

HOW LONG CAN RED SNAPPER LIVE?

Revealing the bomb radiocarbon pulse in an otolith with LA-AMS

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The otolith of a red snapper (*Lutjanus campechanus*) was analyzed for radiocarbon (^{14}C) with a novel laser ablation (LA) apparatus coupled to the MIni Carbon Dating System (MICADAS). By prior growth zone counting in the otolith, it was estimated that the fish was 50-55 years old. The cross section of the otolith (Fig. 1) used in the LA scans was only a few hundred micrometers thick, and scanning distances did not exceed 6.5 mm. In this application, the LA-AMS technique excels due to low material usage, high spatial resolution, and a quasi-continuous ^{14}C signal along the growth axis.

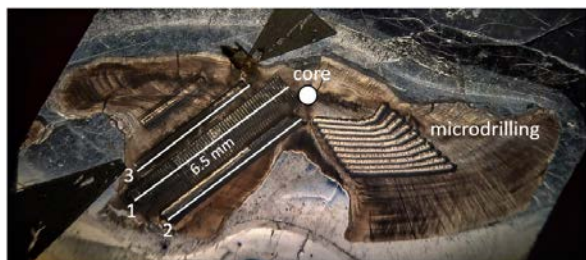


Fig. 1: Cross section of the red snapper otolith: on the left side material was ablated by the laser in three different positions, and on the right side samples were extracted by micromilling for individual CO_2 -AMS measurements.

Material was ablated in several positions of the otolith section—starting close to the core (earliest growth zones), moving along the growth axis to the outer edge, and then returning to the core in the opposite direction along the same path. In addition, a series of samples were taken along the growth axis by micromilling, and the extractions were analyzed individually by CO_2 measurement on the MICADAS to corroborate the findings from LA-AMS. These data were compared to a bomb ^{14}C reference record derived from corals of the Gulf of Mexico [1],

where this fish species lives and was collected for this study. All laser scans and micromilled samples revealed the bomb ^{14}C peak and pre-bomb levels. The rise of bomb ^{14}C was located on the otolith. Growth zone counting added ~12 years prior to the ^{14}C rise. The coral ^{14}C record indicated the rise was in 1958; the red snapper captured alive in 2004 was ~58 years old.

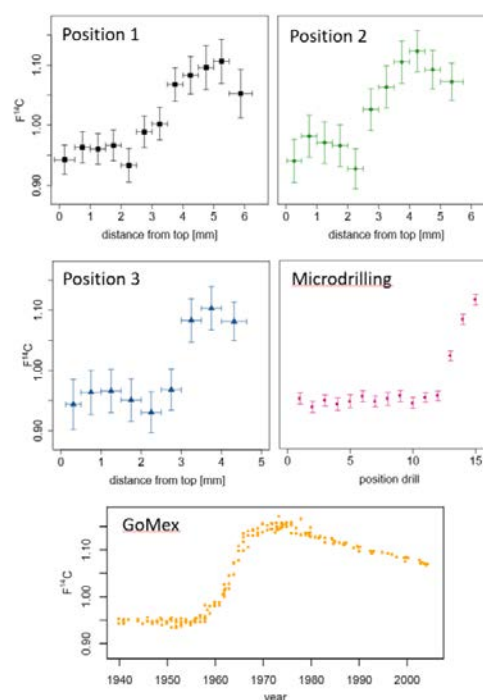


Fig. 2: $F^{14}\text{C}$ Data for the LA-AMS scans at positions 1-3 (Fig. 1), micromilling series, and the GoMex coral ^{14}C reference record.

Analysis of the otolith by LA-AMS validated the age estimation procedures for red snapper and increased longevity to nearly 60 years.

- [1] Andrews et al., Can. J. Fish. Aquat. Sci. 70 (2013) 1131

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