

Report of the age-0 southern bluefin tuna distribution in the
northwest coast of Western Australia in 2022

2022年の西オーストラリア州北西沿岸における
ミナマガロ0歳魚分布調査の結果報告

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要約

ミナマガロについて仔魚から1歳魚までの分布と回遊はほとんど知られていない。西オーストラリア州北西沿岸で小型0歳魚（尾叉長25cm未満）の分布を調べる調査プロジェクトを2019年に開始し、24.4cmの小型0歳魚を含む2個体の採集に成功した。第2回目の調査を2022年12月に8日間実施し、曳縄によってSBT14個体を採集した。SBTの尾叉長は23.0cmから25.2cmの範囲であり、目的とした0歳魚であった。採集海域は水深約400mの陸棚斜面より沖合域であった。

Summary

Little is known about the distribution and migration of southern bluefin tuna (SBT) between larvae and age-1. We planned a research project to investigate the distribution of small age-0 fish (< 25 cm in fork length) in the northwestern coast of Western Australia and succeeded to catch two SBT including 24.4 cm small age-0 fish in 2019. The second survey was carried out in December 2022 for eight days. We collected the targeted 14 age-0 SBT ranging from 23.0 to 25.2 cm fork length by trolling gears. The sampling locations were offshore from the shelf-edge at depths of about 400m.

1. Introduction

It has been revealed from the collection of larvae and the catch of adult fish with developed ovaries that the spawning grounds of southern bluefin tuna (*Thunnus maccoyii*; SBT) are located in the waters between south of Java and northwest of Australia (10S-20S, 100E-125E) (Ueyanagi 1969, Warashina and Hisada 1970, Farley and Davis 1998). It is known that the fish, which has grown to about 45 cm (1 year old), is distributed on the west coast of Western Australia where Leeuwin Current, a thin, slow speed warm current that flows from north to south, exist (Hynd 1965). However, little is known about the distribution and migration of fish between larvae and age-1. It is important to know the distribution and migration of fish in the life stage during this period, and the influence of the environment on it, because it would make available to understand the annual fluctuation of recruitment of SBT stock.

In the 1980s and 1990s, the Japanese Fisheries Agency carried out several research surveys using the research vessel Shoyo-maru on the west coast of Western Australia, and collected SBT by trolling. As a result, the distribution of age-1 fish was confirmed mainly off Perth (32S), and a total of 11 small age-0 fish of 25 cm or less were collected. However, no survey was conducted after that, and information on the distribution of small age-0 fish was not added.

In December 2019, we started the research project to investigate the distribution of small age-0 fish (< 25 cm in fork length) in the northwestern coast of Western Australia and succeeded to catch two SBT individuals including a 24.4 cm small age-0 fish by trolling gears (Itoh and Tsuda 2020). The pandemic of COVID-19 forced us to interrupt the survey for two years. We carried out the second survey in December 2022. The result of the survey is presented in this document.

2. Materials and methods

An Australian vessel, *Adrianus* (23m long, 7m wide, 42.5 ton) was chartered (Fig. 1). One researcher and four crew members boarded. The study area was on the northwest coast of Western Australia, spanning 195 km, from Exmouth to the south east off Exmouth Peninsula. We conducted the survey from 6 am to 5 pm and anchored in calm bay at night. GPS recorders recorded the position every five seconds. During the trolling operation, the boat speed was 5-7 knots. The trolling has seven lines and is equipped with a plastic lure. When any fish were caught, its body length in fork length was measured. For some individuals, the body weight was measured and biological samples including stomach and muscle tissue were collected.

3. Results

The survey lasted eight days started from Exmouth on 3 December to back to Exmouth on 10 December (Fig. 2). A total of 45 fish were caught, including 14 SBT, 13 yellowfin tuna *Thunnus albacares*, 7 skipjack *Katsuwonus pelamis*, 1 mackerel tuna *Euthynnus affinis* and others (Table 1). A SBT was caught off the northwest of Exmouth Peninsula (21.8S, 113.8E) on 5 December have a fork length of 23.4 cm. On 8 December, 13 SBT were caught off the southwest of Exmouth Peninsula (23.0S, 113.3E) in three occasions with range from 23.0 to 25.2 cm (Fig. 3). Species of SBT was identified from the number of gill rakers and the morphology of the liver on the boat. The depths to bottom where SBT caught were about 400m. Stomach of SBT contained crustacean larva and small fish. The total weight of SBT mortality of 14 fish was estimated as 4.2 kg assuming 0.3kg per fish.

4. Discussion

Because the 24.4cm SBT sample in the 2019 survey was collected at 22.43S, which is quite north of the surveyed area, and near the shelf-edge, the area off the west coast of the Exmouth Peninsula and around the slope-edge was intensively investigated in the 2022 survey. This aim seems to have been achieved, and we succeeded in collecting more age-0 SBT this time, although the survey days were shorter than the previous time. It was proved that it is logistically possible to conduct the field survey, the collection method of trolling was proved to be appropriate, and the area where SBT are distributed were clarified.

It is still unclear whether age-0 SBT favor shelf-edge. It will be possible to clarify this in the future by comparing both shallow water areas on the shelf and deep water areas offshore from the shelfedge. By accumulating the results of collection in the future, it will be possible to improve the collection method more suitable, and it will be possible to clarify the whole picture of the spatio-temporal distribution of age-0 SBT.

In this research area, the wind was strong in December when the two surveys were conducted so far. The next survey is scheduled for April 2024, when the wind is weaker and survey and research activities are easier. In April, fish born in January and February can be surveyed as around 25 cm, and fish of about 40 cm that were born around October of the previous year can also be surveyed if they are distributed in the survey area.

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Figure 1. Adrianus, used for the 2022 survey of the age-0 SBT distribution research.

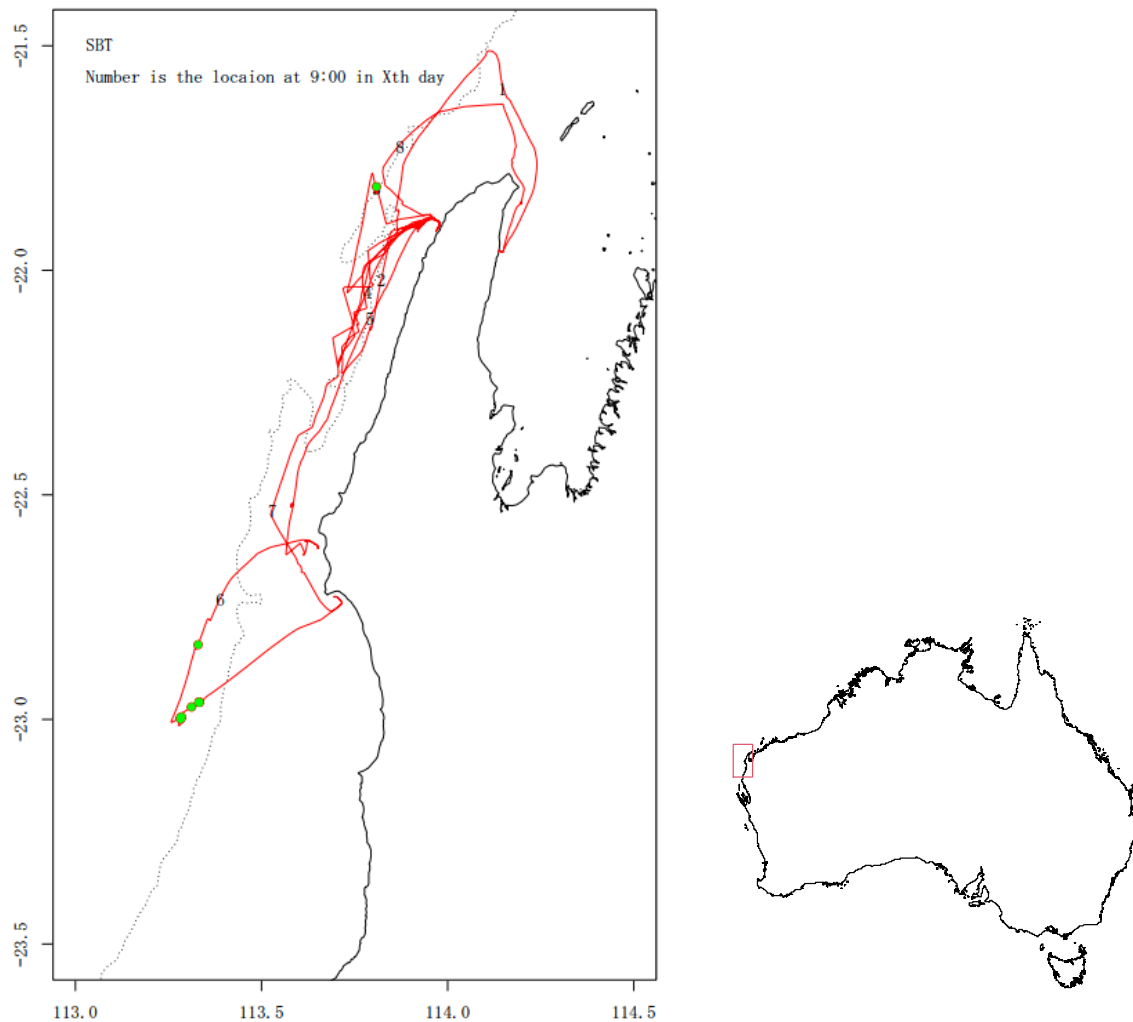


Figure 2. The trajectory of the vessel (line) and locations of southern bluefin tuna caught (circles) in the age-0 SBT distribution survey in 2022.

The numbers are the location at 9AM on sequential day.



Figure 3. Southern bluefin tuna age-0 individuals caught including 23.0 cm fork length in the age-0 SBT distribution survey in 2022.

Table 1. List of fish caught in the age-0 SBT distribution survey in 2022.

English name	Scientific name	N	Remark
Southern bluefin tuna	<i>Thunnus maccoyii</i>	14	
Yellowfin tuna	<i>Thunnus albacares</i>	13	
Skipjack	<i>Katsuwonus pelamis</i>	7	
Mackerel tuna	<i>Euthynnus affinis</i>	1	
Shark mackerel	<i>Grammatorcynus bicarinatus</i>	1	
Dolphin fish	<i>Coryphaena hippurus</i>	2	
unknown		7	Hook came off before identification.