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Preliminary Analysis on Catch of Southern Bluefin Tuna (*Thunnus maccoyyi*) by Fishing Area from Indonesian Tuna Longline Fleet

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Abstract

Southern Bluefin Tuna (*Thunnus maccoyii*, SBT) has been historically caught as a by-catch by Indonesian tuna longline fisheries since 1970s. However, little are known about their biological charateristics. This study is undertaken to determine the catch and size composition of the southern bluefin tuna caught by Indonesian longline fleets by their fishing area by utilising port sampling, scientific observer and e-logbook data. The result showed that recently (2015-2019), SBT dominated landings in Benoa Port, comprising between 40 and 75 percent of the catch. Its fishing season began in September, peaked in January and February, and then began to decline throughout the second and third quarters. During peak season (January-March), the majority of southern bluefin tuna was captured in area 2 (between 20^oS and 37.5^oS), whereas area 1 had a greater catch at the beginning of the season (September-December). The monthly median size caught in the area 2 was relatively lower compared to area 1, except for certain months (April and May), however it overshadowed by the lack of data available.

Keywords: By-catch, Catch-at-size, Catch composition, Fishing season

1. Introduction

Southern bluefin tuna (SBT, *Thunnus maccoyii*) is a single, highly migratory stock that spawns in the north-east Indian Ocean (off the coast of north-western Australia and south of Indonesia) and migrates across the temperate southern waters (Farley et al., 2014; Sulistyaningsih et al., 2018). It is managed internationally by the Commission for the Conservation of the Southern Bluefin Tuna (CCSBT). Southern Bluefin Tuna (*Thunnus maccoyii*, SBT) has been historically caught as a by-catch from longline fisheries targeting yellowfin (since the late-1970s) (Farley et al., 2014) and bigeye since the early 1980s after deep-longlining was introduced (Sadiyah et al., 2011).

Among the tuna fishing ports, SBT mainly landed in Benoa. Landing activities are regularly monitored by Research Institute for Tuna Fisheries (RITF) through scientific port sampling and scientific observer programs. The first program was initiated in mid-2002 but had a long history as a collaboration project, traced back to 1993 (Farley et al., 2014). On the other hand, the scientific observer program has been introduced since mid-2005 as an Indonesia-Australia collaboration (Project FIS/2002/074 of Australian

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Centre for International Agricultural Research). After 2010 the activities were conducted by RITF with support from the state budget.

This study is undertaken to determine the catch and size composition of the southern bluefin tuna caught by Indonesian longline fleets by their fishing area. The projected outcome of this study was to fulfill the task allocated for the 16th Compliance Committee.

2. Materials and Methods

2.1. Landing composition

The catch of southern bluefin tuna was regularly monitored through the scientific port sampling program since 2002. Port of Benoa was chosen as a representation of Indonesia's main industrial fishing ports. At least 30% of all landings at each processing plant should be covered every day (IOTC, 2002). However, due to Covid-19 disruption which affect heavily on the coverage, therefore, the data used for the analysis only span from 2012-2019. The analysis intended to describe the development of southern bluefin tuna fishery against other target species, namely albacore, bigeye tuna, and yellowfin tuna.

Given the nature that all fishes were weighted in gilled and gutted (GGT) condition, a conversion from processed to round weight was implemented by multiplying the GGT weight to 1.1 as the raising factor (FAO, 2000). Then, the estimation of total production can be calculated as follows:

$$CM = LM * AVM \tag{1}$$

Where:
CM : Estimated catch (kg)
LM : Total number of landings (unit)
AVM: Total species sampled (kg)/total number of vessel sampled (unit)

2.2. Species composition by area

Species composition by 5x5 grid and CCSBT fishing area were analyzed using e-logbook data from 2019-2021, courtesy of Directorate General of Capture Fisheries. Prior to extraction, the logbook data has been scrutinized by the verificatory officers by consider following rules:

- Conformity of fishing ground, gear and type of species landed
- Suitability between total catch reported and landed
- Compatibility between the catch reported related to the fishing capacity of each vessel
- Confirmation of departure and landing port as mentioned in the license

Moreover, to ensure a robust analysis, data cleaning and filtering were conducted prior to analysis. This was necessary, largely purposed to clear any potential inconsistencies and typos, which commonly found in logbook data (Sampson, 2011). In principle the process was commenced as follows:

- Setting must be commenced between the departure and the arrival date
- The number of day-at-sea should be the differential between the arrival and the departure date
- Total sets per landing should be at least 50% of the total day-at-sea

- Georeferenced points should not intersect with the land nor excess the boundaries from the area of interest

As a consequence, 53,894 set by set e-logbook data from six tuna-related gears were effectively generated. However, only those from the longline used for analysis were included, as southern bluefin tuna exclusively engage with this type of gear.

2.3. Catch distribution by area

The distribution of monthly positive catch (kg) by fishing area was projected on every set based tuna longline e-logbook data from 2019-2021, courtesy of Directorate General of Capture Fisheries.

2.4. Size distribution

Size distribution by area was analysed using scientific observer data from 2006-2021, courtesy of Research Institute for Tuna Fisheries. All statistical analyses were conducted using R version 4.1.2 (R Core Team, 2022)

3. Result and Discussion

The proportion of yellowfin and bigeye tuna that was landed in Benoa Port prior to 2015 was greater than fifty percent of the total estimated catch. However, southern bluefin tuna (SBT) dominated landings thereafter (2015-2019), comprising between 40 and 75 percent of the catch (Figure 1).

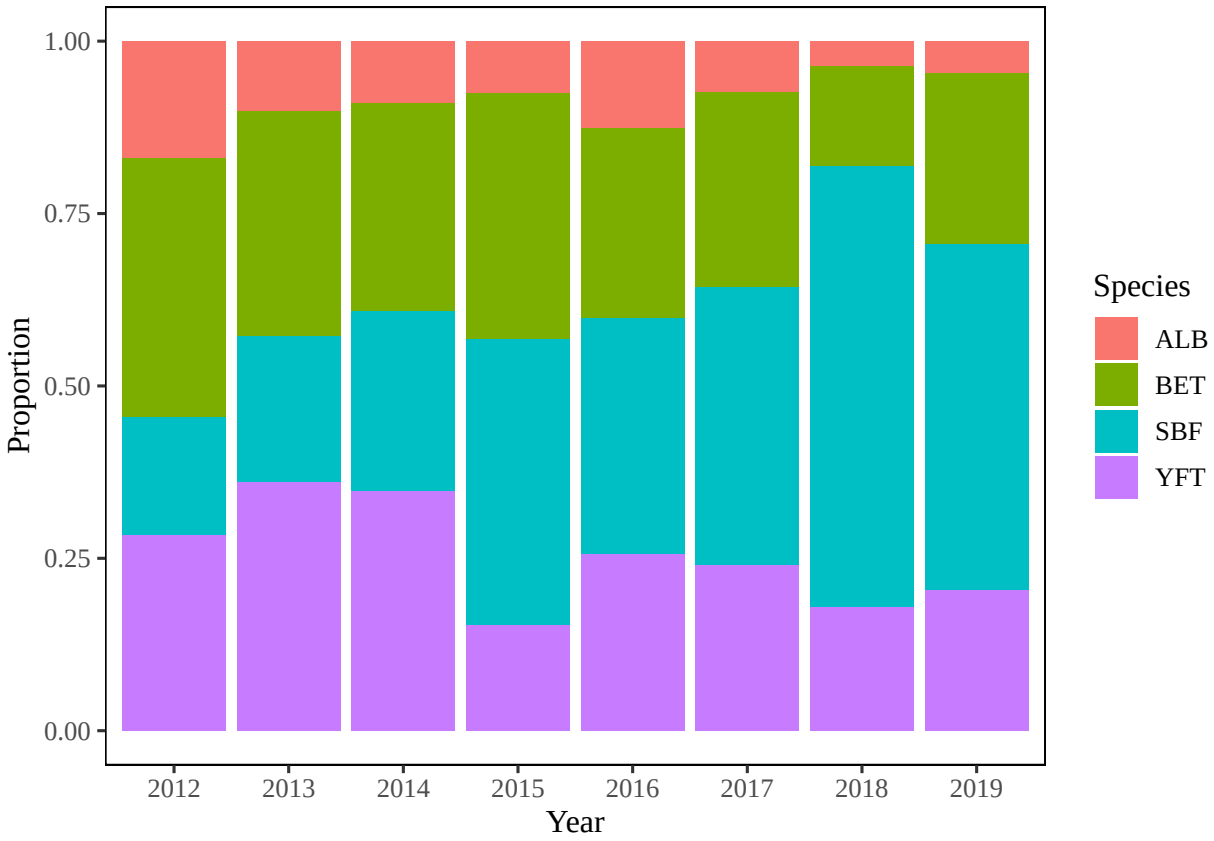

Figure 1. Catch proportion of southern bluefin tuna based on scientific port sampling in Benoa Port during 2012-2019

The southern bluefin tuna fishing season began in September, peaked in January and February, and then began to decline throughout the second and third quarters. During peak season, a larger proportion of yellowfin tuna and albacore are also found in temperate (below 25^oS) and tropical regions. In contrast, bigeye tuna was more prevalent during the off-season and was mostly found in tropical regions (Figure 2).

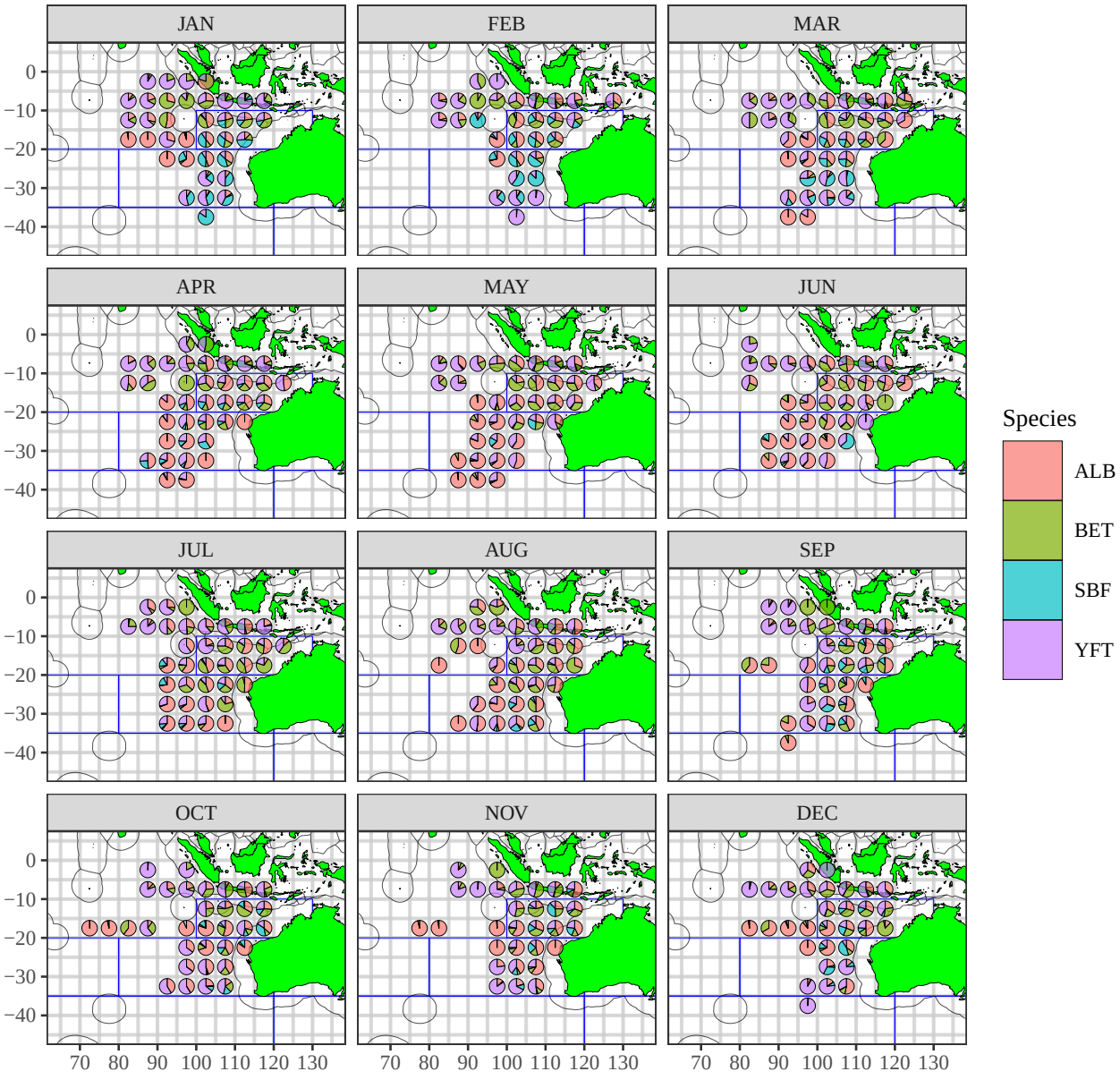

Figure 2. Catch composition of four main tuna species based on 5x5 degree blocks. Source: E-logbook data from 2019-2021

The catch of southern bluefin tuna can be detected along the fishing year. During peak season (January-March), the majority of SBT was captured in area 2 (between 20^oS and 35^oS), whereas area 1 had a greater catch at the beginning of the season (September-December) (Figure 3).

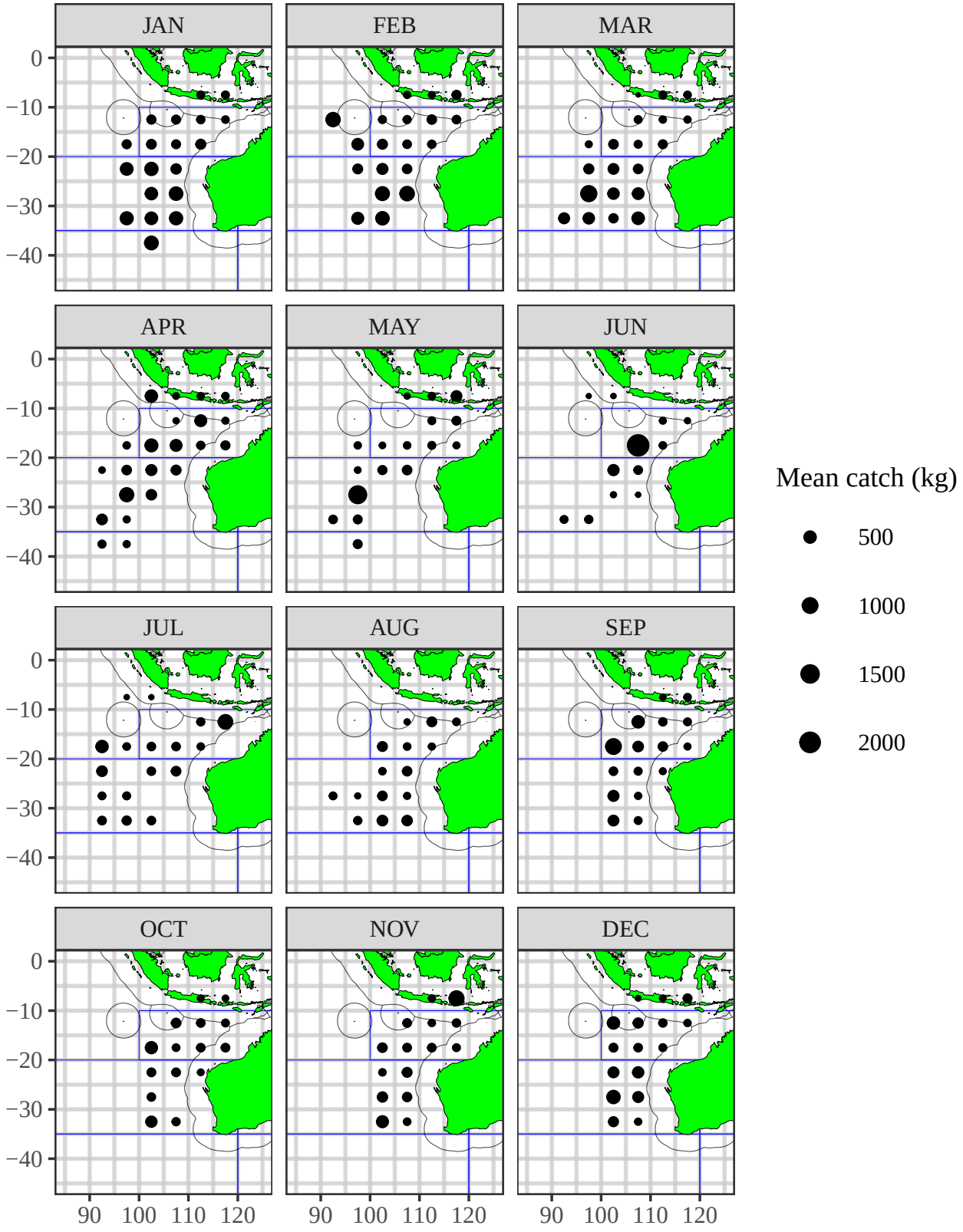

Figure 3. Monthly average catch of southern bluefin tuna based on 5x5 degree blocks. Source: E-logbook data from 2019-2021

Based on scientific observer data, the observed length of the southern bluefin tuna was ranged from 62-218 cm FL (mean = 162.16 ± 19.46). The monthly median size caught in the area 2 was relatively lower compared to area 1, except for certain months (April and May) (Figure 4).

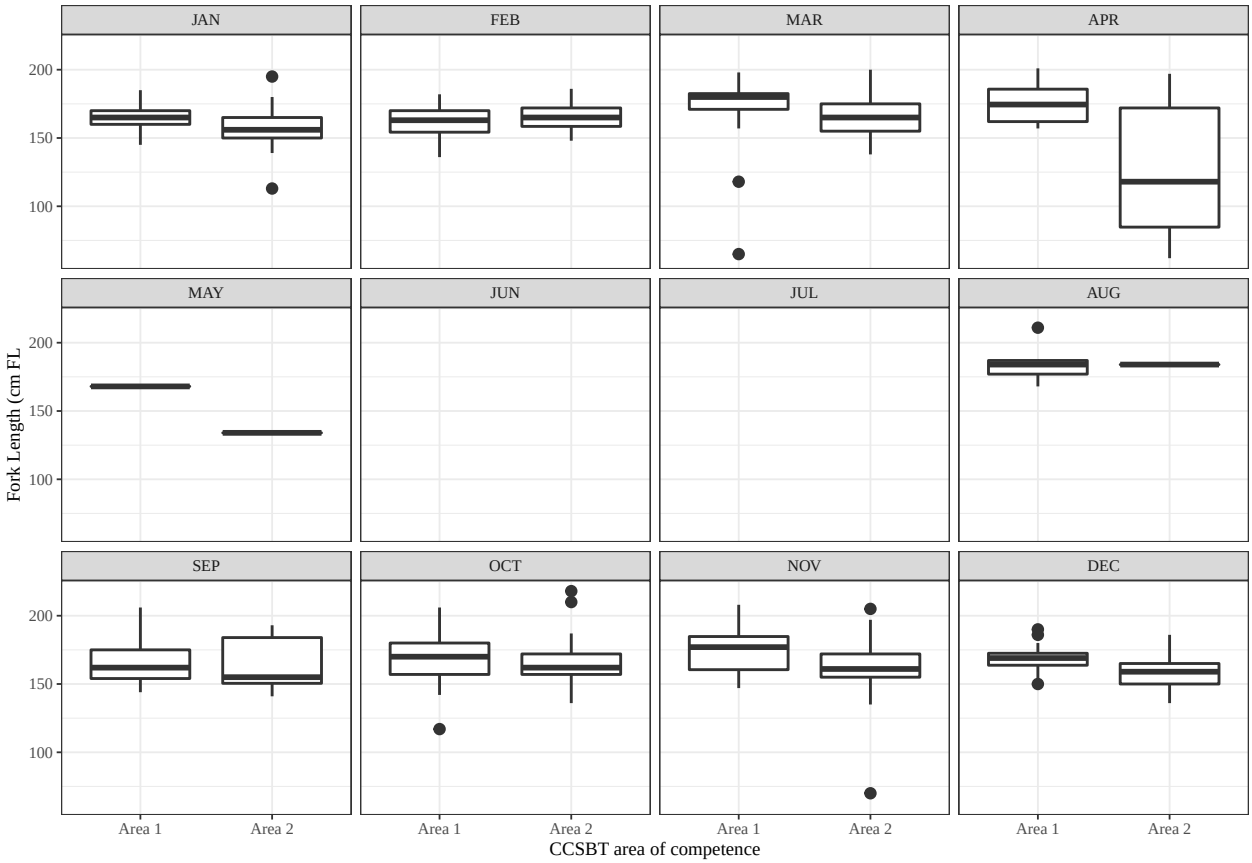

Figure 4. Monthly mean size of southern bluefin tuna based on 5x5 degree blocks. Source: Scientific observer data 2005-2021

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