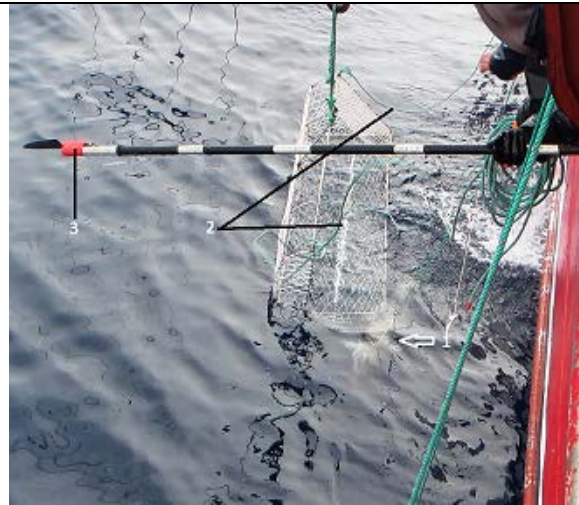


Figure 5 Cradle lowered below the surface and underneath fish.

- Once fish was securely in the cradle it was lifted out the water together with the running hook line hauler causing less tension on the snood attached to fish (Figure 5).
- Operations were stopped just above the surface so snood could be cut (Figure 6).



Figure 6 Cradle hoisted just above surface to cut snood.

It was important to cut the snood as soon as possible and as close to the surface as possible. This prevented fish lying awkwardly in cradle and minimum hook damage to the jaws and body. (Figure 7)



Figure 7 The snood is cut as soon as the cradle is out of the water to prevent further tension and possible more hook injury

Once snood was cut the fish was usually positioned in cradle ready for measuring and tagging without having to handle it further.

- Crew member gaffing fish assisted in guiding the cradle out the water especially in adverse weather conditions.
- The tagging coordinator always communicated with the pulley operators throughout the process about getting cradle and fish on board as quickly and efficiently as possible.
- Fish are prevented from falling out with one side of the cradle being completely closed.
- It was important to manoeuvre the cradle away from the hook line to prevent entanglement with loose snoods coming up and cause further delays to hauling operations.

Modifications to the landing cradle

The objectives to modifications to the cradle were to:

- optimize the handling of the cradle to secure the fish while still in the water;
- achieve rapid retrieval to minimize hauling downtime;
- minimize handling of fish and time out of the water by tagging the fish inside the cradle;
- use the cradle to release the fish and avoid the fall impact; and
- possible release of the fish below the surface to mitigate possible predation from seabirds.





In 2017 the vessel constructed a cradle, based on designs from the CCAMLR Tagging Protocol. The first design consisted of a half tubular shaped stainless steel frame open on both sides, which was manually handled with ropes attached to each end. Shortly after, the frame was altered and rounded into a tubular form with an “eye” on the rear side so that it could be lowered and raised from a single point using a mechanical hoist. The bottom section of the cradle was later replaced with a PVC sheet preventing fish from abrasion.

The overall process of recovering a large fish for tagging starts with the line hauler being stopped with the fish close to the surface. Ideally, the slow forward movement of the vessel results in the orientating with the tail pointing to the stern of the vessel. The basic operation with the cradle was

to orientate it with the open side towards the side of the vessel and the hoisted end pointing out board. The cradle is then lowered down the side of the vessel and maneuvered over the fish before lowering into the water so that it closes under the fish through the open side or moving the cradle forward with the fish entering through the left hand opening of the cradle (viewing the cradle from the open end). Depending on sea conditions this is an intricate process and initially a number of problems were experienced with first getting the fish into the cradle and then preventing it from sliding out before the cradle and fish were hoisted out of the water.

During the course of the last two seasons a further series of alterations were made to optimize the cradle's functionality (Table 1)

Table 1 Sequential modifications to the cradle.

			
<p>1.-The bottom half of “right hand side” of the cradle closed off to prevent fish sliding out that side;</p> <p>2.-The horizontal bar on “left hand side of the cradle” that supported the left opening was cut and angled downwards and to the back of the frame to facilitate capturing the fish into the left side of the cradle</p> <p>3.-The frame and eye used to hoist the cradle was moved forward to cause the front end of the cradle to tilt up more to further secure the fish while being raised out of the water.</p>	<p>1.-Adding a series of cross bars across the lower section of the left opening to prevent fish sliding out of the left end after they were caught in the cradle and before raising the cradle out of the water</p> <p>2.-The PVC sheet and fine mesh net were replaced with a large mesh net (approx. 30mm stretched mesh) to create less resistant in water and make it easier and faster to manoeuvre in water.</p>	<p>1.-A section of was net added across bars on bottom right hand side to prevent fish from getting stuck between bars;</p> <p>2.-A measuring tape was fastened inside the cradle. (The perspex measuring board was removed when changing from the PVC liner to all net covering the cradle);</p> <p>3.-The right hand end sections of cross bars on top of the cradle was covered with net to prevent fish escaping through the right hand end of the cradle;</p> <p>4.- An extended line cutter was made up (sharpened knife on long pole), to cut snood at water level and to prevent having to haul the cradle (and line) at same time towards the roller</p> <p>5.- The net was extended over the right hand side of the cradle so that the entire right hand quarter of the cradle was covered with net to further secure the fish when retrieving it out the water.</p>	<p>1.-Front end of cradle reinforced with thicker rope to prevent chaffing alongside vessel</p> <p>2.-Both ends shortened by 20cm total length of 1.7m for easier manoeuvring on deck.</p>

Discussion

The overriding objective in tagging is to ensure that the fish has optimal chance of survival from being hauled and landed onto the vessel. The CCAMLR Tagging Protocol (Annex 41-01/C) and six assessment criteria assist in gauging the fish suitability for tagging rely mainly external indicators. Internal injuries cannot be readily assessed and the recommendation is for all fish to be tagged to be landed with a net or cradle. However these landing aids often disrupt the hauling process and are difficult to use in the areas where more adverse weather conditions prevail. Lifting a fish out of the water on the hook and raising it up to the roller appears to be viable for smaller fish and placing them into a holding tank allows them to be assessed for viability. However there is no clear indicator at what size a fish is too large to be landed in this way. In this study the hook injury to the mouth was used as a indicator and it clearly showed that fish larger than approximately 115cm had more sever hook damage than those less than 115cm.

Small fish also appear to be better suited to be kept in a holding tank for viability assessment in contrast to larger fish that lay more inert in the tank with less signs of viability. This would indicate that tagging and releasing larger fish as soon as possible from them being removed from the water may also be advantageous to increase their chance of survival.

The objective of the Tronio development of its tagging cradle was to tag the fish in the cradle as soon as it was on deck and immediately release the fish again from the cradle. This also meant that there was minimal handling of the fish in and out of the cradle and least amount of downtime for the hauling operations. These objectives could not be achieved with a landing net.

Landing larger fish, requires most effort and cooperation from the hauling crew to get the fish into the cradle. Once on deck if the observer or tagging crew can handle the cradle it has no further disruptive effect on the hauling operations. The development of current cradle has largely achieved this objective through a number of improvements:

- using large mesh net to for minimum resistance so it can easily be manoeuvrer;
- modifications to the frame to prevent the fish from escaping once inside the cradle;
- independent means to rapidly raised the cradle out of the water onto the deck and back into the water to release the fish (*this was achieved using a manual pulley system operated by crew*);
- built in measuring tape to accurately measure and tag the fish without having to remove it. from the cradle;

Further improvements proposed include:

- placing a secure metal strip across the bottom left hand side of cradle to act as a head board for more accurate measurements of the fish inside the cradle;
- replace the flexible measuring strip with a 5cm to 10cm wide Perspex measuring strip for more accurate measurements; and
- design a purpose-made winch and crane for retrieval and release - positioned so the operator can see the cradle in the water or have remote control.

Being able to lower the fish back into the water was also seen as a significant improvement to the tagging process:

- it prevented the fall-impact and possible stunning that would occur if released from the height of the tagging station;
- it reduced the risk of the fish impacting with ice in areas where this occurs; and
- it also allowed for releasing the fish below the surface, further preventing any risk of injury from seabirds.

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