Fisheries Session

The Use of Otoliths for Aging *Morone* Hybrids

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Abstract: The use of otoliths for aging hybrid striped bass (*Morone chrysops* x *M. saxatilis*), proved successful in central Florida where reading scales is not a reliable method. Verification of annulus formation was accomplished by checking known-age fish, determining the time of annulus formation and comparing assigned ages of fish with stocking records to verify that the number of annuli was not greater than expected. Aging by reading otoliths revealed that hybrids live at least 3 years longer than indicated by reported growth rates and length frequency analysis.

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Ages and annual growth rates of hybrid striped bass (*Morone chrysops* × *M. saxatilis*) in Florida cannot be accurately determined from scales. The subtropical climate and long growing season result in failure of the scales to set distinct annuli. This problem was encountered with largemouth bass (*Micropterus salmoides*) from Lake Sangchris, a central Illinois cooling reservoir, and other thermally disturbed environments (Taubert and Tranquilli 1982).

Aging of hybrid bass was previously based upon growth rates reported for other Florida lakes (Ware 1974) and length-frequency analysis. Because of the limited number of hybrids collected during routine sampling and the variety of trophic conditions among lakes, this method was not considered reliable. Growth of age 0 hybrids could generally be determined from length frequencies, but size ranges of older year classes overlapped. To accurately determine age, an alternative method was needed.

Verification of annuli in otoliths of fish have been reported by Williams and Bedford (1974 according to Taubert and Tranquilli 1982) and Gregory

and Jow (1976). The sagittae, the largest of the 3 pairs of otoliths, have been used to age largemouth bass when scales were inaccurate (Taubert and Tranquilli 1982). Carlander (1969) reported that otoliths from Dolly Varden (*Salvelinus malma*) from Eva Creek, Alaska, and, in some instances, from arctic char (*Salvelinus alpinus*) gave better results than scales. This study was implemented to determine whether otolith (sagittae) analysis is a viable method for aging *Morone* hybrids from central Florida lakes.

Methods

Hybrid bass were collected by gill netting and angling from 8 central Florida lakes (Table 1). Lengths (standard and total) to the nearest mm and weights to the nearest g were recorded and sagittae were removed. Otoliths were stored dry in plastic vials until they could be examined.

Preparing otoliths for observation consisted of breaking them through the vertical axis near the nucleus and grinding them by hand on progressively finer wet-or-dry sandpaper (180 grit and 400 grit) up to the nucleus. Thermoplastic cement was used to attach the ground end of the otolith to a glass slide. The slide was then inverted and the remaining portion of the otolith was ground to a thickness of approximately 1 mm. Ground otoliths were observed and opaque bands were counted under immersion oil at 40X magnification using a Unitron binocular microscope with transmitted light.

Fish used in age determination were collected from most study lakes during December and January. To determine if and when annuli formed, hybrids were collected from Lake Apopka during February, April, May, July, September, and December ($N = 285$). Known-age hybrids were collected from Lake Apopka and a man-made lake at the Sea World tourist attraction in Orlando, Florida. Years in which hybrids were stocked into each study lake are summarized in Table 1.

Table 1. A comparison of original stocking dates and age of hybrid striped bass collected from 8 central Florida lakes.

Lake	Years stocked	Last date sampled	Ages collected (*N* annuli)	Oldest possible age (*N* annuli at sampling time)
Apopka	1980–81	12/82	I, II	II
Howell	1977–81	12/81	O, I, II	IV
Yale	1977–82	1/82	O, I, II, III, IV	IV
Umatilla	1977–81	12/81	O, I, III, IV	IV
Harris	1976–82	12/82	O, I, II	VI
Dora	1976–81	12/82	I, II, III	IV
Davis	1978–82	12/82	O, I, II	IV
Sea World	1977	1–83	V	V

Figure 1. Tranverse section of an otolith from a 6-year-old *Morone* hybrid showing 5 annuli.

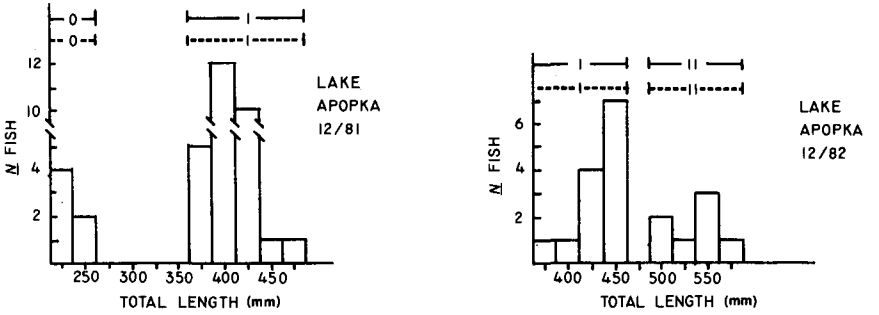

Figure 2. Age assignment of *Morone* hybrids from Lake Apopka, Florida, based on length frequency (- - -) and otolith (——) analysis.

Results and Discussion

Otoliths consisted of opaque bands that appeared brown in transmitted light and translucent areas between the bands. The bands were interrupted along the distal surface (Fig. 1).

The distance from the nucleus to the first opaque band was greater than the space between subsequently formed bands, and the first band was also wider than those formed later.

Known-age fish collected from Lake Apopka in December 1981 were easily separated into age 0 and I individuals based on length-frequency (Fig. 2). Analysis of the sectioned otoliths from hybrids designated age I ($N = 29$) had 1 band. Hybrids collected 1 year later (December 1982) and aged by length-frequency as age I ($N = 13$) and II ($N = 7$) possessed 1 and 2 opaque

bands, respectively. Otoliths from 14 known-age hybrids collected from Sea World all had 5 opaque bands which corresponded exactly to the number of completed winters since the 1977 stocking date. The fish ranged from 429 to 607 mm total length.

Hybrids collected from Lake Apopka in February 1982 ($N = 26$) had relatively wide bands of translucent material on the outer edges of their otoliths. Some individuals collected in April ($N = 6$) possessed new, fully formed opaque bands and by May ($N = 14$), new bands were formed by all individuals. In July, formation of additional translucent material beyond the opaque bands was obvious. This translucent band was progressively wider in September and December ($N = 20$) samples.

Stocking records for all lakes were reviewed to determine whether any

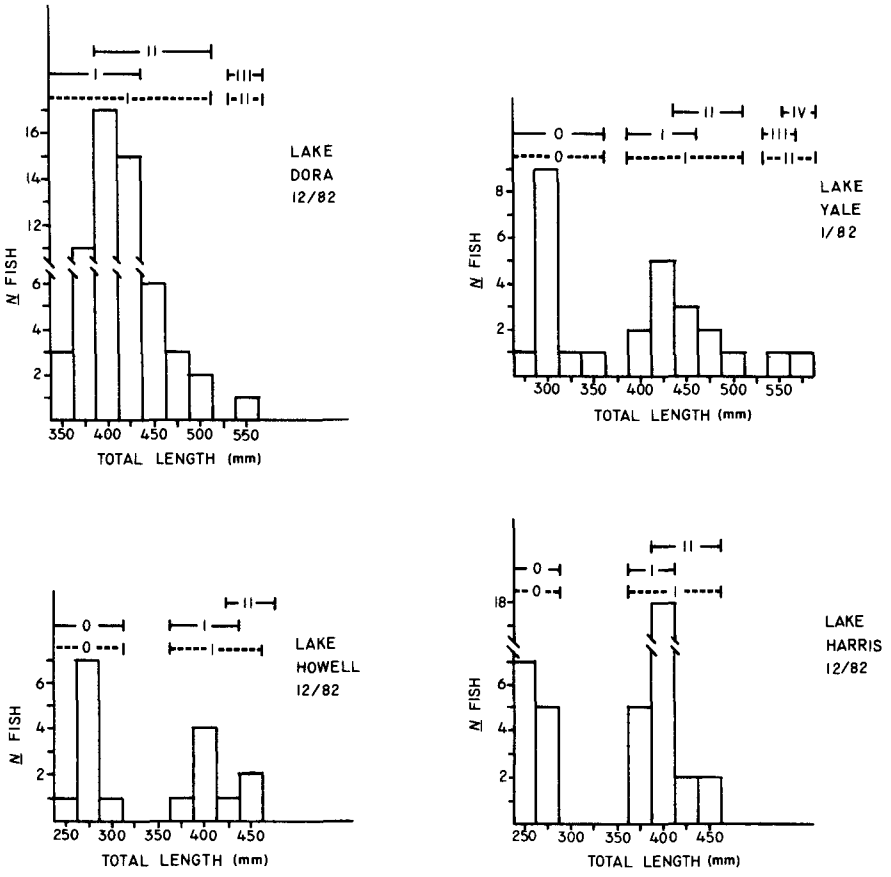

Figure 3. Age assignment for *Morone* hybrids from selected central Florida lakes based on length frequency (- - -) and otolith (——) analysis.

discrepancy existed between the oldest age assigned from counts of opaque bands and the primary stocking date. No fish was assigned an age older than possible based on these stocking dates (Table 1). Ages determined by otolith analysis were also compared to ages assigned from length-frequency histograms and reported growth rates (Ware 1974, Crandall 1978). Based on otolith analysis, it was determined that hybrids live up to 3 years longer than originally believed in central Florida (Table 1, Fig. 3).

Conclusion

The existence of annuli was verified by criteria used for verification of annuli in scales. The opaque bands on otoliths were formed in the spring, and the number of bands corresponded exactly to ages of known-age fish or to ages apparent from length frequencies. No fish was assigned an age from band counts that was older than possible based on stocking dates; therefore, the opaque bands are annuli.

Hybrids in central Florida previously have been assigned age classes based on reported growth rates and length frequency histograms. Using this aging technique, it appeared that hybrids did not live past age II (3+ years of age). Ages assigned from sectioned sagittae revealed that hybrids live longer than originally believed, but growth rates of older hybrids decrease considerably.

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