Estimation of age-at-length for bigeye tuna from the EPO based on otolith daily increment counts

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Inter-American Tropical Tuna Commission

Bigeye and Yellowfin Tuna Age and Growth Workshop, La Jolla, California USA, 23-25 January 2019

Introduction

- Tagging and OTC marking experiments conducted in the central and eastern Pacific Ocean demonstrated that bigeye tuna in the length range of 38 to 135 cm, deposit daily increments in their sagittal otoliths.

- Assuming bigeye tuna deposit increments at the same daily rate when less than 38 cm and greater than 135 cm, up to about 150 cm fork length, age estimates from daily increment counts will provide accurate estimates of age at length. However, this only appears valid for counts along the primordium to the post-rostral tip

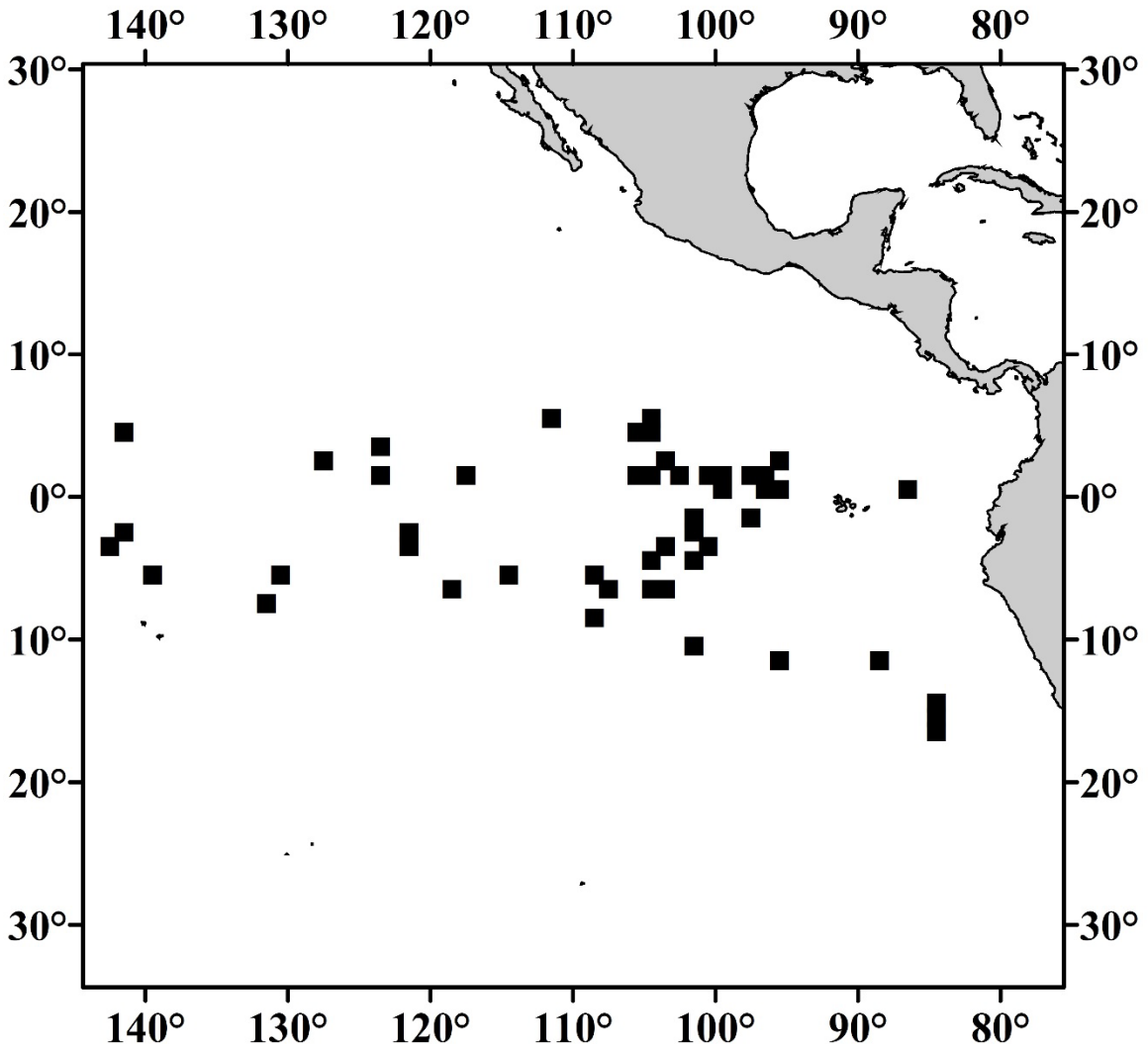
- The objective of this study was to use validated daily increment counts along the primordium – post rostral axis to estimate the age of bigeye tuna captured in the EPO.

Materials and Methods

- 378 sagittal otoliths were collected from bigeye tuna between 2000 and 2004, between 5°29'N and 16°05 S and 84°23 W and 142°27 W

Materials and Methods

Bigeye tuna otolith sample locations

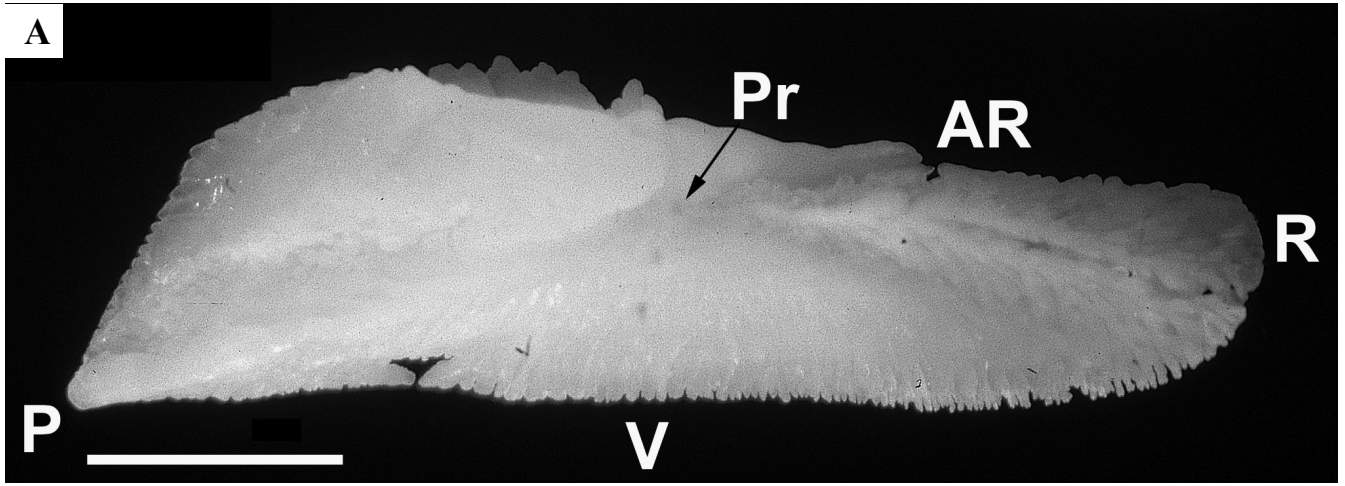


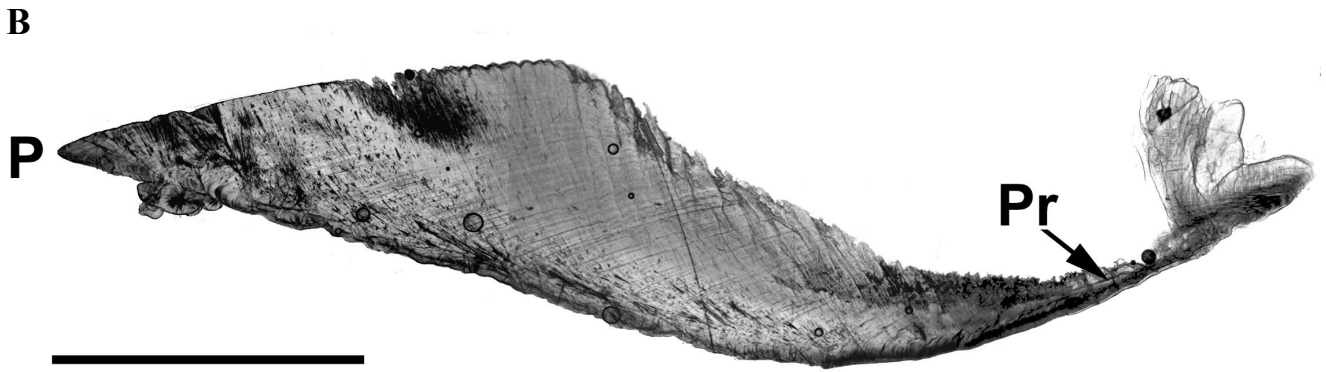
Materials and Methods

- 378 sagittal otoliths were collected from bigeye tuna between 2000 and 2004, between 5°29'N and 16°05 S and 84°23 W and 142°27 W
- Selected otoliths were mounted in epoxy resin and allowed to cure
- Sections were cut in the primordium – postrostral axis and hand polished
- Sections were viewed at 1000x (oil immersion)
- A composite digital image of the entire counting path was created using a Diagnostic Instruments SPOT RT digital camera and Image Pro Plus software, with a final magnification of 1425x

Materials and Methods

Sagittal Otolith of Bigeye tuna





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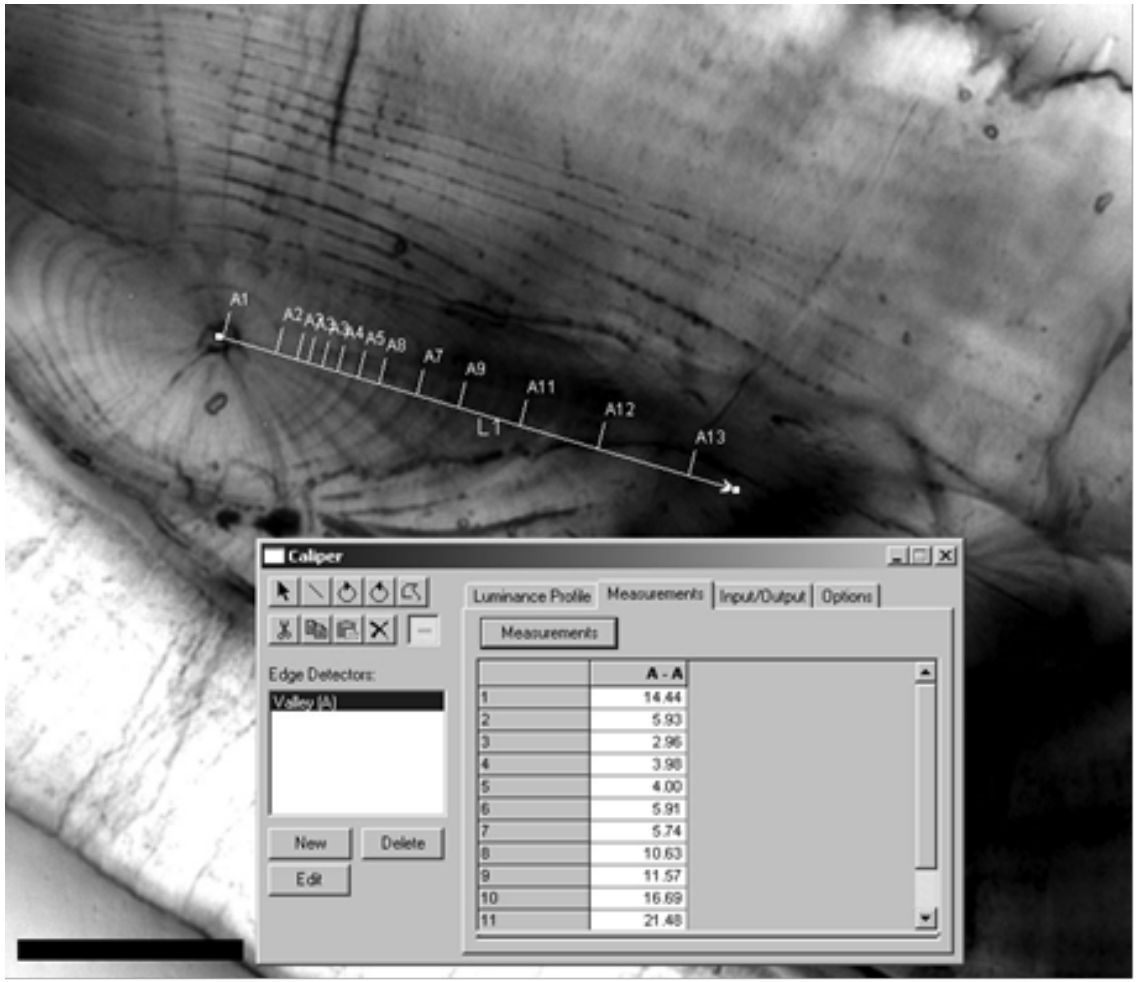

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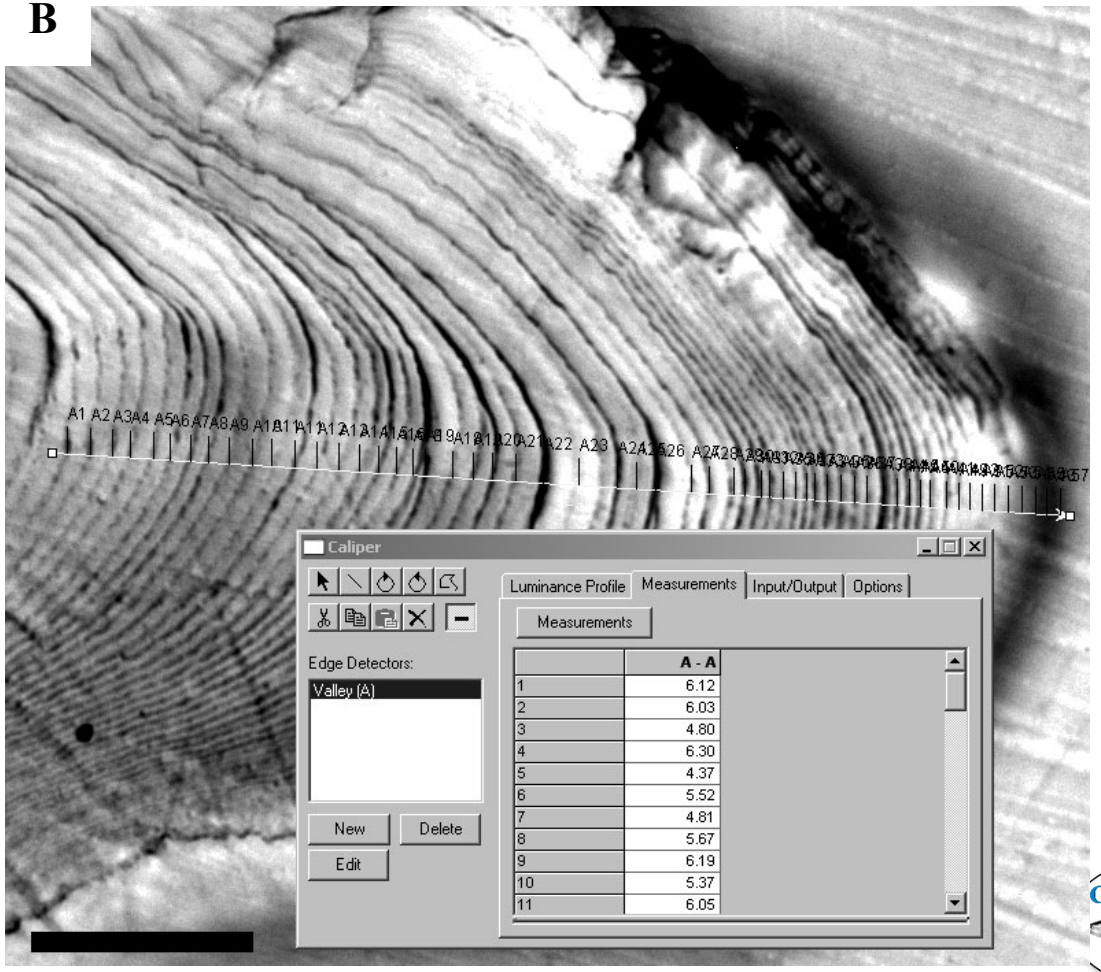

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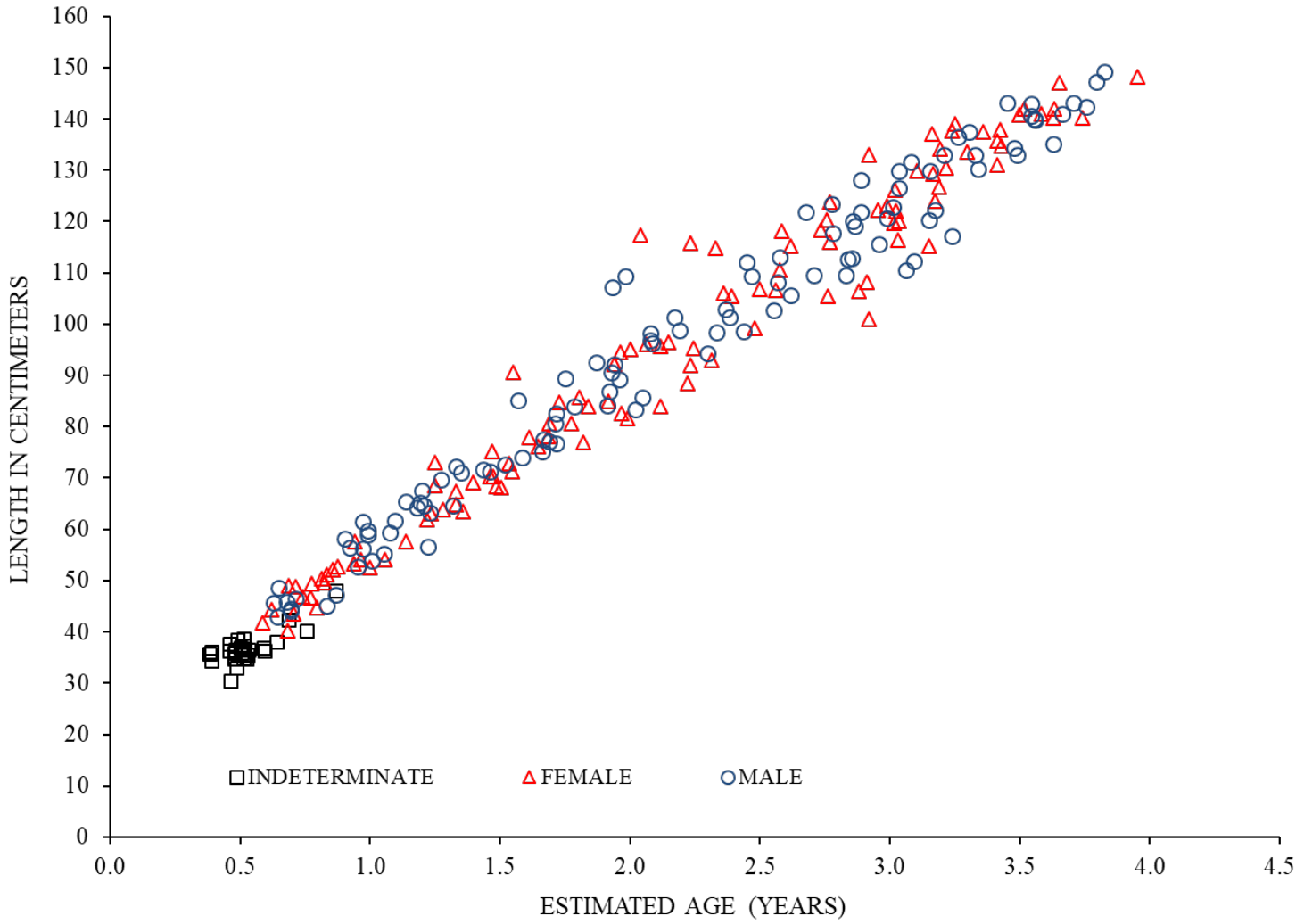
- 254 bigeye tuna sagittal otoliths were read (30 to 149 cm) and provided direct estimates of their ages in days

Results

Estimated age at length from daily counts



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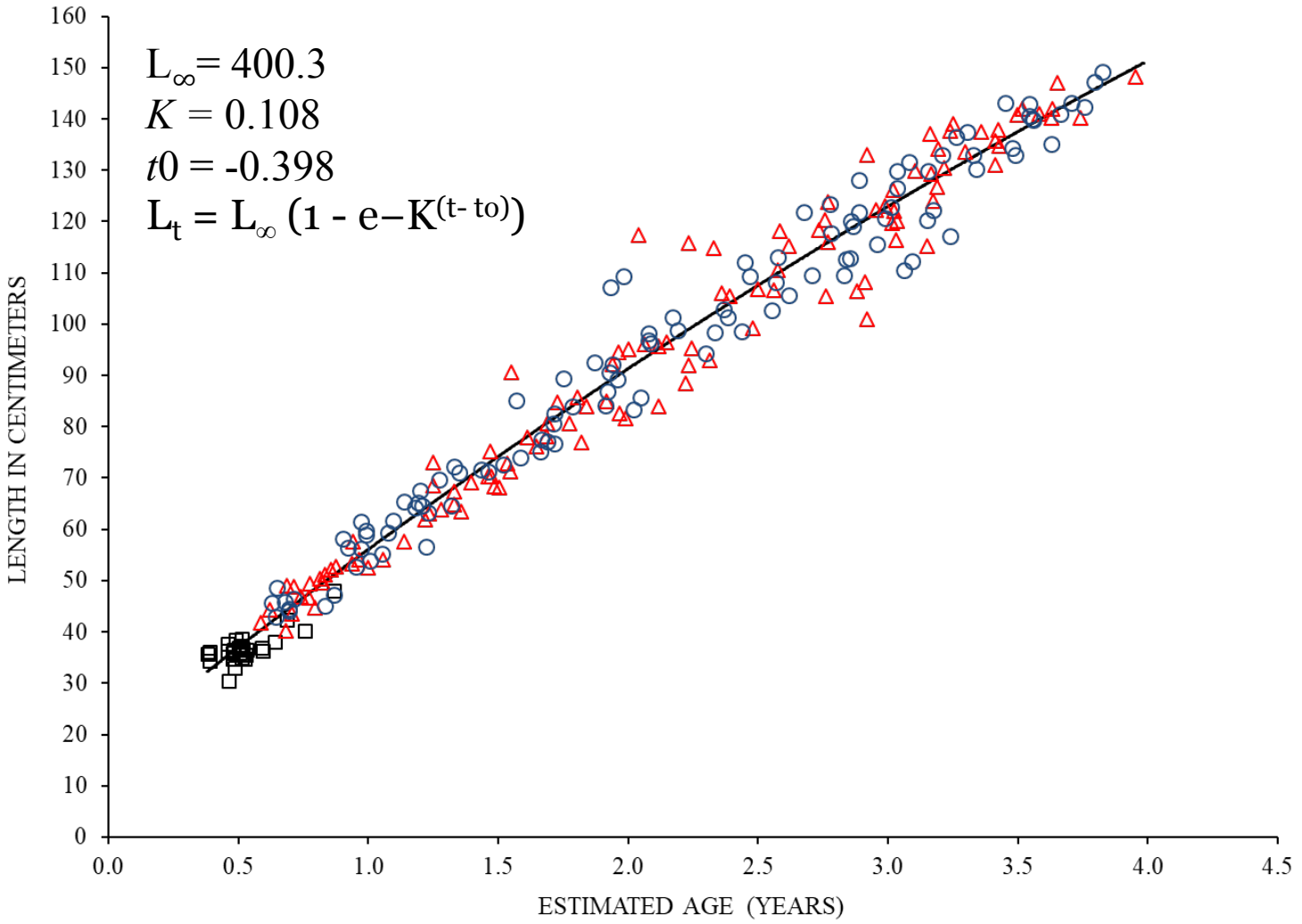

Results

- Daily increment counts for bigeye tuna (30.4 to 149.1cm) ranged from 139 to 1453 d (0.4 to 3.98 years)

- The mean width of the last 50 increments of the 20 oldest bigeye in this study is 2.51µ (range 1.59µ to 3.74µ), which is well above the limit of optical resolution of ~0.3µ.

- It may be possible, using the methods employed in this study, to derive age estimates for bigeye larger than 150 cm (4 years), however further validation work would be necessary to determine at what age one can no longer resolve daily increments

- A GAM was fit to the age at length data for females and males and the results indicated no significant difference in age at length between the two sexes

Questions