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Report of the trolling monitoring survey for the age-1 southern bluefin tuna recruitment index in 2026

ミナミマグロ 1 歳魚の加入指標のための
曳縄モニタリング調査 2026 の結果報告

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要約

ミナミマグロ 1 歳魚の加入指数を求める科学曳縄調査を、2026 年 2 月に実施した。Esperance から Bremer Bay を含んで Albany までの海域を調査し、ピストンラインは 7 回、調査した。航海を通じて漁獲したミナミマグロは 252 個体であった。101 個体にアーカイバルタグを装着して放流し、ミナミマグロを含む 121 個体の胃内容物を分析し、14 点で CTD による海洋観測を実施した。2024 年に引き続いて、0.3 歳魚が主体となった。ミナミマグロの年齢別の分布、回遊に変化が生じている可能性が示唆される。

Summary

In February 2026, the scientific trolling survey that provides the data for the recruitment index of age-1 southern bluefin tuna (SBT) was carried out. The surveyed area extended from Esperance to Albany, including Bremer Bay with seven times on the piston line. A total of 252 SBT were caught during the survey. 101 SBT individuals were released with archival tags implemented, and the stomach contents of 121 fish including SBT were analyzed. Oceanographic observations were also conducted at 14 locations using CTD. As in 2024, age-0.3 fish dominated in 2025. This suggests a possible shift in the age-specific distribution and migration patterns of SBT.

1. Introduction

Recruitment level is crucial information for stock management of fish, including southern bluefin tuna (*Thunnus maccoyii*, SBT). Several research activities have been attempted for the recruitment monitoring of SBT. Since 1989, Japan has conducted a series of recruitment monitoring surveys within a cooperative research framework with Australian scientists. Japan carried out a trolling and pole-and-line catch monitoring survey from 1989 to 1993, and then carried out an acoustic monitoring survey using sonar and echo sounder from 1995 to 2006, for age-1 SBT distributed off the southern coast of Western Australia (Itoh 2006). The recruitment index derived from the acoustic monitoring survey predicted the low recruitment levels of the 1999-2001 year classes of SBT which was confirmed several years later by the model-based assessment so that it was likely to be a reliable index. However, the acoustic survey ceased after the final survey in 2006 due to a budget restriction. Alternatively, we have carried out a trolling survey since 2006. Australia had carried out a scientific aerial survey in the Great Australian Bight in South Australia since 1993 and provided the recruitment indices, as the aerial survey index, to CCSBT (Eveson et al. 2006). The aerial survey was discontinued after 2017 because of budgetary reasons and logistical problems. Since 2016, a pilot Gene Tagging (GT) project has been started instead of the aerial survey. GT estimates the absolute amount of stock of age-2 SBT and is utilized in the current Management Procedure (MP) (Preece and Bradford 2023).

The trolling survey is a reasonable way to know the recruitment status of age-1 SBT. The recruitment index of age-1 SBT derived from this survey has been provided to CCSBT as a fishery-independent indicator and utilized in robustness tests for MP. This survey finds SBT schools by trolling off the southern coast of Western Australia. Additionally, we set a single straight transect line in the survey area and are investigating it intensively each year on this line (Itoh and Kurota 2006). This survey is a long-term survey covering 19 years from 2006 to 2025 except 2015 (Itoh 2021, 2022, 2023, 2024, 2025, Itoh and Kurota 2006, Itoh and Sakai 2007, 2008, 2009a, 2010, Itoh et al. 2011, 2012a, 2013, Itoh and Tokuda 2014, Itoh and Tsuda 2016, 2020, Tsuda and Itoh 2017a, 2018, 2019). The long time series data can be expected to detect not only the interannual fluctuation of recruitment of age-1 SBT but also a medium-term trend of it. Additionally, the recruitment index from this survey becomes available immediately in the same year of the survey carried out. Therefore, in order to find recruitment failure, if it occurred, as quickly as possible and understand the recruitment trend, it is necessary to continue the trolling survey for the age-1 SBT.

In 2021, due to the global pandemic of COVID-19, the trolling survey was conducted in a limited area in a short period of time. In 2022, the trolling survey was carried out in full

range scale including piston-line, though the research items were limited due to still being under the influence of COVID-19. Since 2023, the trolling survey has been able to be carried out in the same specification as before 2020. The trolling index calculated from this survey data is described in another paper (Itoh 2026a: CCSBT-ESC/2608/25).

2. Materials and methods

An Australian vessel, *The Southern Conquest* with 17 m in total length, was chartered (Fig. 1). This vessel was consistent with the previous year's surveys.

The survey area was off the southern coast of Western Australia between Esperance (123E) and east of Albany (117E), including off Bremer Bay (Fig. 2). The area covers about 450 km x 60 km. From the coast to offshore, the continental shelf of about 70 m in depth extended largely, and then dropped sharply at the shelf edge to deeper than 500 m in depth within a distance of 2 km. The piston-line was laid off Bremer Bay.

The vessels engaged in the survey from 6:00 to 17:00 and returned to a port or a calm bay every day. GPS position data were recorded every second in GPS logger devices. The vessel operated trolling at a speed of 7-8 knots. Seven trolling lines consisting of four types of lines at maximum were trolled. Each line has one hook with a plastic lure. Because the trolling index derived from the survey is based on the number of SBT schools, not the total number of SBT individuals caught, we did not try to maximize the number of fish caught. Individual fish caught of any species were measured by their length. Some SBT were killed for biological samples including stomach for contents analysis and muscle tissue for stable isotope analysis. Other SBT were released, followed by their fork length (FL) measured. SBT in good condition were implemented with archival tag (LAT2810L from Lotek Inc. or C8X from Biologging Solutions Inc.) and released. To determine the proportion of fish—attracted to the vessel or the fishing gear—that are actually hooked and caught, underwater footage was recorded during trolling operations using a system equipped with an action camera.

Oceanographic observations for vertical profile of temperature and salinity (conductivity) were carried out at 14 points using the Conductivity-Temperature-Depth profiler (JFE Advantech Co. Ltd., CTD RINKO-Profiler) to just above sea bottom or 200 m in depth.

3. Results

The trolling survey started on 4th February and finished on 24th February, 2026. We departed from Esperance, spent a few days off the coast of Bremer Bay, headed to Albany,

returned to Bremer Bay, and finally made our way back to Esperance. In total, 19 days were surveyed, and two days weren't due to strong winds. The piston line was surveyed seven times.

During the survey, a total of 400 fish were caught, including 252 SBT, 24 skipjack *Katsuwonus pelamis*,18 yellowtail kingfish *Seriola lalandi*, 27 oriental bonito *Sarda orientalis*, 13 western australian salmon *Arripis truttaceus,* and others. This total also includes 56 unidentified fish that were unhooked at a distance from the boat. 121 fish, including 89 SBT were killed for stomach contents observation where pilchard *Sardinops sagax* was dominant. Muscle tissue for isotope analysis was sampled from 120 fish, including 89 SBT. Total weight of SBT killed was 147.4 kg. 101 SBT were implemented with archival tags, detailed are reported in another document (Itoh 2026b: CCSBT-ESC/2608/26).

There are four size/age components of SBT in this area at the time of the year: age-0.3 in 30-35 cmFL, age-1.0 having a mode at around 48 cmFL, age-1.3 in 57-63 cmFL, and age-2 in 65-80 cmFL (Itoh et al. 2012b). There are two sub-cohorts in age-1, presumably due to different spawning peaks exists in October and January/February. SBT caught in 2026 ranged from 32 to 74 cmFL (Fig. 3). Applying a mixed normal distribution to length frequency estimated that age-0.3 was 47.8%, the total of age-1.0 and age-1.3 was 37.4% and age-2 was 15.2%. Estimated from fork length, age-0.3 fish were dominant, which is an unusual pattern compared to previous years being age-1.0 dominated. In 2024, age-0.3 was the dominant, which was the first time happened since recruitment monitoring surveys began in the late 1980s.

4. Discussion

Fishery data are basic information to assess the current stock status of SBT in CCSBT. Especially, CPUE of Japanese longline, which covers a wide area, season and SBT age range based on detailed information reported from fishermen, is a long-time series index exceeding 50 years used for SBT stock status. The aerial survey was also valuable research because it covered a wide area in a short duration of time in the Great Australian Bight (GAB) by using an airplane and data of school biomass were derived as an estimation by a spotter, though it ceased in 2017. Gene Tagging is expected to be a fishery-independent index for age-2 SBT and is also used in the Management Procedure. However, there is no single index that can directly reflect the status of SBT stock in the whole range in both age and geographical distribution. Therefore, we need to collect a variety of information as many as possible to assess the stock status appropriately. Trolling survey provides important information on age-1 SBT abundance.

The design of the trolling survey corresponds to the temporal and spatial distribution of age-1 SBT, although its survey period and geographic area are limited. A majority of age-1 SBT is thought to be distributed in the coastal area of Western Australia in austral summer (Itoh and Sakai 2009b). Then the age-2 SBT widely migrates to the east and west at the end of the summer, while the majority of the SBT move to the GAB. SBT of age-2 and older are distributed widely in the area between off New Zealand and off Cape, and the fish returns to the GAB by the following year are not always. Therefore, the recruitment survey targeting age-1 SBT in the southern coast of Western Australia may provide an abundance index that represents the whole stock at age-1 SBT.

To derive an accurate year trend in an index of recruitment level, we need to exclude other factors that fluctuate by year. Carrying out the survey in a consistent method for all years is a good way to do this. We have not changed the gear specification used, and general research method for 20 years. We changed the survey vessel at the 10th and 12th surveys, but the type and size of the vessels were consistent throughout the survey. The survey area has been consistent for 19 years except 2021, when the main survey area was limited to off Esperance relevant with COVID issue. Such a consistent survey design is expected to facilitate obtaining an index that reflects only annual SBT recruitment change. Additionally, the trolling is a robust survey method against environmental factors, including wind, wave, and swell. There were a few days when the research was suspended during the cruise due to rough sea conditions in 20 years. We did not find a tendency that SBT was less caught in rough weather conditions (see Tsuda and Itoh 2017b).

Combining recruitment monitoring data from over 30 years since the early 1990s with information on past fishermen's experience catching SBT, we now know a lot about the distribution of age-1 SBT along the coast of Western Australia. It was surprising that the age-0.3 fish was the dominant in 2024 for the first time in over 30 years. While age-1 returned to dominance in 2025, age-0.3 fish became dominant again in 2026. This suggests a possible shift in the age structure or migration patterns of SBT. The proportion of age-0.3 fish should be monitored carefully in the future. Furthermore, although there were few age-1.0 fish in the surveys from 2017 to 2026 and the trolling index (TRG) has been low, the CPUE of longline by the corresponding year class remained high (Takahashi and Itoh 2026: CCSBT-ESC/2608/27). This discrepancy between the indices is a concern. If there are changes in the distribution and migration of age-1 SBT that are different from the past, we should understand the situation well and make changes to the trolling survey design if necessary. Also, if there are changes in the distribution and migration of age-1 fish, this may have an impact on the gene tagging that uses age-2 fish, and MP that use it as input data. Caution should continue to be exercised in comparing the various recruitment indices. This may be something that should be discussed at the ESC,

including possible changes in the distribution and migration of age-1 fish, or juvenile fish between age 0 and 4, and their impacts on assessment and management through GT estimates.

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Figure 1 The Southern Conquest, used for the 2026 trolling survey.
Photo was taken in 2018.

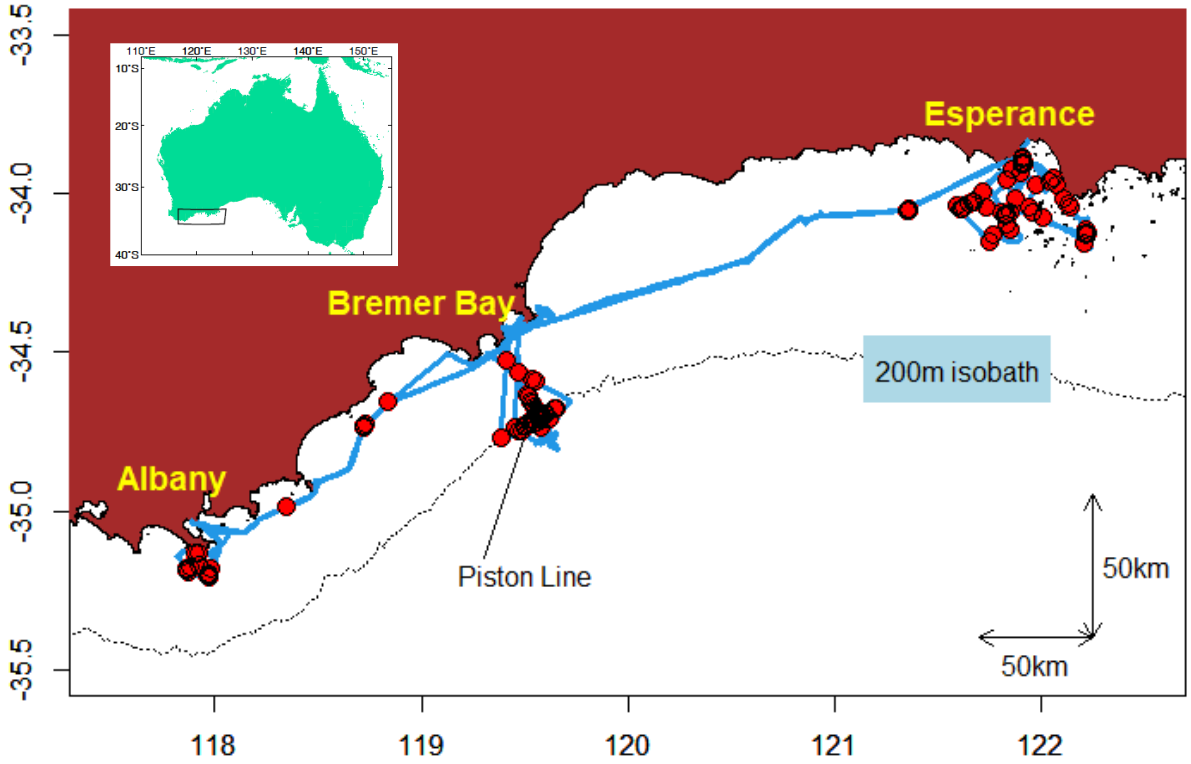


Figure 2 Trajectory of the vessel with location of southern bluefin tuna caught (circle) in the 2026 trolling survey.

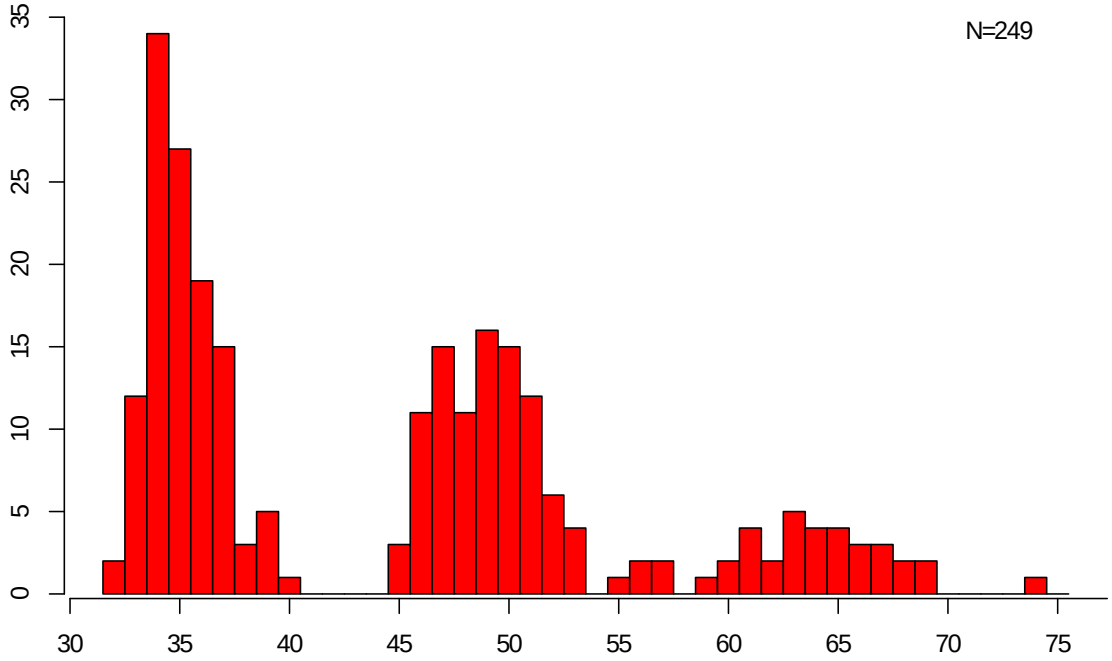


Figure 3 Fork length frequency distribution of southern bluefin tuna caught in the 2026 trolling survey.