
**THE CHALLENGE OF MONITORING THE CONSUMPTION OF THE YFT QUOTA IN REAL TIME:
THE CASE OF THE FRENCH TROPICAL TUNA PURSE SEINE FLEET IN 2017**Maufroy A.¹, Goujon M.¹, Floch L.² and Bach P.³**Abstract****Introduction**

Following the evaluation of the stock of yellowfin tuna (YFT) in the Indian Ocean for 2014 (concluding that the stock was overfished and subject to overfishing; IOTC, 2015), an interim plan for rebuilding the stock was implemented in the Indian Ocean (IOTC Resolution 16/01). Among others, it was decided to reduce purse seine YFT catches of 15% for CPCs with catches greater than 5000 t in 2014, as compared to the reference year of 2014 (IOTC Resolutions 16/01 and 17/01). For European Union, this decision resulted in implemented a quota of 77 698 tons of YFT to be shared among EU flagged purse seiners operating in the Indian Ocean in 2017. In January 2017, this quota was then distributed between French, Italian and Spanish purse seiners and France was allocated a sub-quota of 29 501 tons for 12 purse seiners of two different French fishing companies (EU Regulation 2017/127).

The Producer Organisation ORTHONGEL, representing all French tropical tuna purse seine fishing companies operating in the Indian Ocean, was mandated by the French administration (DPMA) to distribute the quota amongst French fishing companies and to monitor the consumption of the quota in real time by the French PS fleet. Since June 2017, a YFT quota management plan has been implemented for this fleet (ORTHONGEL decision n°13 of the 26/06/17), setting out the repartition of the French YFT sub-quota among French purse seine fishing companies and describing the means used by ORTHONGEL to monitor YFT catches in real-time.

Since the beginning of the fishery during the 1980s, it is the first time that a catch quota applies to tropical tuna purse seiners of the Indian Ocean. This new situation has raised issues for ORTHONGEL and its member fishing companies that must carefully follow the consumption of their YFT quota in real time though official catch data are usually produced once a year after a correction of species composition. The objectives of the present document are threefold (i) describe the methodology used by scientific institutes to prepare official catch statistics (ii) describe the methodology adopted by ORTHONGEL in 2017 to monitor YFT catches in real time (iii) report on differences between the two sources of information and discuss potential solutions to overcome these issues.

1.1. Preparation of official catch statistics**1.2. Collection of raw catch data**

The Institute for Research and Development (IRD) and its Observatory of Exploited Pelagic Tropical Ecosystems (Ob7) is in charge of monitoring the catches of French tropical tuna purse seine fleet since the early 1980s in the Indian Ocean. This monitoring of catches of French tropical tuna purse seiners consists in two main tasks (i) collecting data on catches and catch composition (ii) preparing official catch data that are transmitted annually to tuna RFMOs, after statistical processing and validation of processed data.

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Raw catch data are collected in logbooks of purse seiners. For each fishing set, catches are visually estimated by captains per species and per commercial category. Catch data are reported along with the position, the date, the type of fishing set (i.e. on Floating Objects – FOBs – or on Free Swimming Schools – FSC) and information on effort (e.g. nb of fishing hours per day). Logbooks are transmitted to the IRD at the end of each 7-8 week fishing trip and the information is stored in a dedicated database (AVDTH: *Aquisition et Validation des Données de pêche au THon tropical*, Capture and Validation of tropical tuna catch data, Lechauve, 1999).

1.2 Processing of raw catch data using T3+

Due to the multi-species nature of the tropical tuna purse seine fisheries (targeting skipjack, yellowfin and bigeye tunas) and to the misidentification of juveniles of yellowfin and bigeye tuna caught under FOBs, catch data collected in logbooks require a series of corrections. Since the late 1990s, these corrections are achieved through a large scale multi-species sampling and the data are processed with the tool T3 (Tropical Tuna Treatment) or its improved version T3+ (Pianet and Pallarés, 2000; Cauquil *et al.*, 2017).

Correction of total catch per fishing trip

Though raw catch data collected in logbooks are as detailed and precise as possible, they consist of visual estimates of catches per species. On the other hand, landed or transhipped catches are weighed but the position of fishing sets is not available, though this information is necessary to use size and species samples collected at port. Discharging and transhipments certificates are transmitted to the IRD at the end of each fishing trip and used to calculate the ratio between catches and landings. This ratio is used as a raising factor to correct the total catches reported in logbooks for a given fishing trip.

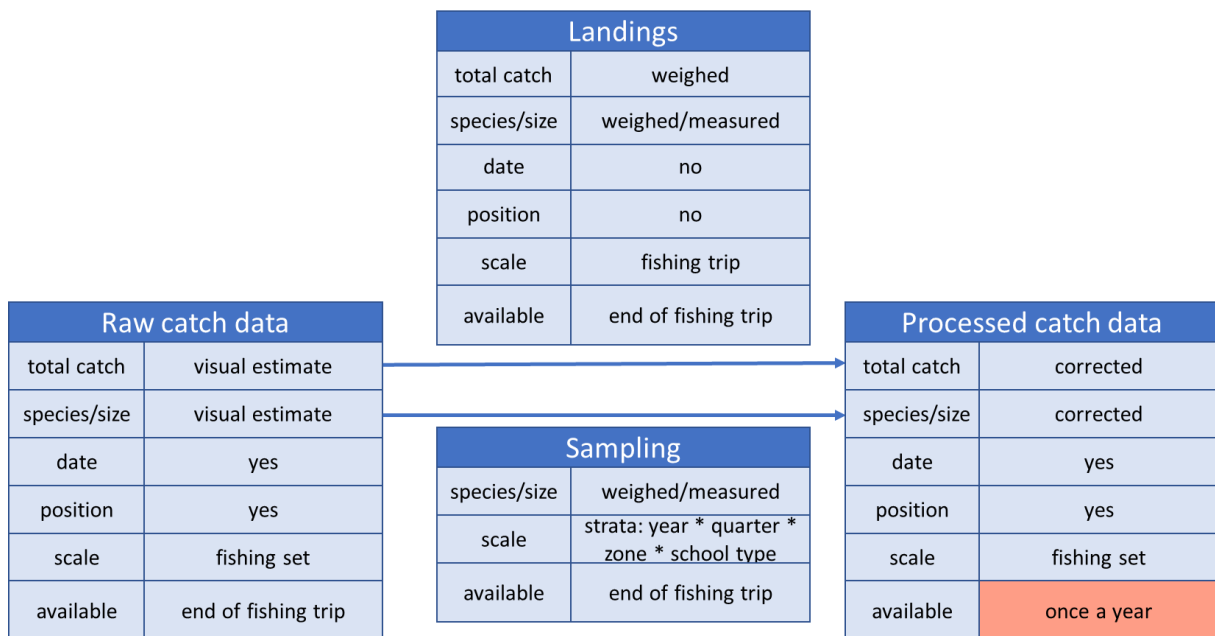


Figure 1: main statistical treatments operated with T3+

Correction of size and species composition per fishing set

Samples are collected at port to determine the species and size composition of catches. The well plan, providing the link between fishing sets and the corresponding well where the catch has been stored, is used to determine the position where individuals of the samples have been fished. Samples collected

for a given strata (defined by a year, a quarter, a fishing area and a type of fishing set) are applied to all fishing sets of the same strata to correct the size and species composition of each fishing set.

Common structures of databases, at port sampling schemes and data processing tools are used by the different institutes in charge of monitoring catches of the different tropical tuna purse seine fleets in the Indian Ocean (IRD, IEO, AZTI, SFA). Samples collected aboard purse seiners operating under different flags are then pooled and used to correct the size and species composition of all fishing sets, regardless of the fleet of the vessel (e.g. samples collected aboard Spanish and Seychellois purse seiners are used to correct French data).

2. Monitoring of YFT catches with landing data

2.1 French YFT quota management plan

So far, raw logbook data have been processed by IRD once a year, during the year following the collection of the data (i.e. official statistics for 2017 will be available in 2018). Though such a schedule may be adapted to produce official catch statistics, it is obviously not suitable for a real-time monitoring of catches of yellowfin tuna by tropical tuna purse seiners. To overcome this issue, ORTHONGEL and its fishing companies have decided to use information on landings as well as estimates of catches stored onboard, as these sources of information are available in near real time (Figure 2).

Regular YFT quota management plan

Prior to 80% of YFT quota consumption, cumulated YFT catches are estimated by ORTHONGEL once a week. For each purse seiner, ORTHONGEL member fishing companies provide (i) logbooks, available at the end of each fishing trip (ii) landed and transhipped catches detailed per species and fishing trip and (iii) estimates of catches stored on board since the beginning of the ongoing fishing trip, that are visually estimated several times a week and transmitted by captains to fishing companies. When the first fishing trip of the year covered both 2016 and 2017, logbooks were used to calculate the proportion of catches made in 2017 and correct landed and transhipped catches for the corresponding fishing trip. Finally, cumulated catches of YFT since the beginning of the year are estimated as the sum of landings and transhipments in 2017 and catches stored in fish wells at a given moment.

Each fishing company was requested to take the necessary measures to ensure that no overconsumption of the YFT quota occurs for its purse seiners and to regulate the consumption of the quota, so as to avoid long periods of inactivity at the end of a given year. One of these measures was the adoption of a ban of FSC catches as they mainly consist of large YFT, though such a measure also implies larger catches of YFT juveniles under FOBs.

Reinforced YFT quota management plan

Once 80% of YFT quota consumption has been reached, a reinforced monitoring of YFT catches begins. In addition to previous sources of information, French purse seine fishing companies provide more precise estimates of catches at the end of each fishing trip, based on samples used to refine species of size composition of catches ("sizing data"). Estimated catches of YFT are transmitted 3 times a week to the French administration (DPMA). Once 95% of YFT quota consumption has been reached for a given fishing company, the decision can be made to stop activities for the corresponding purse seiners within 48 hours, if there is a risk of overconsumption of the quota.

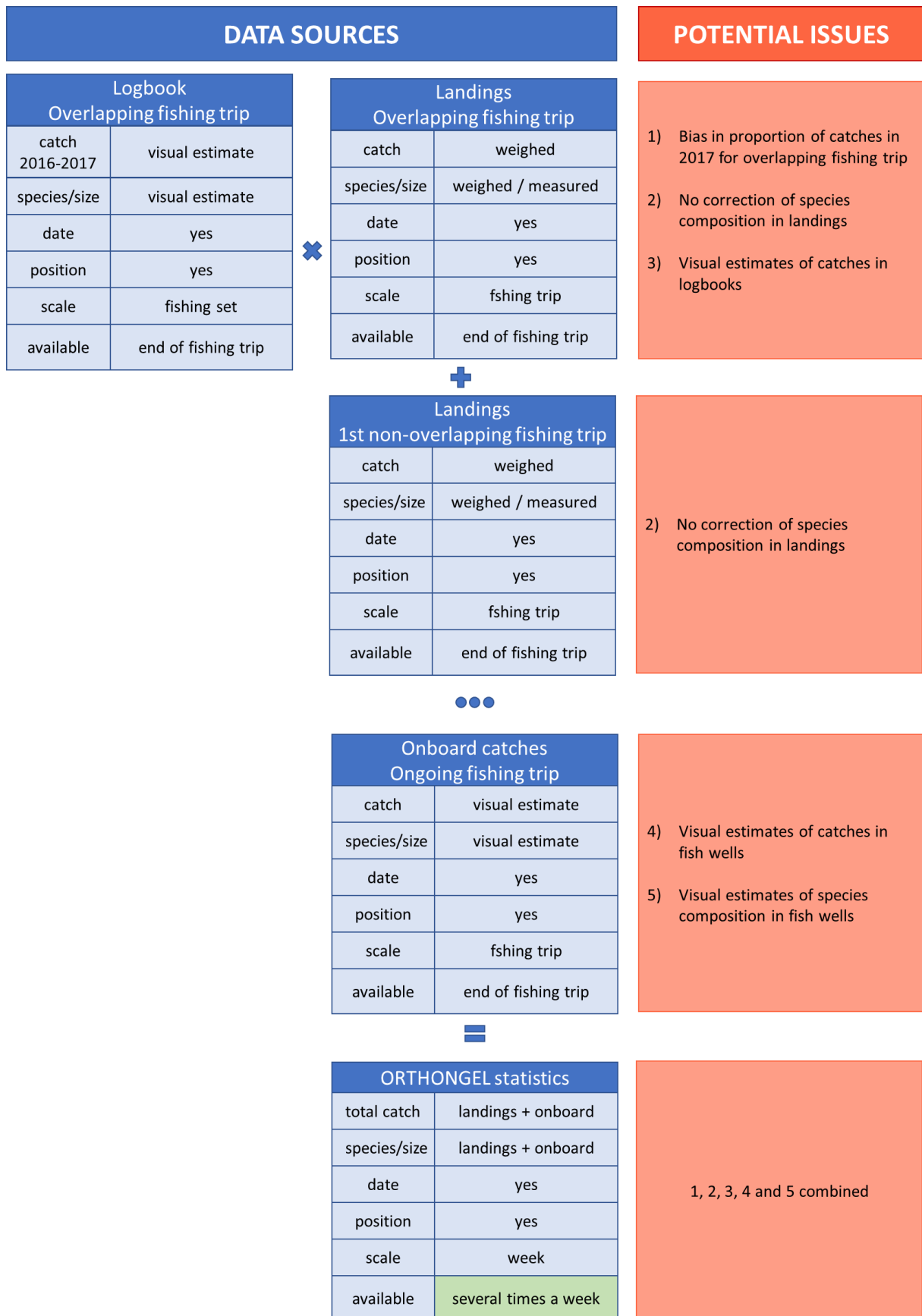


Figure 2: data available in real-time to monitor the YFT quota consumption for the French tropical tuna purse seine fleet in 2017

3. Discussion: issues and potential solutions

3.1 Comparison of T3+ and ORTHONGEL estimates

In order to compare the results of the two methodologies described previously, official catch data and landing data transmitted to ORTHONGEL by member tropical tuna purse seine fishing companies were compared over 2012-2016. A simple comparison of the two estimates indicates that the methodology used by ORTHONGEL and its member fishing companies underestimated official catch data of approximately 3.9% during this period (Figure 3). The results of this comparison also indicate differences between types of purse seiners, with a potential underestimation of 9.0 % for freezing purse seiners and a potential overestimation of 3.2% for deep-freezing purse seiners.

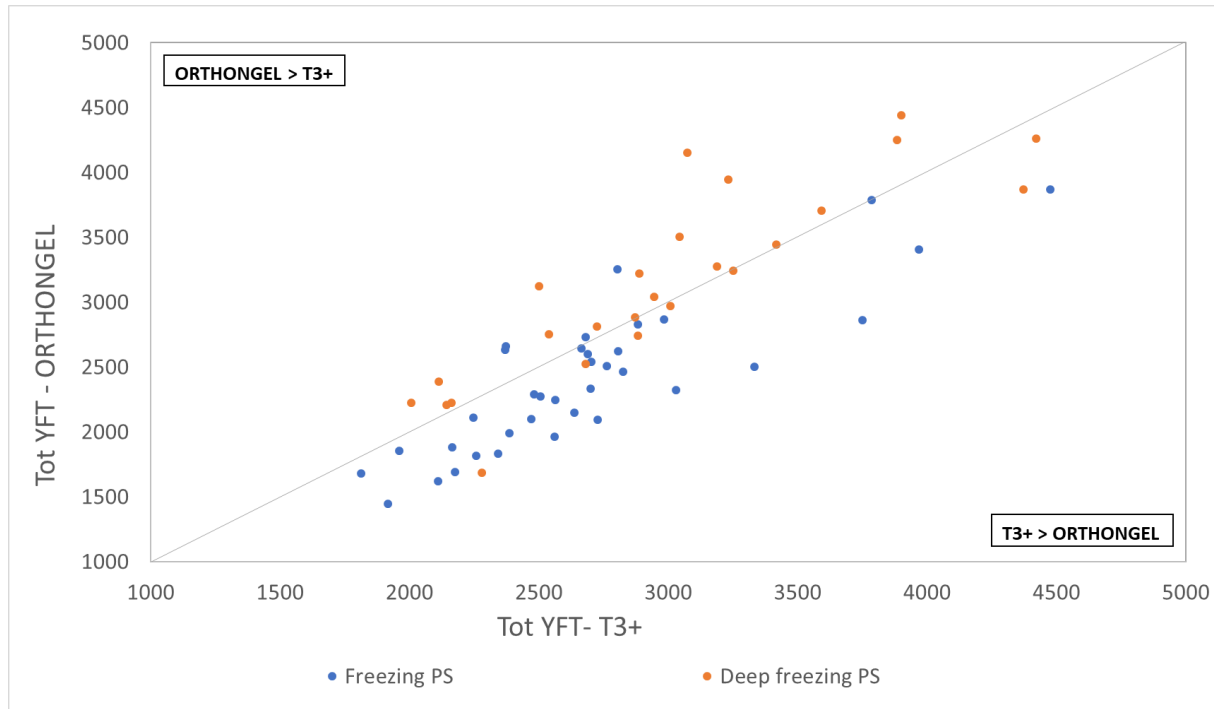


Figure 3: comparison of YFT catches per year estimated with T3+ or with landing data (2012-2016, an observation = cumulated YFT catches per year for a given purse seiner)

Differences between T3+ and ORTHONGEL estimates may be explained by several reasons. First, total catches of all species may not be similar in the two methods, as no information on the date of fishing sets is available in the statistics used by ORTHONGEL. Therefore, landings and transhipped catches of fishing trips overlapping two years should be distributed between the two years, which was not done in the present analysis.

Second, no correction of species and size composition is applied to landing and transshipment data used by ORTHONGEL, though misidentification of juveniles of yellowfin tuna and bigeye tuna may occur (among others). To overcome this issue, the decision was made to refine real time estimates of catches with a sampling procedure (sizing) carried out by an operator contracted by fishing companies. However, the methodology used for this “sizing” procedure still requires a comparison with the sampling procedure used by scientific institutes to validate its results.

Finally, at port sampling used in T3+ cannot be done for deep-freezing tropical tuna purse seiners, due to several manipulations of the catch (the catch is first put into brine before dry deep-freezing). This results in a mixing of numerous fishing sets and a selection of large individuals in deep-freezing wells

which content cannot be used for estimating the size and species composition of fishing sets. Therefore, T3+ samples obtained on freezing purse seiners are applied to the logbooks of deep-freezing purse seiners, though these two types of vessels have different fishing strategies which may result in a different composition of catches.

In addition, the multiple manipulations of the catch occurring on deep-freezing purse seiners allow a better estimation of the species and size composition of catches in discharging and transshipment certificates for this category of vessels. This may explain why ORTHONGEL and T3+ estimates are more similar for deep-freezing purse seiners than for freezing purse seiners. This also motivated the adoption of the “sizing procedure” that should reduce the difference between ORTHONGEL and T3+ estimates for freezing purse seiners.

3.3 Improving T3+

Quarterly T3+

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Improving sampling of deep-freezing purse seiners

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