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Commission des Thons de l'Océan Indien

Work Protocols and Sampling Strategies for Tuna Purse-seine

IOTC ROS SFO TR16.1

Category: Sampling strategies as a function of the IOTC fishery

[IOTC ROS SFO TR16]



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This module aims to familiarize Observers with work protocols, sampling requirements, procedures and methods to be used in the collection of scientific fisheries data with the industrial tuna purse-seine fishery as these will be used daily in their routine work.

Trainee performance is to be evaluated against IOTC ROS competency standards:

- **Capable of collecting and estimating catch weight, volumes and ratios according to ROS standard procedures.**

The achieving of these standards is demonstrated by candidate capacity to:

- **Correctly select work protocols and sampling strategies to use as a function of the set type and vessel configuration.**
- **Correctly estimate weights, volumes and ratios with the industrial tuna purse-seiners.**



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Work protocols on a tuna purse-seiner are to be selected based on the:

- 1. Tuna school type (free or associated school)**
- 2. Vessel catch sorting arrangements**
- 3. IOTC ROS Sampling Requirements**
- 4. IOTC ROS Sampling Priorities**



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1. Tuna School Type

A tuna purse-seiner can set its nets around one of two types of tuna schools:

| <u>Free School</u> | <u>Associated School</u> |
|---|---|
| 1. Large number of fish | 1. Large number of fish |
| 2. Short time period | 2. Short time period |
| 3. Catch uniform in size and in species composition | 3. Catch non-uniform in size and in species composition |
| 4. Catch composition uniform throughout brailing | 4. Catch composition not uniform throughout brailing |





2. Vessel Catch Sorting Arrangements

Vessel catch sorting arrangements and the well where the catch is to be stored will influence the choice of the work protocol to be followed by the observer. For each set the catch can be:

1. Returned to sea via the inverting of the pocket (bunt)
2. Sorted on the main deck
3. Sorted on the lower deck
4. Sorted at offloading
5. Sorted during shifting
6. **Discharged/returned to sea using a conveyor belt**
7. **Discharged/returned to sea using a net or fish bins**

One or more of the ones above together.





There can also be a combination of the situations listed above.

- **Example 1**

During a set where the catch is being brailed and sorted on the main and lower deck, vessels fish wells get full. In this situation the captain might decide to release the remaining fish by inverting the net.

- **Example 2**

During a set on an associated school, the catch is brailed, large bycatch specimens are sorted on the main deck; small bycatch is sorted on the lower deck; discards are directly discharged at sea through a hatch at the end of the conveyor belt. During brailing the crew sees there's a whale shark on the net and the Captain decides to partially invert the net to release the whale shark. After which the remaining fish is brailed into the vessel.

In such situations, the observer should use one or more of the protocols detailed on this presentation.





3. IOTC ROS Sampling Requirements

The IOTC Resolution 11/04 & 15/02, the IOTC ROS Standards, the IOTC ROS Minimum Standard Data Collection Fields, detail the information an Observer is to collect and its level of importance (mandatory and optional).

1. Catches, catch composition, discards, by-catches and size frequency to be estimated.
2. Length frequency data (size data) to be collected for at least one fish by ton caught, by species.
3. Information on bycatch species to include whether retained or discarded and their state at capture and at release.
4. Information on SSIs to include biological whether retained or discarded, their state at capture and at release, details on gear interaction and handling by the crew and sub-sampling (biometrics, etc.).
5. Monitoring and sub-sampling (biometrics, etc.) of recaptures of tagged fish.
6. Monitoring of depredated fish.





4. IOTC ROS Sampling Priorities

The IOTC ROS Guidelines for Observers on Purse-seiners, details the information an observer is to collect at sea and it's level of priority and importance

1st Priority - Species of Special Interest

All marine mammals and turtles, seabirds, whale sharks, oceanic whitetip sharks, thresher sharks, striped, black, blue marlin and Indo-Pacific sailfish.

2nd Priority – Discards / Rejections of Target Species

The 16 species listed in Annex B of the IOTC Agreement.

3rd Priority - Bycatch Species

All species, other than the 16 species listed in Annex B of the IOTC Agreement, caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence.

4th Priority - Retained Target Catch





Work Protocols on a Tuna Purse-seiner

- Difficulties faced by the Observer to estimate catch and catch composition (target and non-target catch) will vary between vessels and sets.
- These difficulties can be linked to the volume and diversity of the catch, (free-school Vs associated-school), and to vessel catch sorting arrangements and the well where the catch is to be stored.
- **Work protocols detailed below will provide guidance on the process(es) to follow to estimate catch & catch composition and to conduct biometric sampling taking into account the type of school fished and vessel catch sorting arrangements, and considering IOTC ROS sampling requirements and priorities.**



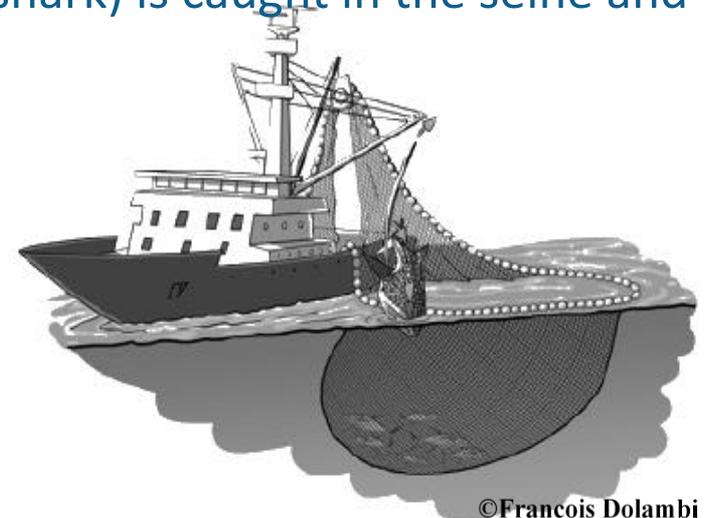


>> Protocol 1 – Inverting the pocket

The bag of the net is fully or partially emptied into the sea.

It happens when:

- fish-wells are full;
- the net holds a small volume of catch or no commercial species;
- there's an equipment / mechanic failure; and
- a very large animal (e.g., a whale shark) is caught in the seine and released alive.



©François Dolambi

Figure 1: Partial inversion of the net due to release a whale shark.



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When the pocket of the net is emptied into the sea, you won't have direct access to information on the released catch and you might not have sufficient experience to estimate the amount or specific compositions of the catch released.

You will therefore proceed as follows:

- 1) Observe the pursing and hauling of the net from the upper deck;
- 2) Check quantity (in tons) and the specific composition of the catch discarded when of the inverting of the net with the captain, the 1st Officer, the Chief Engineer or the Factory Manager
- 3) Place yourself behind the console from where the 1st officer and the bosun usually manoeuvre the net, in order to ask their estimation of the catch released and to better observe the species contained in the pocket and the species released (*their sizes, their fate - released dead or alive, or even take a picture to clarify the specific composition later*);
- 4) If in the presence of a marine mammal or a whale shark, try to identify it (take a photo), to assess or estimate its size and determine the sex if possible.



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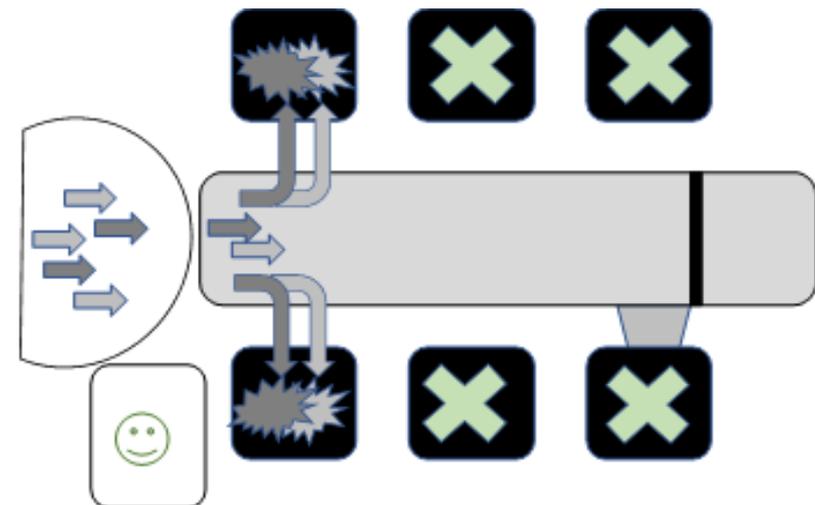


>> PROTOCOL 2 - UNSORTED CATCH / UN-ASSOCIATED SCHOOL

Observer is to follow this work protocol is the catch is brailed and passed directly to the wells without being sorted, or if the vessel catches a free school of tuna (<5% bycatch).

In these situations, no significant sorting of bycatch is done on the lower deck. While large bycatch individuals (sharks, marlins...) are sorted on the upper deck.

Plan of the factory deck of a vessel where the catch has been brailed and moved directly to the wells. The smiley face indicates the placement of the observer on the factory deck.





For these situations you will proceed as follows:

1. Observe the pursing and hauling of the net from the bridge.
2. Observe the making of the pocket from the console. Check if there are any large size bycatch swimming in the net. Ask the 1st Officer his estimation of the catch.
3. Move to the lower deck and **collect a sample of fish via “Spill method”**, directly from the catch that goes to the wells, to estimate catch composition. Set it aside.
4. Return to the main deck, place yourself behind the purse-seine winches and :
 - *Count the number of brailers and estimate their fullness.*
 - *Sample all large size bycatch landed as required.*
4. When brailing ends, move to the lower deck and sample any bycatch set aside by the crew and process the sample you've collected previously.
 - *Sample all bycatch set aside by the crew, as required;*
 - *Separate the different species present on your sample, collect information as required and sample them for biometrics.*

The setting aside of any bycatch requires the help of the crew and needs to be organised before-hand with the Bosun or Factory Manager.





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Collecting a sample of fish via the “Spill method” (stratified sampling).

The observer tips the fish from a
pile / receptacle / conveyer belt
into a bin to avoid hand selection
of individual fish.

Photos by PIRFO SPC



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HOW TO OBTAIN FISHING EVENT RETAINED CATCH WEIGHT (by calculation or by obtaining fishing vessel estimations)

SONAR / SOUNDER *(Tuna school volume can be estimated by the indications given in the sonar / sounder)*

- Ask the Captain / 1st Officer for this information
- Compare it with information obtained by other methods

FISH-WELL *(In the case of zero discards, set total catch volume can be estimated from the volume of fish stored in the fish wells located in the lower dek.)*

- Ask the factory manager for this information
- Compare it with information obtained by other methods

BRAIL VOLUME *(Total catch weight can be determined by multiplying N^o of brailers with brailer capacity .*

- Ask the factory manager for brail capacity for a given species
 - Count the No. of brails and calculate total catch weight
- Total Catch Volume = [(No. of brails/brail fullness) X (Brailer Av. Weight)]**
- Compare it with information obtained by other methods



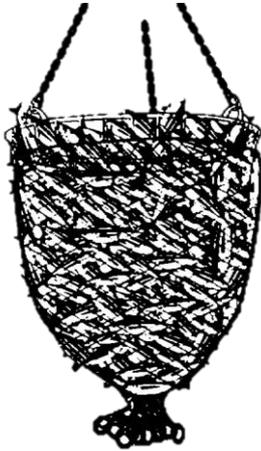
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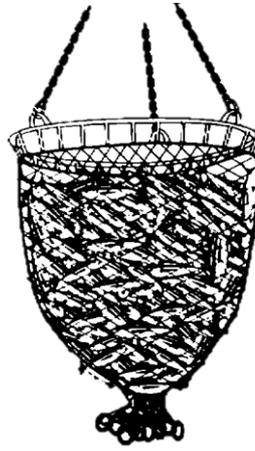
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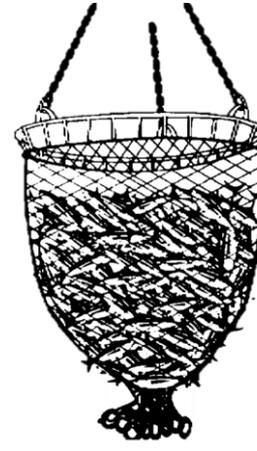
BRAIL FULNESS



Full brail



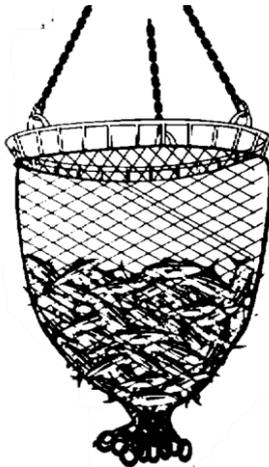
7/8 full



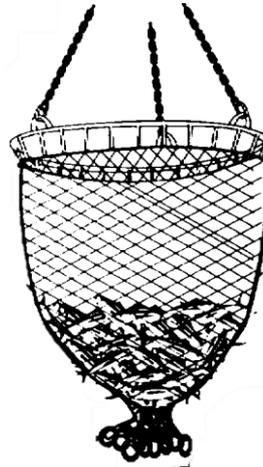
3/4 full



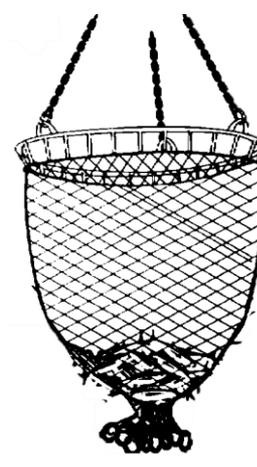
2/3 full



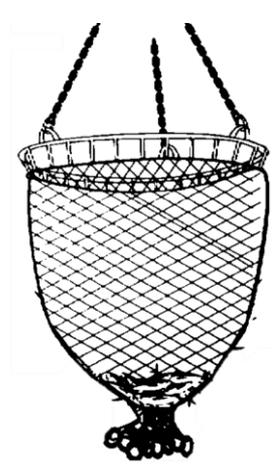
1/2 full brail



1/3 full



1/4 full



1/8 full



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>> PROTOCOL 2 - UNSORTED CATCH / UN-ASSOCIATED SCHOOL

→ Estimation of Set Catch Composition

To estimate set catch composition, the Observer will need to have collected the following information:

- **A SAMPLE OF THE CATCH** of 50 to 100kg (1 to 3 vessel bins of an Av. Capacity of 30kg each) of fish (**target and bycatch**) from the catch going to the wells.
- **SAMPLE ALL LARGE BYCATCH SPECIES** landed on the main deck + **ALL SMALL BYCATCH SPECIES** set aside by the crew on the lower deck.
- **ESTIMATION OF FISHING EVENT RETAINED CATCH VOLUME.**

When in possession of these data the Observer is to raise the volume of each species present on its sample to the total catch to estimate set catch composition.





Exercise 1: Estimation of Catch and Catch Composition

>> PROTOCOL 2 - UNSORTED CATCH / UN-ASSOCIATED SCHOOL

Exhaustive Sample of Large Bycatch

| Species | No | Weight | Fate |
|----------------------------|----|--------|----------|
| Black Marlin | 2 | 150Kg | Retained |
| Green Turtle | 1 | 60Kg | Released |
| Oceanic White Tip Shark | 3 | 250Kg | Released |

Sample of the Catch Obtained by Spill Method

| Species | No | Weight | Fate |
|---------|----|--------|----------|
| YFT | 10 | 100Kg | Retained |
| BET | 1 | 15Kg | Retained |

N° of brails: 3 full + 2 ½ full + 4 ¼ full

Brail average weight: 5 t

Estimate fishing event (set):

- Target catch
- Catch composition (i.e. catch per species)
- Total catch





>> PROTOCOL 3 - SORTED CATCH / ASSOCIATED SCHOOL

The catch is brailed and substantial sorting is performed immediately before placing the target catch in the wells allowing for the separation of target species from bycatch species. Large individuals (sharks, marlins...) are sorted on the upper deck and other small bycatch species are sorted on the lower deck.

We can distinguish here between two scenarios related to the method and swiftness by which the vessel discards the sorted catch. This depends on the presence or absence of a discard chute in the vessel factory deck :

- Vessels with a discard chute conduct ad-hoc discards
- Vessels without a discard chute conduct batch discards





For both scenarios you will proceed as follows:

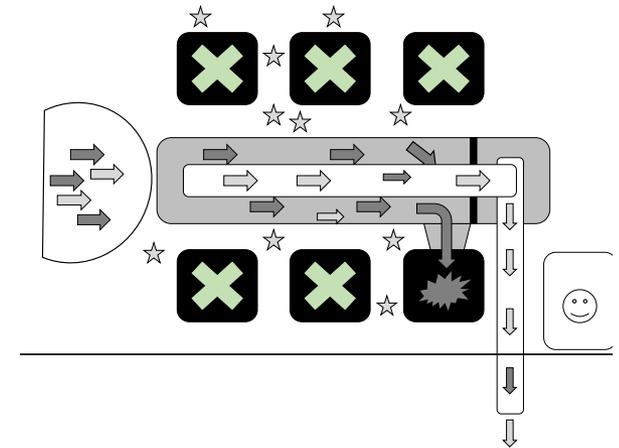
1. Observe the pursing and hauling of the net from the bridge.
2. Observe the making of the pocket from the console. Check if there are any large size bycatch swimming in the net. Ask the 1st Officer his estimation of the catch.
3. Observe the 1st brail. If the pocket is inverted follow protocol 1.
4. Request Officer on the console to keep track of all large bycatch species that aren't brought onboard or released 'alive' (number, fate, condition at capture and release, gear interaction, and handling method).
5. Request the crew to place all dead large bycatch aside on the main deck for latter sampling (this needs to be organised before-hand with the Bosun).
6. Move to the lower deck, collect a sample for the estimation of catch composition, identify, count and sample tuna rejections and bycatch.
7. Return to the main deck, observe brailing final moments and estimate discard volume, if the net is inverted.
8. Return to lower deck and complete sampling while the crew is tiding up.



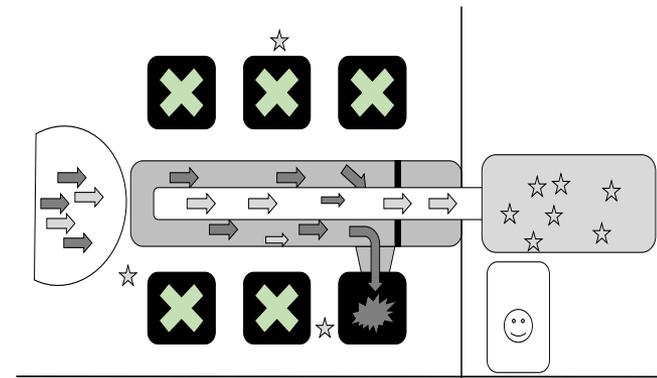
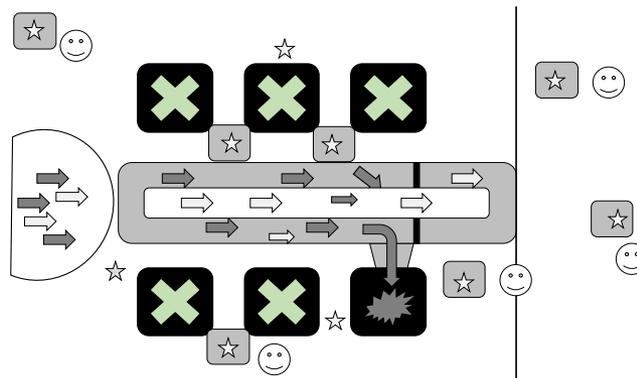


>> PROTOCOL 3 - SORTED CATCH / ASSOCIATED SCHOOL

1. On **vessels with a discard chute**, place yourself next to the discard hatch, to identify and count all discards.



2. On **vessels without a discard chute** ask the crew to store discard bins against the factory wall and move around the factory deck, sampling the discards stored in the bins and in the discard net (if any).





>> PROTOCOL 3 - SORTED CATCH / ASSOCIATED SCHOOL

→ Estimation of Set Catch Composition

To estimate set catch composition, the Observer will need to have collected the following information:

- **DISCARDS**
 - **HIGH CATCH VOLUME → PROPORTIONAL SAMPLE** of at least 100kg of discards collected from the rejection conveyer belt;
 - **LOW CATCH VOLUME → EXHAUSTIVE SAMPLE** of all discards.
- **EXHAUSTIVE SAMPLE of large bycatch species** on the main deck.
- **ESTIMATION OF FISHING EVENT RETAINED CATCH VOLUME (TARGET SPECIES).**
- **ESTIMATION OF FISHING EVENT TOTAL CATCH VOLUME**

When in possession of this data extrapolate the volume of each species present in the discards sample to the total catch to estimate the total volume of discards per species. If the sample is exhaustive, don't extrapolate.





>> PROTOCOL 4 – SHIFTING OF THE CATCH

Vessels equipped with brine and dry wells shift regularly the catch from brine wells to dry wells and sort the catch during the process, discarding any bycatch.

In this scenario the Observer is to follow the subsequent work protocol and sampling strategies:

- 1. Be present during the "SHIFTING" OPERATION, which can take place during the day or the evening.**
- 2. Ask the Chief Engineer or Factory Manager for an indication of the sets stored on the wells to be shifted.**
- 3. For each well that is open for shifting record associated fishing set number(s) and sample discards.**





>> PROTOCOL 4 – SHIFTING OF THE CATCH

→ Sampling strategies

- **DISCARDS / BYCATCH**
 1. **Count all discards (No. per species) and determine discards specific composition (weight / N°);**
 2. **Collect a SUB-SAMPLE for catch composition and length-frequency**
 - **HIGH CATCH VOLUME → Several Proportional Samples** of the discards at different moments of the shifting (100kg minimum).
 - **LOW CATCH VOLUME → EXHAUSTIVE SAMPLE** of all discards.

Add your sample values to the sample collected during the processing of the set and extrapolate the volume of each species to the total estimated discards / bycatch volume for the given set. If the sample is exhaustive, don't extrapolate.





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