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Southwest Pacific Striped Marlin Population Biology (Project 99)

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Executive summary

This paper describes preliminary work being undertaken by CSIRO and Fish Ageing Services (FAS) to continue to assess age, growth and maturity estimates for Southwest Pacific striped marlin (WCPFC Project 99). The aim of the work is to evaluate the suitability of striped marlin otoliths for providing estimates of age and growth, and to evaluate the histological criteria used to determine maturity status of females by Kopf et al. (2009).

The project commenced in March 2020 just as the COVID-19 pandemic began to spread. This reduced access to laboratories at both CSIRO and FAS, which has caused delays in project activities. However, the otolith samples and ovary histology sections to be used in the study were located (from studies by Kopf et al. 2012; 2013) and sent to CSIRO and FAS. Additional samples were identified in the WCPFC Tissue Bank, which were sent to the CSIRO quarantine freezer in Brisbane, Australia. Very preliminary work has been undertaken on the samples. Most otoliths are stored in glycerine, and FAS is assessing whether the glycerine has affected the otoliths. A small number of the ovary histological sections have been read to assess the ovarian development phase. It is anticipated that the laboratory work will be completed by the end of the year, and the results reported in the final report for the project and at WCPFC SC17.

Background

Accurate life history parameters are required for robust stock assessments and to develop management advice. Age, growth and maturity parameters were estimated for southwest Pacific (SWP) striped marlin in the late 2000s (Kopf et al. 2011; 2012). Age was estimated using counts of assumed annuli in sectioned dorsal fin spines and growth parameters were included in the 2012 stock assessment (Davies et al. 2012). A maturity ogive was developed from histological analysis of ovary samples collected at around the same time (Kopf et al. 2012). The biological parameters obtained in these studies were input to regional stock assessments (e.g., Davies et al. 2012).

A recent study recommended that estimating age from otoliths should be investigated for billfish because recent advancements in swordfish age and growth suggested that otoliths are likely to be more reliable than spines, especially in larger/older fish (Farley et al. 2016). In 2019, a preliminary assessment of 17 otoliths indicated that striped marlin may live longer than previously estimated using spines (Farley et al. 2019). A preliminary von Bertalanffy growth model was fit to the new otolith age data and included daily age data from Kopf et al. (2011), for use in the 2019 stock assessment (Ducharme-Barth et al. 2019a). The stock status estimates had a high degree of uncertainty that was attributed to uncertainty in biological information, including growth parameters, and it was recommended that additional work on age and growth be prioritized to reduce the uncertainty in future assessments (Ducharme-Barth et al. 2019a).

The 2019 stock assessment also used an updated maturity ogive for striped marlin (Ducharme-Barth et al. 2019a, 2019b). The maturity ogive was a product of the sex ratio at length and the proportions of females mature-at-length from Kopf et al. (2012). The maturity ogive shifted the spawning potential to older individuals relative to the ogive used in the 2012 assessment. Concerns were raised at SC14 that the estimates of proportions of females mature-at-length from Kopf et al. (2012) may be biased toward larger individuals if large mature-resting females were misidentified as immature.

In 2019, the WCPFC funded Project 99 to assess age, growth and maturity estimates for SWP striped marlin. The aim of the project was to continue to evaluate the suitability of otoliths for providing estimates of age and growth, and to evaluate the histological criteria used to determine maturity status of females. This report describes the preliminary work undertaken in this project.

Project activities

The project commenced in March 2020 just as the COVID-19 pandemic began to spread. This reduced access to laboratories at both CSIRO and FAS, which has caused delays in project activities. However, the otolith samples and ovary histology sections to be used in the study were located and sent to CSIRO and FAS. The samples included unread otoliths and ovary histology from Kopf et al. (2011; 2012). In addition, a small number of otoliths and ovaries were obtained from the WCPFC Tissue Bank. The Tissue Bank samples were sent to the CSIRO quarantine freezer in Brisbane, Australia.

Very preliminary work has been undertaken on the samples. Most otolith samples were stored in glycerine and it was unknown if this storage medium affected the preparation and readability of the otoliths. Initially it was feared that glycerine as a storage medium may impact the ability for thin sections to be prepared from the otoliths. A sub-sample of otoliths were selected for preparation to determine if this was the case. The otoliths selected were cleared with alcohol and dried prior to preparation. Once dried, the otoliths were prepared using the same method previously reported for swordfish (Farley et al. 2016). Results from this initial work suggested that the storage of otoliths in glycerine did not adversely affect the ability of the otolith to be prepared. However, whether the storage medium of these otolith has affected the readability of the prepared otolith is unknown as we have relatively few otolith samples that were not stored in this way for comparison.

A small number of the ovary histological sections have been read to assess the ovarian development phase. Histological criteria, such as 'maturity markers', have been identified in the ovaries and will be used to confirm the maturity status of each female.

It is anticipated that the laboratory work will be completed by the end of the year, and the results reported in the final report for the project and at WCPFC SC17.

References

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