Korean SBT otolith collection activities in 2020

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ABSTRACT

To investigate the age and growth of southern bluefin tuna (SBT) we collected 185 otolith samples in 2020, totally 930 otoliths since 2015. The relationship between fork length and total weight was TW=6.4E-05 x $FL^{2.757}$ (R^2=0.907). The von Bertalanffy growth's parameters estimated from the non-linear method using length-at-age data were L_∞=175.8 cm, K = 0.179/year, t_0 = -1.435 years.

1. Sampling activities of otolith and ovary and its process

Since 2015 a total of 930 otoliths of SBT have been collected by Korean scientific observer program (Fig. 1). The fork length and weight were measured onboard for each specimen by sex, and the age was determined from annuli in otolith, based on the CCSBT manual (CCSBT, 2002). We analyzed the relationship between fork length (FL) and total weight (W), and estimated the von Bertalanffy growth parameters (1938). We first calculated the growth parameters using Walford method (Walford 1946) and the mean fork length by age. With the calculated parameters as initial (or starting) values, they were re-estimated by the non-linear method using length-at-age data which consists of length and age estimated to each fish at the time the fish was captured, and their confidence intervals were constructed througth boostrappng with 1,000 iterations using R package *FSA* (Ogle et al. 2018) in the R stats package (R Core Team 2018).

2. Analysis of age and growth using otolith

The SBT otolith samples were collected from April to September during 2015-2020. The length distributions collected for analyzing age of SBT are shown in Table 1. The length ranged from 66 cm to 181 cm with a mean of 131.0 cm in fork length (FL).

The relationship between fork length and total weight is shown in Fig. 2, which was W = 6.4E-05 x $FL^{2.757}$ (R^2 = 0.907).

The von Bertalanffy's growth parameters estimated by a non-linear method were L_∞ = 170.5 cm, K = 0.197/year, t_0 = -1.668 years (Fig. 3).

Fig. 3 shows the von Bertalanffy growth model for SBT with the 95% confidence intervals for the mean length-at-age and the 95% prediction intervals from bootstrapping. With initial values (L_∞=174.5 cm, K=0.172/year, t_0=-1.172 years) estimated by Walford method (1946) using the back-calculated mean fork length, the von Bertalanffy's growth parameters estimated from the non-linear method using length-at-age data were L_∞=175.8 cm, K=0.179/year, t_0=-1.435 years.

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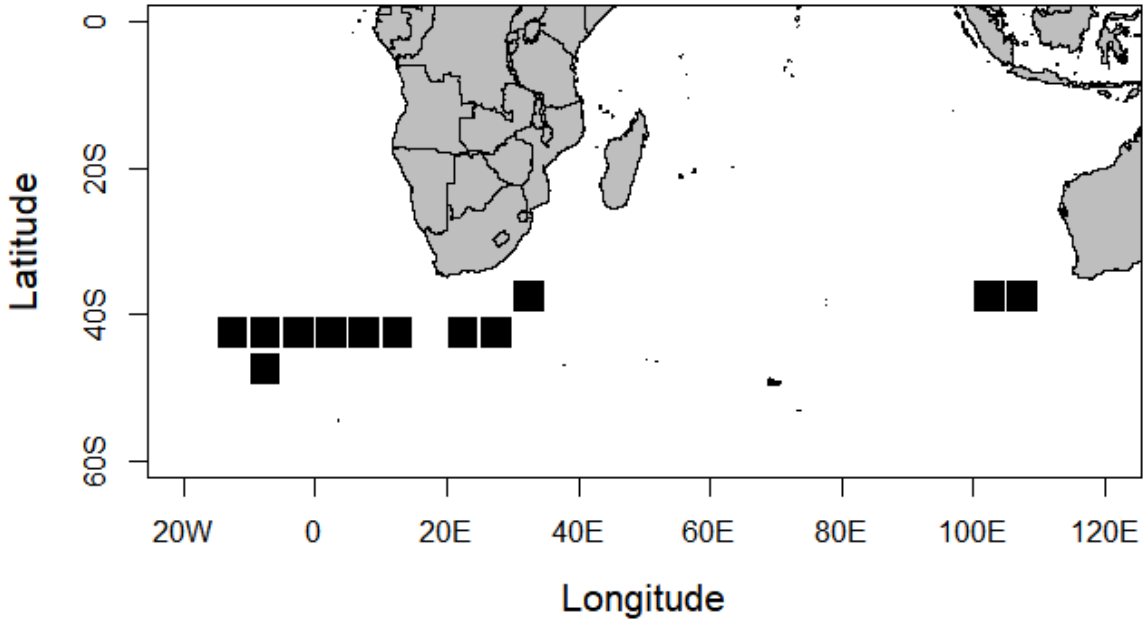

Fig. 1. Map showing the sampling area of SBT otoliths collected by Korean scientific observer program during 2015-2020.

Table 1. Length distributions of SBT collected by Korean observer programs, 2015-2020

Month	Area 8			Area 9			Total		
	No. samples	Range of FL (cm)	Mean FL (cm)	No. samples	Range of FL (cm)	Mean FL (cm)	No. samples	Range of FL (cm)	Mean FL (cm)
Apr				218	100-165	136.6	218	100-165	136.6
May				170	97-174	141.7	170	97-174	141.7
Jun				269	82-176	126.3	269	82-176	126.3
Jul				147	83-181	122.9	147	83-181	122.9
Aug	66	66-178	128.2	22	90-127	104.7	88	66-178	122.3
Sep	32	86-168	135.2				32	86-168	135.2
Total	98	66-178	130.5	826	82-181	131.0	924	66-181	131.0

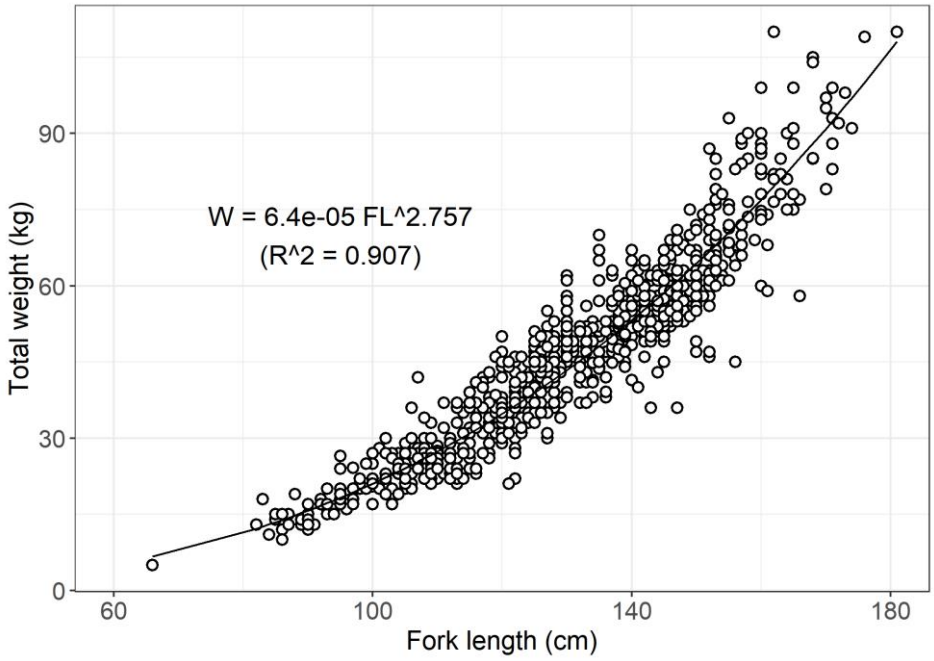

Fig. 2. Relationship between fork length and total weight of SBT collected during 2015-2020.

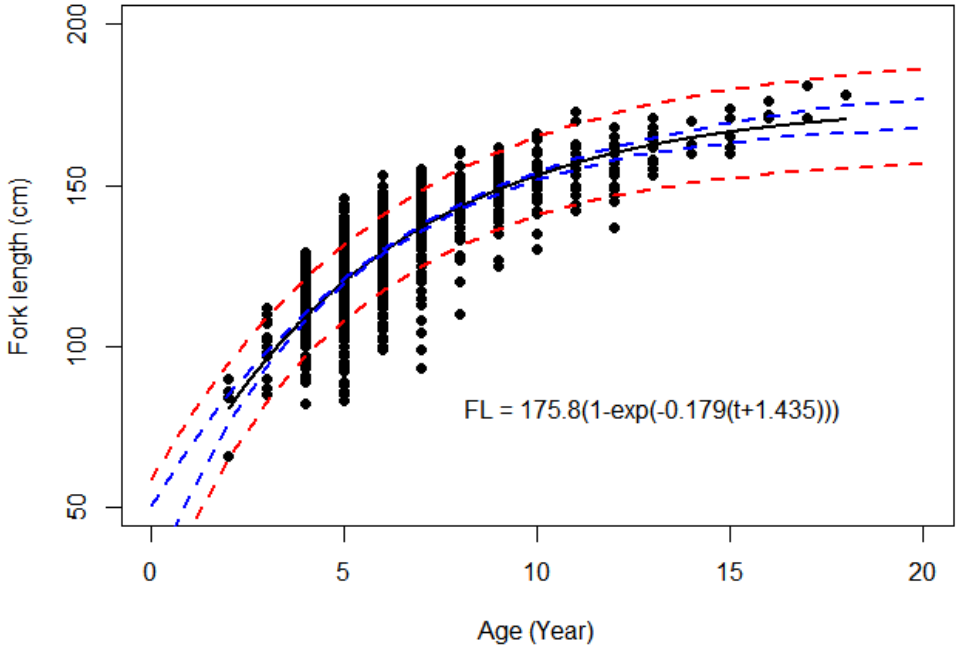

Fig. 3. The von Bertalanffy growth curve of SBT.