CCSBT-ESC/2508/23
(ESC Agenda item 7.1)

Report of the age-0 southern bluefin tuna distribution in the northwest coast of Western Australia in 2025

2025 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

伊藤智幸
Tomoyuki ITOH

国立研究開発法人水産研究･教育機構 水産資源研究所
Fisheries Resources Institute,
Japan Fisheries Research and Education Agency

要約

ミナミマグ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、2022 年の第 2 回調査を含めて最小尾叉長 23.0 ㎝までの SBT 小型魚の採集に成功していた。第 4 回調査を 2025 年 5 月に実施し、曳縄での漁獲を試みたものの、SBT の採集は無かった。

Summary

Little is known about the distribution and migration of southern bluefin tuna (SBT) from larvae to age 1. A research project to investigate the distribution of small age-0 fish (< 25cm fork length) along the northwest coast of Western Australia was started in 2019, and has been successful in collecting small SBT with a minimum fork length of 23.0cm, including the second survey in 2022. The fourth survey was conducted for in May 2025, and attempted to catch SBT using trolling, but no SBT were 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 believed that the spawning season of SBT, which runs from September to April of the following year, has two peaks, one in October and the other in January and February, based on data from Japanese commercial longline CPUE in the spawning area in the 1950s and 1960s, body length composition of age-1 fish off the southwest coast of Australia, and monitoring of adult fish landings in Indonesia since the 1990s, (Mimura and Warashina 1962, Hynd 1963, Shingu 1970, Farley and Davis 1998). The two sub-cohort structure of SBT has also been confirmed by length frequency analysis of SBT between age 0 and 2 caught in the trolling surveys conducted off the south coast of Western Australia (Itoh et al. 2012). 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 a new research project to investigate the distribution of small age-0 fish (< 25 cm in fork length; FL) off the northwest coast of Western Australia, and has been successful in collecting small SBT with a minimum of 23.0cm FL by trolling gears, including the second survey in December 2022 (Itoh and Tsuda 2020, Itoh 2023). Among the SBT caught in the trolling survey in the southern Western Australia, there were few fish born in October, which was the target of the December survey (Itoh et al. 2012), and because strong winds make it difficult to conduct surveys in December, the survey period was moved from March to May to target fish born in January and February. However, we did not have any SBT collection in the third survey which held in March 2024 (Itoh 2024). We conducted the fourth survey in May 2025. The result of the survey is presented in this document.

2. Materials and methods

Australian vessels, *Kujira* (6.5m long, 2.5m wide, 2.5 ton) and Shearwater (7.5m long, 2.5m wide, 3.2 ton) was chartered for the earlier and later periods, respectably (Fig. 1). One researcher and three crew members boarded. The study area was on the northwest coast of Western Australia, off the west of North West Cape (Fig. 2). Piers for launching boats were limited to Tantabiddi, Bundegi and Coral Bay. In the morning, the trailer carrying the research vessel was towed by a car and unloaded at the pier, and in the evening, the vessel was loaded onto the trailer and returned to the accommodation. GPS recorders recorded the position every one second at the sea. During the trolling operation, the boat speed was 5-7 knots. The trolling has four lines with different specifications and each line is equipped with a plastic lure. When any fish were caught, its body length in fork length and the body weight were measured and biological samples including stomach and muscle tissue were taken.

3. Results

The survey was carried out over nine days between May 1 and May 10. Strong winds prevented the vessel from departing for one day.

A total of 34 fish were caught, including 3 yellowfin tuna *Thunnus albacares*, 9 skipjack *Katsuwonus pelamis*, 6 mackerel tuna *Euthynnus affinis*, and 11 unidentified fish because hook come off far from the vessel (Table 1). No SBT were collected.

The stomach contents of 16 individuals were observed. Fish accounted for 66% of the prey weight, and crustaceans for 34%. In skipjack stomachs, crustaceans accounted for 66 %. Among crustaceans found, mantis shrimp larvae stood out.

4. Discussion

The first and second of our surveys, conducted in December, targeted fish born around October that were more than 60 days old and thought to have reached a fork length of 20 cm or more. Our third survey, conducted in late March 2024, targeted fish born during the second peak, but because only less than 60 days had passed since the beginning of February SBT would be too small to be caught by trolling at the survey season so that we didn't have any SBT catch. This survey was conduced in early May, which was expected to catch SBT which grow large enough to be caught by trolling, but no SBT were caught.

There are three possible reasons why no SBT were caught. These possibilities may be

interrelated. The first is that there may have been few fish born during the spawning season from September 2024 to April 2025. This possibility will be verified through a trolling survey to be conducted in February 2026 and a gene tagging to be conducted in 2027. The second possibility is that our efforts were too small to encounter SBT schools. The third possibility is that the distribution of SBT is affected with seasonal changing of the Leeuwin Current. The Leeuwin Current is a warm current that flows south along the west coast of Western Australia, and its strength is weak in summer and strong in winter (Ridgway and Condie 2004, Feng et al. 2003). The speed of the Leeuwin Current is about 1 knot even in winter when it is strong, and its effect of directly transporting SBT is thought to be small. However, the wide spread of seawater with the same physical properties such as water temperature to the south may have expanded the habitat of SBT, making it easier for SBT to migrate south, and hence the density of SBT distribution may have decreased, which resulted in decreasing the probability of encountering us. These possibilities need to be verified through further research in the future.

Acknowledgment

We thank J. Totterdell, N. Glahn-Bertelsen and N. Passeck for their help of this survey. We thank AFMA given us scientific research permission in the Australian coastal waters (#1006168).

References

Farley J. H. and Davis, T.L.O. (1998) Reproductive dynamics of southern bluefin tuna, *Thunnus maccoyii*. Fish. Bull. 96:223-236.

Feng, M., Wijffels, S., Godfrey, S., Meyers, G., 2005. Do eddies play a role in the momentum balance of the Leeuwin Current?. J. Phys. Oceanogr 35, 964–975.

Hynd J.S. (1965) Southern bluefin tuna population in south-west Australia. Aust. J. Mar. Freshw. Res., 16:25-32.

Itoh T. (2023) Report of the age-0 southern bluefin tuna distribution in the northwest coast of Western Australia in 2022. CCSBT-ESC/2308/20.

Itoh T. (2024) Report of the age-0 southern bluefin tuna distribution in the northwest coast of Western Australia in 2022. CCSBT-ESC/2409/23.

Itoh, T., O. Sakai, and D. Tokuda (2012) Sub-cohort structure of southern bluefin tuna in the recruitment monitoring trolling survey in 2012. CCSBT-ESC/1208/39.

Itoh T. and Tsuda U. (2020) Report of the age-0 southern bluefin tuna distribution in the northwest coast of Western Australia in 2019. CCSBT-ESC/2008/21.

Mimura K. and Warashina I. (1962) Studies on Indomaguro (*Thunnus maccoyii*?):

Description of the development of the fishery, geographical difference and seasonal change of distribution and relation which is seen among Indomaguro, Southern bluefin and Goshumaguro distributions. Report of Nankai Regional Fisheries 16: 135-154.

Ridgway, K.R., Condie, S.A., 2004. The 5500-km-long boundary flow off western and southern Australia. J. Geophys. Res. Oceans 109 (C4), C04017.

Shingu C. (1970) Studies relevant to distribution and migration of the southern bluefin tuna. Bull. Far. Seas Fish. Res. Lab., 3. 57-113.

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. Kujira (upper panel) and Shearwater (lower panel), used for the 2025 survey of the age-0 SBT distribution research.

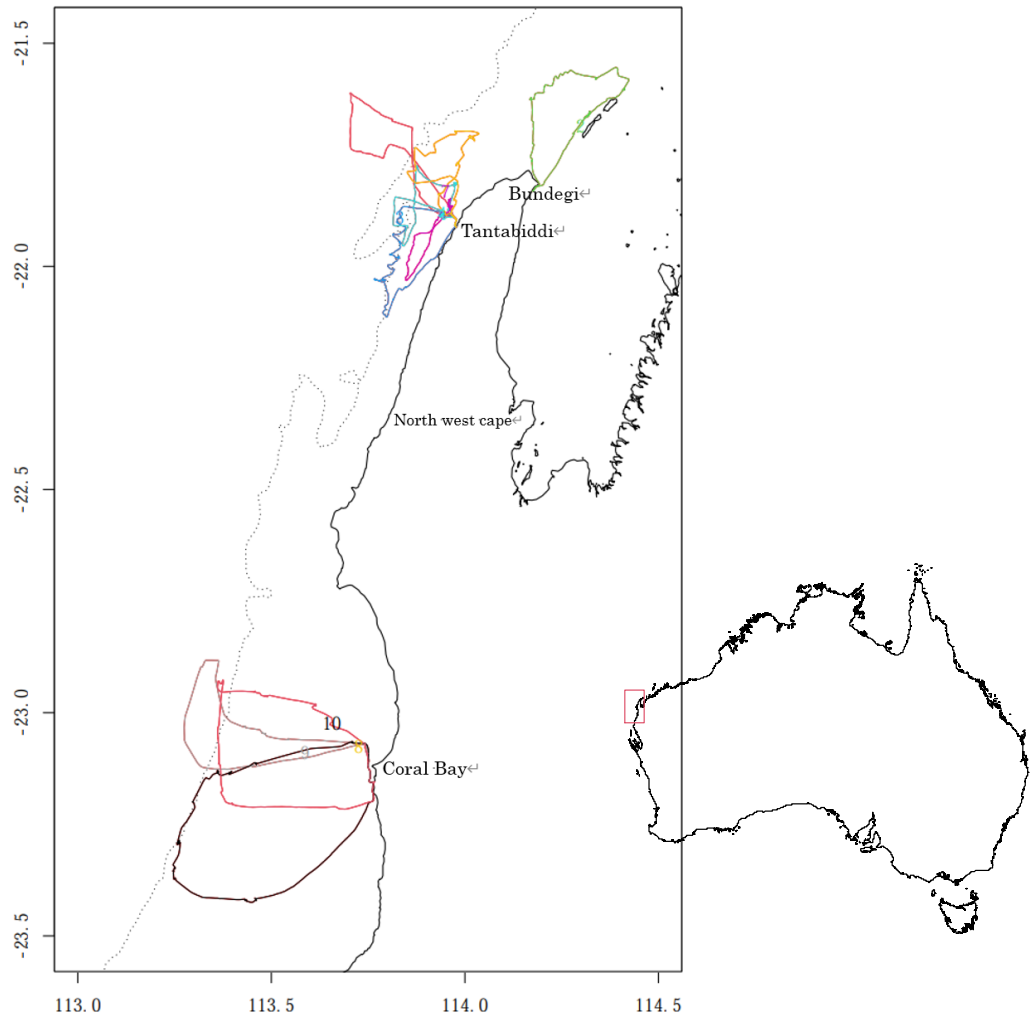

Figure 2. The trajectory of the vessel in the age-0 SBT distribution survey in 2025. The numbers are the location at 9 AM on sequential day. Different days are shown in different colors.

Table 1. List of fish caught in the age-0 SBT distribution survey in 2025.

English name	*Scientific name*	N	Remark
Yellowfin tuna	*Thunnus albacares*	3	
Skipjack	*Katsuwonus pelamis*	9	
Mackerel tuna	*Euthynnus affinis*	6	
Narrwo-barred Spanish mackerel	*Scomberomorus commerson*	1	
Shark mackerel	*Grammatorcynus bicarinatus*	1	
Dolphin fish	*Coryphaena hippurus*	1	
Marlin		1	Line broken. Probably black marlin *Istiompax indica*
Gold spotted trevally	*Carangoides fulvoguttatus*	1	
Unknown		11	Hook came off before identification.
Total		34	