SPECIAL REPORT

Estimating the age of *Euthynnus affinis* through hard part analysis

Annie Nunis Billy, Raihana Abdul Rahman, Nik Zuraini Nawawi Omar, and Mohamad Syahidan Azmi
SEAFDEC/MFRDMD

Tunas belong to the family Scombridae and are categorized into oceanic tunas, neritic tunas, and tuna-like species. While neritic tunas are most often found in the waters of Southeast Asia, notably the Andaman Sea (AS) and South China Sea (SCS), oceanic tunas roam across a distance of a thousand kilometers (SEAFDEC, 2017). The most commonly fished oceanic and neritic tunas in the region include skipjack, yellowfin, albacore, bigeye, striped bonito, longtail, kawakawa, and frigate tunas. Neritic tunas are captured using purse seines, drift gillnets, and falling gear (Siriraksophon *et al.*, 2013).

In Malaysia, kawakawa (*Euthynnus affinis*) is an economically significant neritic tuna; however, there is a lack of biological knowledge of this species and the fishery resource is threatened to be overexploited (SEAFDEC, 2022). Estimating the age and reproductive cycle could support the conservation and management of *E. affinis* populations in Malaysian waters. Besides, length-weight correlations are also essential in determining the average weight of fish at a particular length, body condition, growth rates, and age patterns of the dynamics of fish populations (Abdullah & Zain, 2019).

SEAFDEC/MFRDMD is currently conducting a study to determine the age of kawakawa at the time of fishing mortality. The study is under the project "Fish Management Strategies for Pelagic Fish Resources in the Southeast Asian Region" implemented from 2020 to 2024 supported by the Japanese Trust Fund VI Phase II. The findings of this study could aid the population research and stock management of *E. affinis* to enhance the development of fisheries management measures such as the regulation of fishing gear.

For the preliminary study, a total of 370 samples of *E. affinis* were collected from the two fish ports in Malaysia, *i.e.* Tok Bali in Kelantan and Kuala Besut in Terengganu, which were caught by purse seine from the east coast of Peninsular Malaysia. The length (mm) and weight (g) of each fish sample were recorded. The monthly sampling was from January to December 2020; however, no samples were collected in March due to COVID-19 restrictions in the country, and no samples were collected in November and December due to the northeast monsoon.
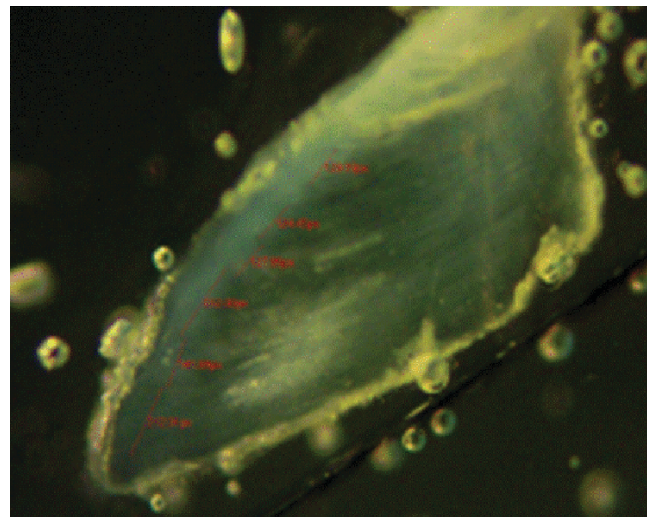

Cross-section of the otolith of Euthynnus affinis *under the light compound microscope with 40× magnification*
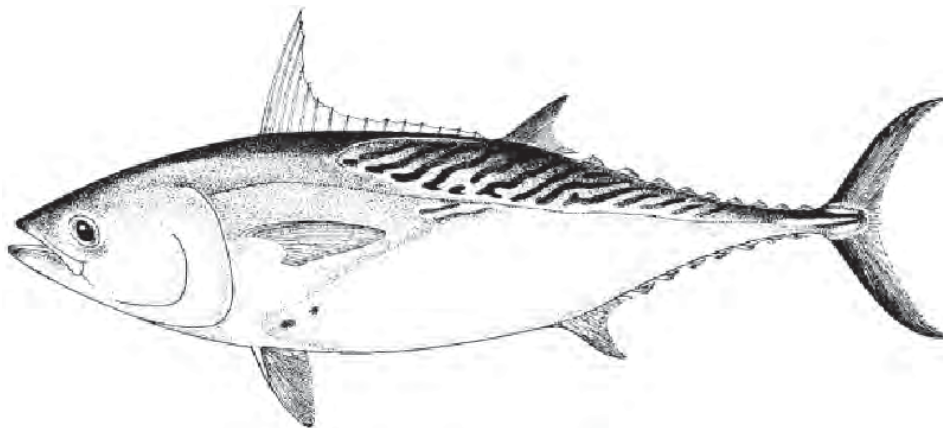
Euthynnus affinis *(Photo: Collette & Nauen, 1983)*

The hard part analysis was employed in this study which is the most precise and dependable technique to determine the growth parameters of fish by examining the hard component of the body (*e.g.* otolith) (Morales-Nin, 1992). The development of otolith is proportional to the size of fish and typically follows an allometric rise in dimensions when measuring the age of a fish (Jawad *et al.*, 2011). In this study, a total of 180 otolith samples were extracted from *E. affinis* samples and examined. The opaque zone of the otolith sample which represented the annuli ring was counted to determine the age of the fish samples.

The results revealed that the *E. affinis* samples (n = 180) had a fork length (FL) range of 232–601 mm and an average of 437 mm. Based on the analyzed otolith samples (n = 180), the age range of the fish samples was between one year and seven years and the average age was four years. Therefore, this study confirmed the linear correlation between FL and annuli rings of the otolith samples.
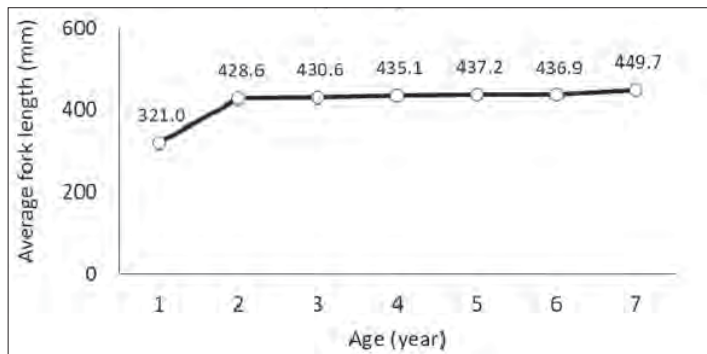
Correlation between fork length and age of Euthynnus affinis *samples from the east coast of Penninsular Malaysia in 2020 (n=180)*

From August to October, the samples of *E. affinis* seemed to be immature (FL = 232–481 mm; age = 1–6 years). Considering the preliminary results of this study, the fisheries management authority could propose a closed fishing season, especially from August to October when this species is in the process of stock-recruitment. Another management option is to increase the mesh size of purse seines from the current 78 mm to a maximum of 100 mm during the stock-recruitment phase to avoid growth overfishing. Alternatively, the fish samples appeared to be mature (FL = 392–601 mm; age = 2–7 years) from January to July, thus, the open fishing season on the east coast of Peninsular Malaysia could be imposed during those months.
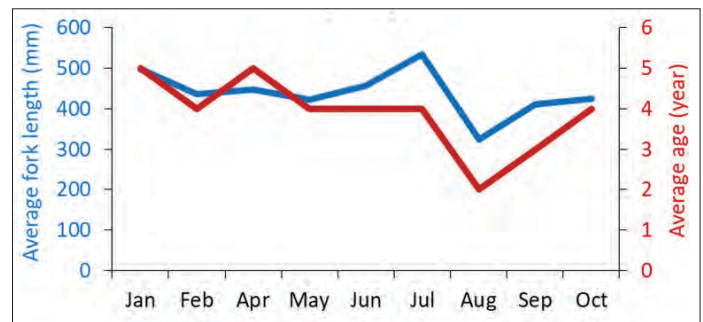
Average fork length and average age of Euthynnus affinis *samples from the east coast of Penninsular Malaysia by month in 2020 (n=180)*

MFRDMD would continue collecting more fish samples and analyzing otolith samples to generate more reliable data. The information that will be obtained from this study would support the development of science-based management measures to sustain and manage the *E. affinis* resource in Malaysia and other countries in the Southeast Asian region.

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