

Increases in maximum observed age of blacknose sharks, *Carcharhinus acronotus*, based on three long term recaptures from the western north Atlantic

Bryan S. Frazier <sup>1</sup>  
William B. Driggers III <sup>2</sup>  
Christian M. Jones <sup>2</sup>

<sup>1</sup> South Carolina Department of Natural Resources  
Marine Resources Research Institute  
217 Ft. Johnson Rd.  
Charleston, SC 29412

<sup>2</sup> NOAA, National Marine Fisheries Service  
Southeast Fisheries Science Center  
Mississippi Laboratories  
PO Drawer 1207  
Pascagoula, MS 39568

Workshop draft not to be cited without permission of authors

## **Summary**

Three tagged blacknose sharks were recently recaptured after extended periods ranging from 10.9-12.8 years at liberty. Vertebrae collected from these sharks were examined to compare direct age estimate and time-at-liberty data with maximum observed ages and theoretical longevities reported by Driggers et al. (2004) and Carlson et al. (2007). Age-at-tagging data, assigned using von Bertalanffy Growth Function (VBGF) parameter estimates summarized in Driggers et al. (2010), were combined with time-at-liberty data to generate expected ages. Both the expected ages and those derived from direct estimate from sectioned vertebrae were greater than the maximum observed ages for males and females from the western north Atlantic (Driggers et al 2004a) and the northern Gulf of Mexico (Carlson et al 2007). Additionally, both expected and direct age estimates for males were greater than the theoretical longevity estimates calculated from both models.

## **Methods**

Three blacknose sharks, initially tagged by the South Carolina Department of Natural Resources' bottom longline survey, were recaptured by commercial fishermen after significant times at liberty. Length-at-recapture measurements were only available from one individual as the other two sharks were processed at sea and therefore were of limited use to verify growth models.

Vertebrae from all three sharks were prepared and aged using the methodology described in Driggers et al (2004). Age-at-tagging was calculated using VBGF parameter estimates summarized in Driggers et al (SEDAR 21-DW-36). Four age-at-tagging estimates were calculated for each shark using four separate VBGF models. Models used were either sex specific or for sexes combined and were for either the western north Atlantic or the western north Atlantic and northern Gulf of Mexico combined. The four age-at-tagging estimates for each

shark were then averaged and added to the time-at-liberty to determine the expected-age-at-recapture.

## **Results**

Initial capture and recapture data are listed in Table 1. Time-at-liberty ranged from 3986 to 4678 days (10.9 to 12.8 years). All recaptures were recovered within ten miles of the initial tagging location. Age estimates by model, expected age-at-tagging and recapture, and direct age estimates are listed in Table 2.

### Blacknose shark L2910

This male was at liberty for 4,371 days after tagging. Expected age-at-tagging ranged from 4.10 to 4.63 years with an average of 4.44 years. Expected age at recapture was 16.4 years. A total of 17 band pairs were counted from the sectioned vertebra resulting in a direct age estimate age of 15.5 years (Figure 1).

### Blacknose shark L1515

At 4678 days, this female had the longest liberty of the three recaptures. Model estimates of age-at-tagging ranged from 4.14 to 4.61 years with an average of 4.34 years. Expected age-at-recapture was 17.1 years (Figure 2). A total of 16 band pairs were counted from the sectioned vertebra resulting in a direct age estimate age 14.5 years; a difference of 2.9 years from the expected age.

### Blacknose shark L3384

This male recapture was at liberty for the shortest time period, 3,986 days. Model estimates were only produced for the Atlantic region due to fork length at time of tagging (1020mm) exceeding the theoretical maximum length for both combined models (979.3 mm sex specific and 1012.3 mm FL for sexes combined). The male only model produced an estimate of

11.87 years, while the combine male and female model estimated 9.3 years. The average of 10.59 years was utilized for an expected age of 21.5 years. Ageing of this recaptured shark proved difficult due to the close proximity of multiple band pairs to the distal portion of the corpus calcareum (Figure 3) in addition to the vertebrae having been fused some time after birth (Figure 4). The initial reading yielded estimates of 21 to 26 band pairs, and on the subsequent reading, the readers conferred, and agreed on 22 band pairs resulting in a direct age estimate of 20.5 years. This age exceeds the theoretical maximum age calculated from the growth constant of previous models.

## **Discussion**

The blacknose shark recaptures reported herein increase the observed maximum ages for females in the western North Atlantic Ocean by 2 years and males by 10 years (Table 3). That two these sharks were approaching theoretical maximum longevity helps to verify the validity of the current growth models. While L3384 exceeds the theoretical maximum age, this discrepancy could result from any number of factors including individual variability in growth.

## **Literature Cited**

- Carlson, J.K., Middlemiss, A.M., and Neer, J.A. 2007. A revised age and growth model for blacknose shark, *Carcharhinus acronotus*, from the eastern Gulf of Mexico using x-radiography. *Gulf of Mexico Science*. 1:82-87.
- Driggers, W. B. III, Carlson, J. K., Oakley, D., Ulrich, G., Cullum, B. and Dean, J. M. 2004a. Age and growth of the blacknose shark, *Carcharhinus acronotus*, in the western North Atlantic Ocean with comments on regional variation in growth rates. *Environmental Biology of Fishes*. 71: 171–178.
- Driggers, W.B., Carlson, J.K., Frazier, B.S., Ingram Jr., G.W., Quattro, J.M., Sulikowski, J.A., Ulrich, G. 2010. Life history and population structure of blacknose sharks, *Carcharhinus acronotus*, in the western North Atlantic Ocean. SEDAR 21-DW-36.

Tag #	Sex	Date	FL	TL	Days at Large	Years at large	Distance Moved
L2910	M	9/8/1995 8/27/2007	876 960	1085 1150	4371	12	~6 miles
L1515	F	10/26/1995 8/16/2008	878	1092	4678	12.8	~6 miles
L3384	M	8/9/1996 7/9/2007	1020	1249	3986	10.9	~8 miles

Table 1. Tag and recapture information for three blacknose sharks from the South Carolina Department of Natural Resources bottom longline survey.

Tag Number	Estimated age at tagging (years)				Average Age (years)	Time at Liberty (years)	Expected Age (years)	Direct age (years)
	Atlantic (sex specific)	Atlantic/Gulf (sex specific)	Atlantic (sexes combined)	Atlantic/Gulf (sexes combined)				
L2910	4.47	4.63	4.1	4.56	4.44	12	16.4	15.5
L1515	4.17	4.44	4.14	4.61	4.34	12.8	17.1	14.5
L3384	11.87	N/A	9.3	N/A	10.59	10.9	21.5	20.5

Table 2. Estimates of age at tagging, based on four models reported in Driggers et al. (2010), expected total age and age of sectioned vertebrae for three blacknose sharks from the South Carolina Department of Natural Resources bottom longline survey.

Location	Sex	Observed Maximum Age (years)	Theoretical Longevity (years)
Western North Atlantic Driggers et al. (2004)	Female	12.5	19
	Male	10.5	16.4
Northern Gulf of Mexico Carlson et al. (2007)	Female	11.5	34.7
	Male	9.5	15.7
Western North Atlantic this study	Female	14.5	
	Male	20.5	

Table 3. Reported observed maximum ages for blacknose sharks from this and previous studies.

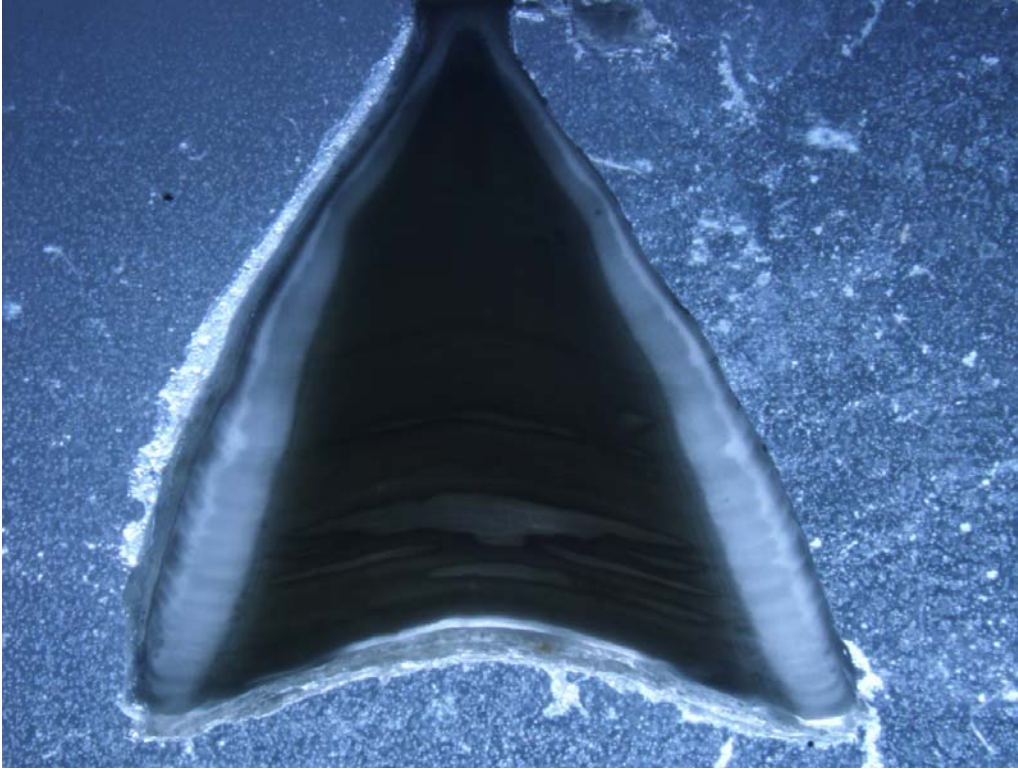


Figure 1. Sectioned vertebrae from blacknose shark L2910; 17 band pairs counted.

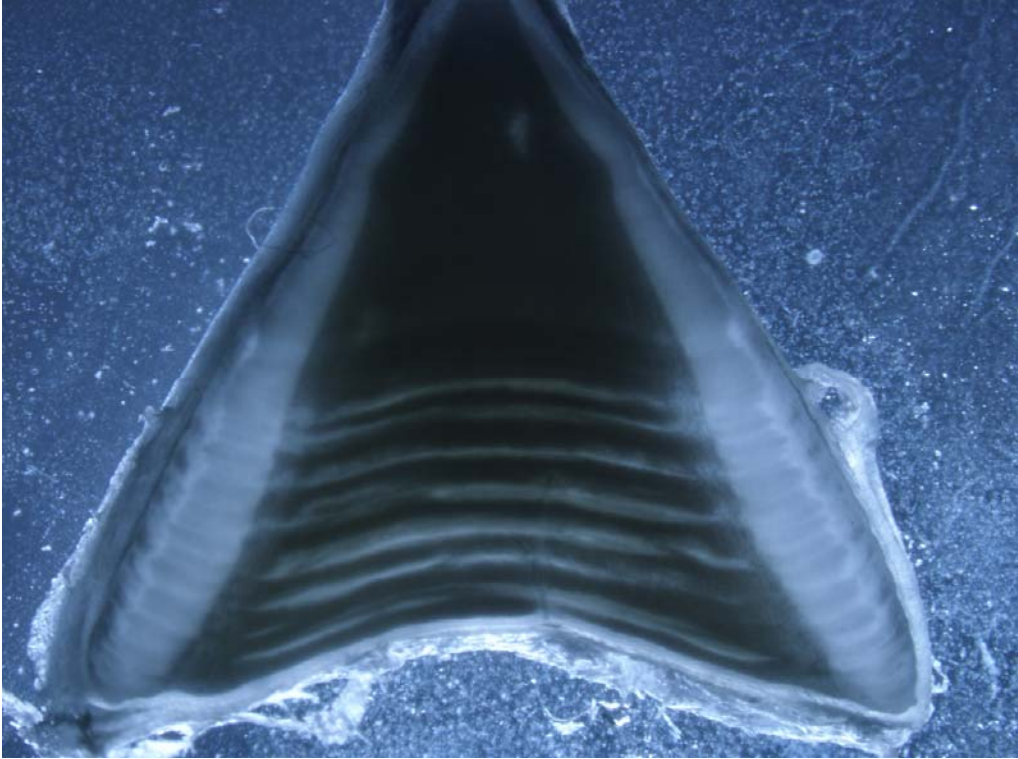


Figure 2. Sectioned vertebrae from blacknose shark L1515; 16 band pairs counted.





Figure 3. Sectioned vertebrae from blacknose shark L3384; 21 to 26 band pairs counted. Consensus between readers was 22 band pairs.

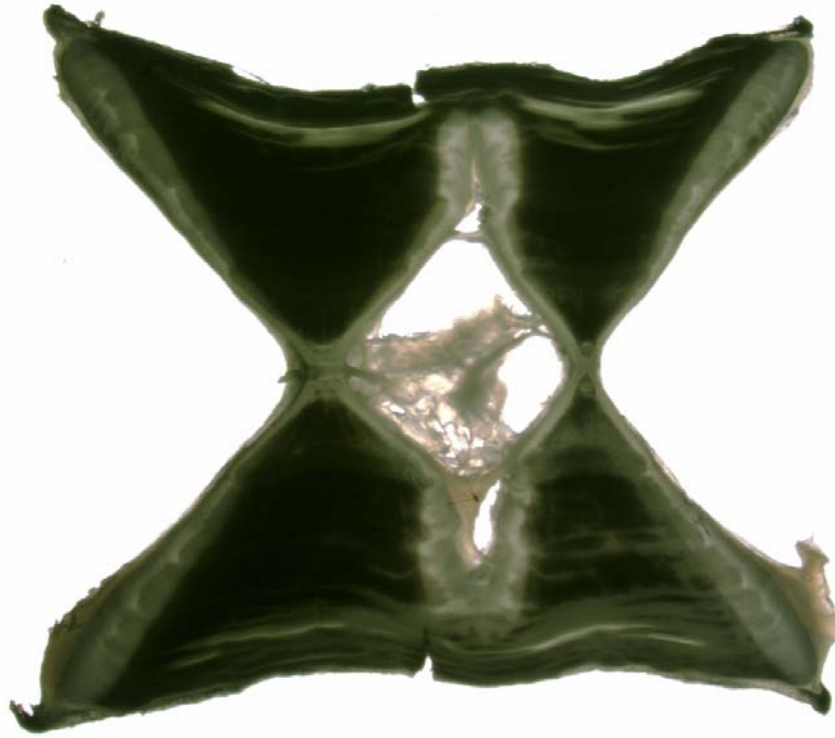


Figure 4. Fused vertebrae from blacknose shark L3384 used for ageing .