

## Report of the age-0 southern bluefin tuna distribution in the northwest coast of Western Australia in 2019

2019年の西オーストラリア州北西沿岸における  
ミナミマグロ0歳魚分布調査の結果報告

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### 要約

ミナミマグロについて仔魚から1歳魚までの分布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企画した。第1年目となる2019年には12月に10日間の調査を実施した。その結果2個体のミナミマグロを曳縄で採集し、そのうち1個体は24.4cmの小型0歳魚であった。今後の調査は実施可能であり、小型0歳魚の分布及びその採集が可能であることが示された。

### Summary

Little is known about the distribution of SBT from larvae to 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. In the first year of 2019, a 10-day survey was conducted in December. As a result, two southern bluefin tuna were collected by trolling, one of which was a 24.4 cm small age-0 fish. Future research is feasible and it is shown that small age-0 can be distributed and collected.

## 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). Little is known about the distribution and migration of larvae to age-1 fish. 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 is possible 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. Therefore, we conducted a survey cruise to obtain information on the distribution of small age-0 fish. This year, the purpose was to evaluate the feasibility of conducting the survey.

## 2. Materials and methods

An Australian vessel, *Latitude 22* (21m long, 5.5m wide, 30 ton) was chartered (Fig. 1). Two researchers and three crew members boarded. The study area was on the northwest coast of Western Australia, spanning 390 km along the coastline from Shark Bay to Exmouth. We conducted a survey from 6 am to 5 pm and anchored in calm bay at night. The GPS recorder recorded the position every second. During the trolling operation, the boat speed was 6-7 knots. The trolling has five lines and is equipped with a plastic lure. Body length in fork length was measured when there was a catch. For some individuals, the body weight was measured and biological samples including stomach and muscle tissue were collected. For oceanic observation, bundling two depth/time measuring devices (JFE Advantech Co., Ltd., DIFI-D10) and temperature/salinity measuring devices (JFE Advantech Co., Ltd., DIFI2-CT) were down to the seabed or up to 200 m depth.

## 3. Results

The survey lasted 10 days from Carnarvon, Shark Bay, on 30 November to Exmouth, 9

December (Fig. 2). A total of 72 fish were caught, including 2 SBT, 1 yellowfin tuna *Thunnus albacares*, 3 longtail tuna *Thunnus tonggol*, 27 skipjack *Katsuwonus pelamis*, 2 mackerel tuna *Euthynnus affinis* and others (Table 1). A SBT caught off the west coast of Shark Bay (24.8S, 112.6E) on December 1 have a fork length of 40 cm, which would be born at the end of the previous spawning period (i.e. around March 2019) estimated from the fork length. Another SBT caught off the west coast of Exmouth Peninsula (22.4S, 113.6E) on December 8 have a fork length of 24.4cm, and are considered to have been born during the spawning period (i.e. September 2019) from the fork length (Fig. 3). The total weight of SBT mortality of two fish was 1.6 kg. Species of SBT was identified from the number of gill raker and the morphology of the liver on the boat, and was further confirmed from DNA of muscle tissue in the laboratory. Oceanic observation was conducted at 9 stations.

#### 4. Discussion

This survey cruise was shown to be highly feasible with the possibility of procuring vessels, anchoring points, and supplying food and fuel. In addition, it was revealed that age-0 SBT of less than 25 cm are distributed and that they can be caught. It is possible and worthwhile to continue the investigation.

One concern is that the wind is strong in this area, and in December 2019, when the survey was conducted, we were blessed with favorable conditions where the wind was weaker than usual. In the future, there may be stronger wind conditions. The number of SBT caught was small. It may have been a low level of year class. The number of collected individuals may increase due to the identification of suitable areas and suitable fishing gear as a result of continuation in the future.

The Shoyo-maru cruise (1988, 1989, 1990, 1991, 1992, 1996) from the 1980s to the 1990s confirmed that SBT of less than 25 cmFL are distributed in 24S near Shark Bay. The collection of 24.4 cm of individual this time was about 150 km north of it. It seems that small age-0 fish of less than 25 cmFL are distributed in a wide area to the north of the previously assumed area.

#### Acknowledgment

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## References

- Farley J. H. and Davis, T.L.O. (1998) Reproductive dynamics of southern bluefin tuna, *Thunnus maccoyii*. Fish. Bull. 96:223-236.
- Hynd J.S. (1965) Southern bluefin tuna population in south-west Australia. Aust. J. Mar. Freshw. Res., 16:25-32.
- Ueyanagi S. (1969) The spawning of the southern bluefin tuna (*Thunnus maccoyii*) as indicated by the occurrence of its larvae. Bull. Far Seas Fish. Res. Lab., 1: 1-4.
- Warashina I. and Hisada K. (1970) Spawning activity and discoloration of meat and loss of weight in the southern bluefin tuna. Bull. Far Seas Fish. Res. Lab., 3: 147-165.



Figure 1. Latitude 22, used for the 2019 survey.

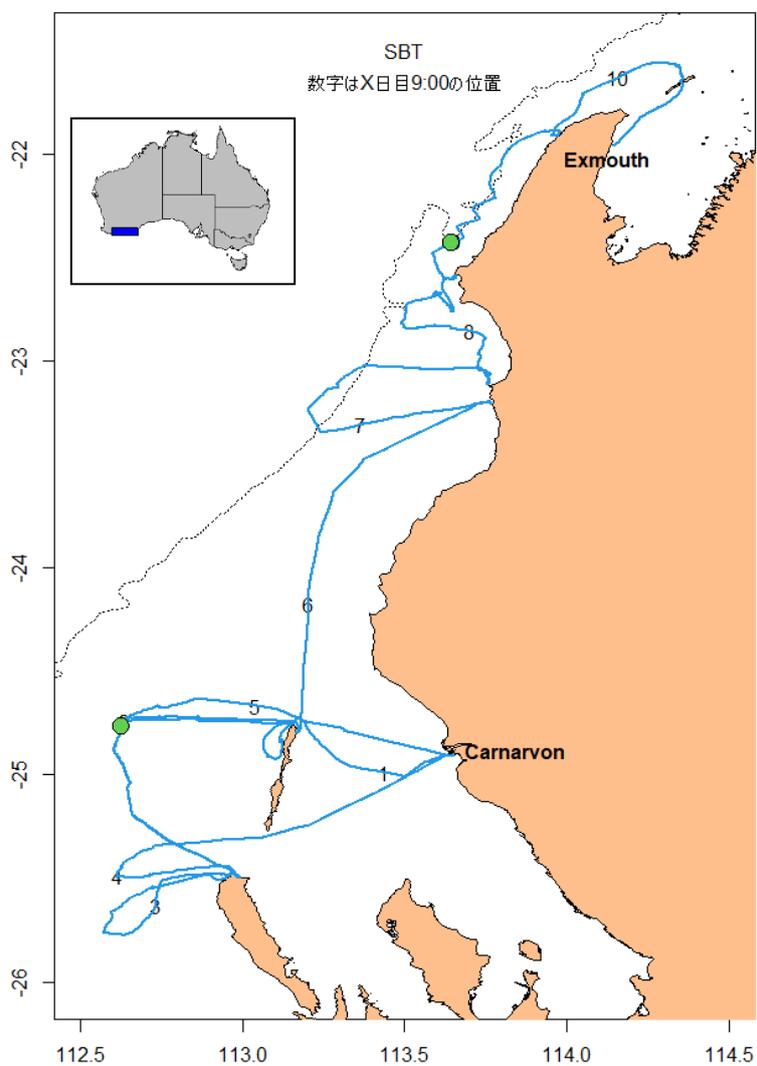


Figure 2. The trajectory of the vessel (line) and locations of southern bluefin tuna caught (circles) in the 2019 survey.

The numbers are the location at 9AM on  $i^{\text{th}}$  day.



Figure 3. Southern bluefin tuna individual caught in 24.4 cm fork length.

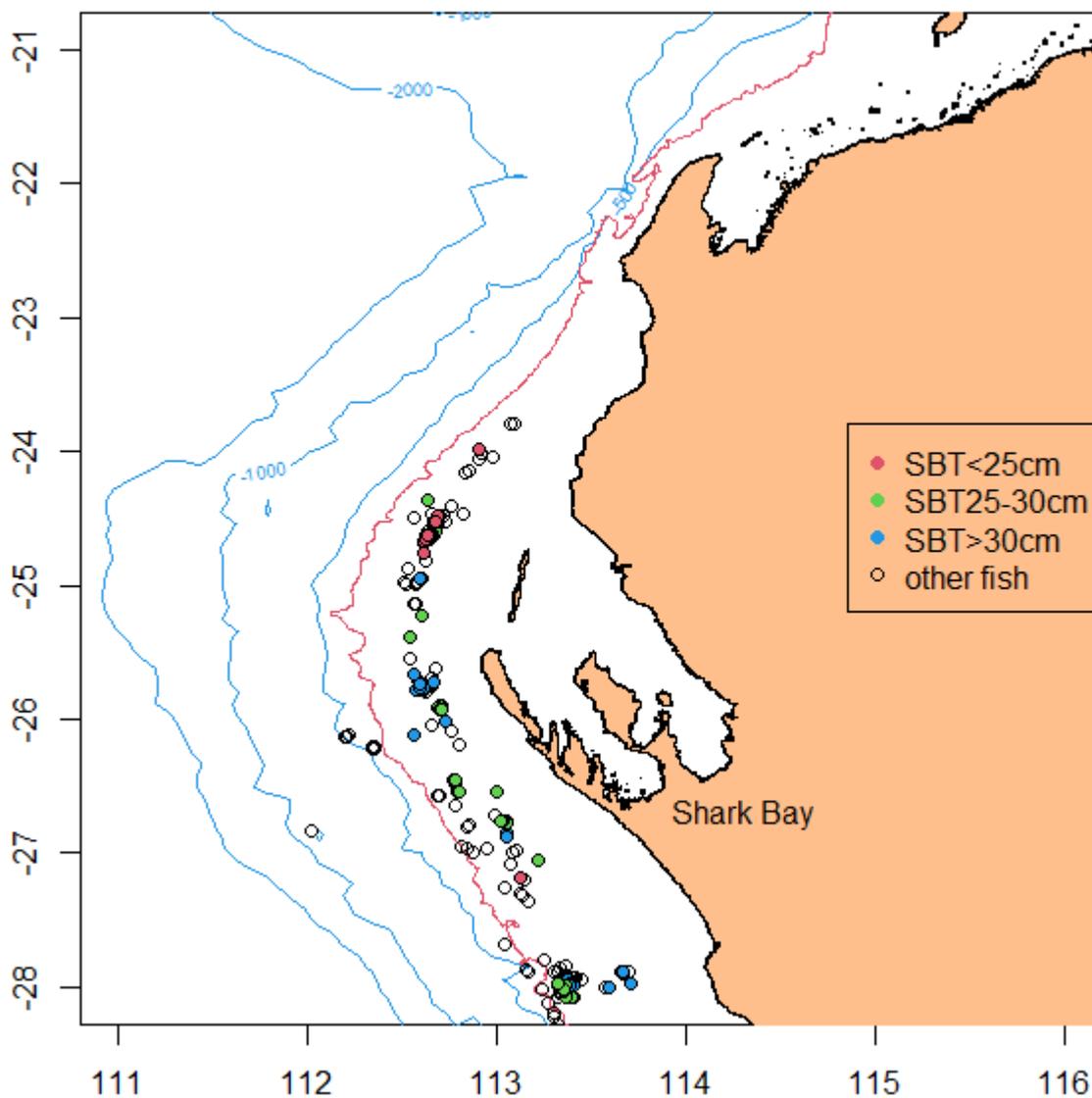


Figure 4. Location of southern bluefin tuna caught in R/V Shoyo-maru cruises in the 1980s and 1990s.

The red line is 200 m isobath.

Table 1. List of fish caught in the age-0 SBT distribution survey in 2019.

English name	Scientific name	N	Remark
Southern bluefin tuna	<i>Thunnus maccoyii</i>	2	
Yellowfin tuna	<i>Thunnus albacares</i>	1	
Longtail tuna	<i>Thunnus tonggol</i>	3	
Skipjack	<i>Katsuwonus pelamis</i>	27	
Leaping bonito	<i>Leaping bonito</i>	1	
Mackerel tuna	<i>Euthynnus affinis</i>	2	
Narrow-barred spanish mackerel	<i>Scomberomorus commerson</i>	4	
Wahoo	<i>Acanthocybium solandri</i>	1	
Double-lined mackerel	<i>Grammatorcynus sp.</i>	2	Including two species.
Australian spotted mackerel	<i>Scomberomorus munroi</i>	1	
Gold spotted trevally	<i>Carangoides fulvoguttatus</i>	2	
Dolphin fish	<i>Coryphaena hippurus</i>	2	
Western buffalo bream	<i>Kyphosus cornelii</i>	1	
unknown		23	Hook came off before identification.