COMPARISON OF SCALE AND OTOLITH AGE ESTIMATES FOR TWO SOUTH DAKOTA BLUEGILL POPULATIONS

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ABSTRACT

Bluegills *Lepomis macrochirus* were collected from Little Moreau Lake (Dewey County) and Lake Louise (Hand County) for a comparison of two different aging techniques. Bluegills were assigned an identification number, weighed, and measured. Scales were removed at the tip of the pectoral fin, below the lateral line, and sagittal otoliths were removed from each fish. Scales were aged by South Dakota Department of Game, Fish and Parks personnel, while otoliths were aged at South Dakota State University. The Little Moreau population sample (N=45) was dominated by young fish; 91% of the fish were ages 2-5 and only one exceeded age 6. Agreement between scale and otolith ages was very high; disagreements occurred for only five fish, and in all cases the age difference was one. The Lake Louise population sample (N=59) had a more extended age structure from 2-11, and 29% of the fish were age 6 and older. We found high agreement between scale and otolith age assignments for ages 2-5; only three disagreements occurred for these 32 fish. However, scale ages were consistently lower than otolith ages for age-6 and older fish. In addition, scale ages were as much as 5 years lower than otolith ages for these older fish. Thus, scales provided age assignments similar to those from otoliths over the first 5 years. However, scale ages were consistently underestimated for older bluegills when compared with otolith ages.

INTRODUCTION

Accurate fish ages are important for proper application of standard methods such as growth analysis, age-structure analysis, and mortality rate determination. Accuracy of bluegill *Lepomis macrochirus* ages from sagittal otoliths was validated by Hales and Belk (1992). Hoxmeier et al. (2001) found that bluegill age estimates for scales were less precise than those for otoliths. However, these authors also reported that latitude affected the precision of scale age estimates. Across even the latitudinal gradient found in Illinois, they reported that precision

of scale age estimates declined for lower (i.e., southern) latitudes. Therefore, the objective of this study was to compare age estimates determined from scales and sagittal otoliths for bluegills collected from two South Dakota impoundments.

METHODS

Bluegills were collected from two small South Dakota impoundments. Little Moreau Lake is a 15-ha impoundment in Dewey County, and Lake Louise is a 66-ha impoundment located in Hand County. All fish were collected during standard trap-net surveys conducted by the South Dakota Department of Game, Fish and Parks (SDGFP) at Little Moreau Lake (June 23 and 23, 2004) and Lake Louise (June 8, 2004). These nets have a bar mesh size of 19 mm, which did retain bluegills as small as 70 mm (total length; TL).

Bluegills were assigned an identification number, weighed, and measured to the nearest millimeter (TL). Scales were removed at the tip of the pectoral fin, and below the lateral line (DeVries and Frie 1996). Sagittal otoliths were then removed from each fish as described by Secor et al. (1991).

Scales were pressed into acetate strips with a roller press, and aged by SDGFP personnel using a microfiche reader. Sagittal otoliths were wiped, returned to South Dakota State University, and stored in plastic vials for a minimum of 2 weeks prior to annulus enumeration. Otoliths were aged in whole view through age 5 (Hales and Belk 1992). Otoliths from age-6 and older bluegills were cracked (broken in half through the nucleus and perpendicular to the longest axis), wet sanded, placed in clay, and viewed with a fiber optic light under a binocular microscope at 40X magnification after immersion oil was applied.

RESULTS AND DISCUSSION

The Little Moreau population sample (N=45) was dominated by young fish; 91% of the fish were ages 2-5 and only one exceeded age 6 (Figure 1). The dashed line indicates the 1:1 relationship (complete agreement), while the solid line depicts the observed relationship. Agreement between scale and otolith ages was very high; disagreements occurred for only five fish, and in all cases the age difference was one.

The Lake Louise population sample (N=59) had a more extended age structure from ages 2 through 11, and 29% of the fish were age 6 or older (Figure 2). We found high agreement between scale and otolith age assignments for ages 2-5; only three disagreements occurred for these 32 fish. However, scale ages were consistently lower than otolith ages for age-6 and older bluegills. Scale ages were as much as 5 years lower than otolith ages for these older bluegills.

For the young bluegill population in Little Moreau Lake, we found little difference in age structures between the two aging methods (Figure 3). For the older bluegill population in Lake Louise, age structures did differ between the two aging techniques (Figure 4). Recruitment patterns appear more stable with the scales ages, but more erratic with the presumably more accurate otolith ages.

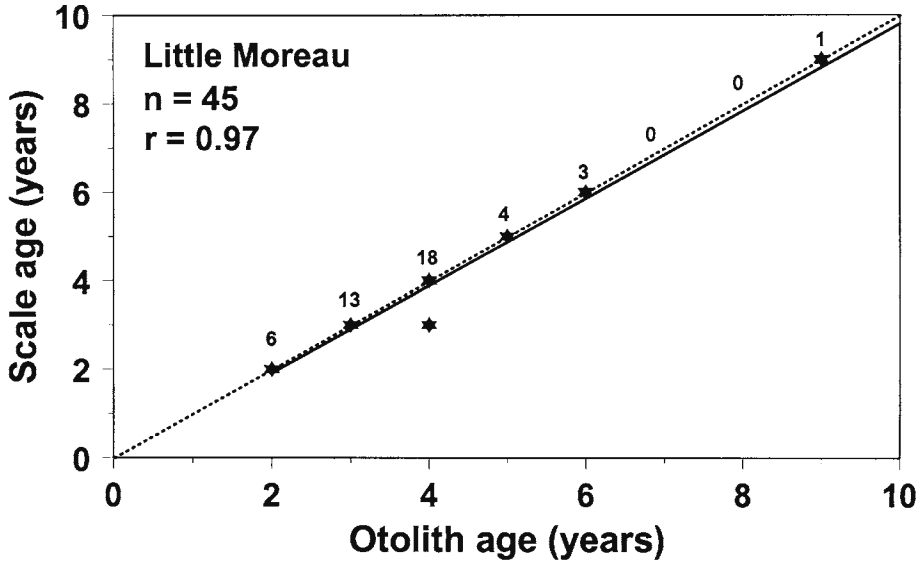

Figure 1. Comparison between ages assigned to bluegill scales and otoliths for fish collected from Little Moreau Lake, South Dakota, June 2004. Numbers above each age represent the number of fish per otolith age group, and the correlation coefficient (r) is for linear relationship depicted by the solid line.

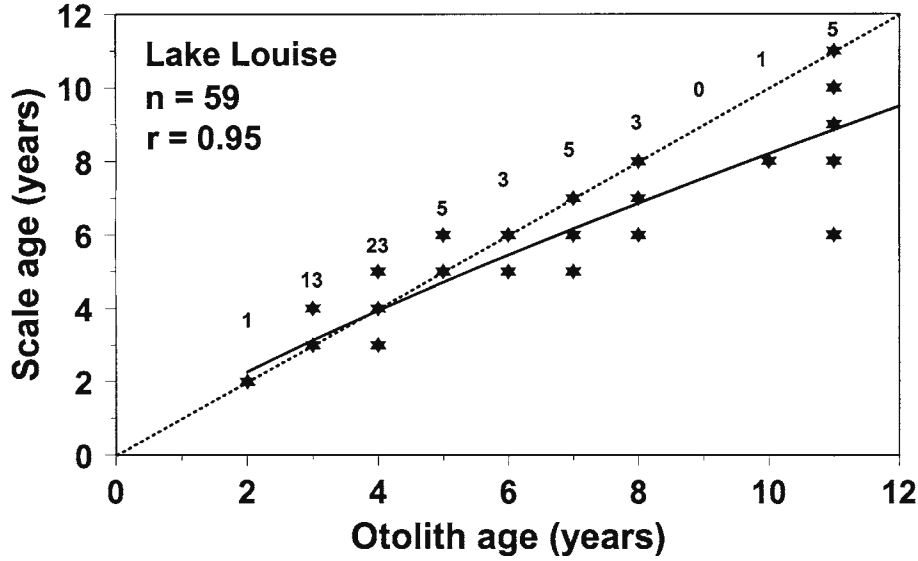

Figure 2. Comparison between ages assigned to bluegill scales and otoliths for fish collected from Lake Louise, South Dakota, June 2004. Numbers above each age represent the number of fish per otolith age group, and the correlation coefficient (r) is for the curvilinear relation depicted by the solid line.

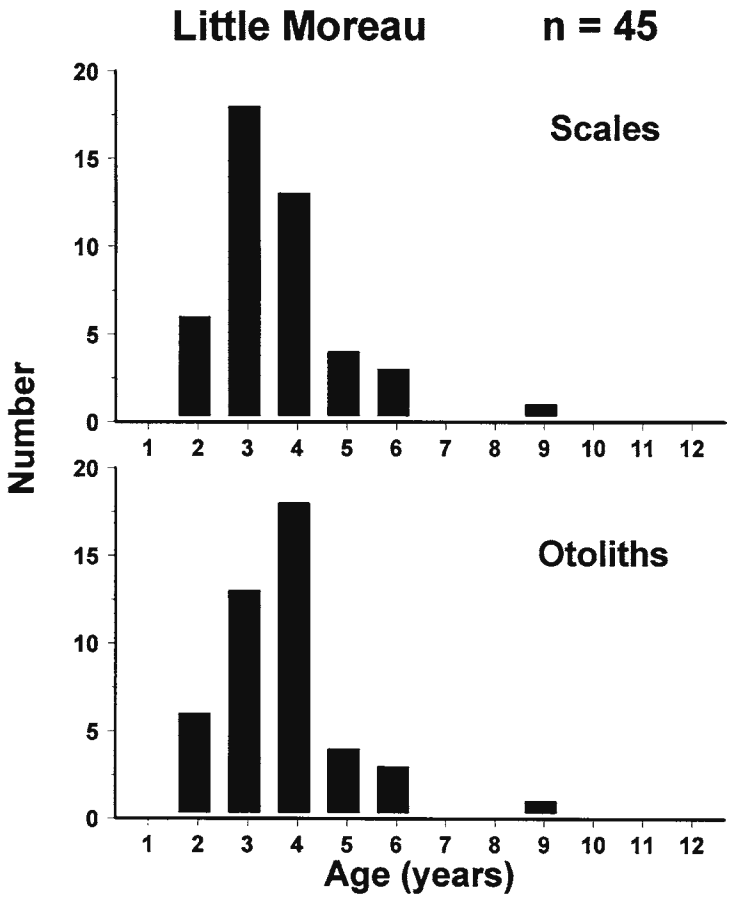

Figure 3. Bluegill age structures based on scales (top) and otoliths (bottom) for fish collected from Little Moreau Lake, South Dakota, June 2004.

Thus, scales provided age assignments similar to those from sagittal otoliths over the first 5 years of bluegill lifespan in our two study populations. If we accept the premise that otoliths provide more accurate (Hales and Belk 1992) and more precise (Hoxmeier et al. 2001) age estimates than scales, then ages assigned to scales were consistently underestimated for older bluegills during our study. Thus, our results corroborate the recommendation by Hales and Belk (1992) that whole otoliths only be used for bluegill aging through age 4 (their study) or 5 (our study), with cracked otoliths being used for older fish. When accurate age-structure assessment or mortality rate determination is required, we recommend that South Dakota bluegill populations be aged with sagittal otoliths.

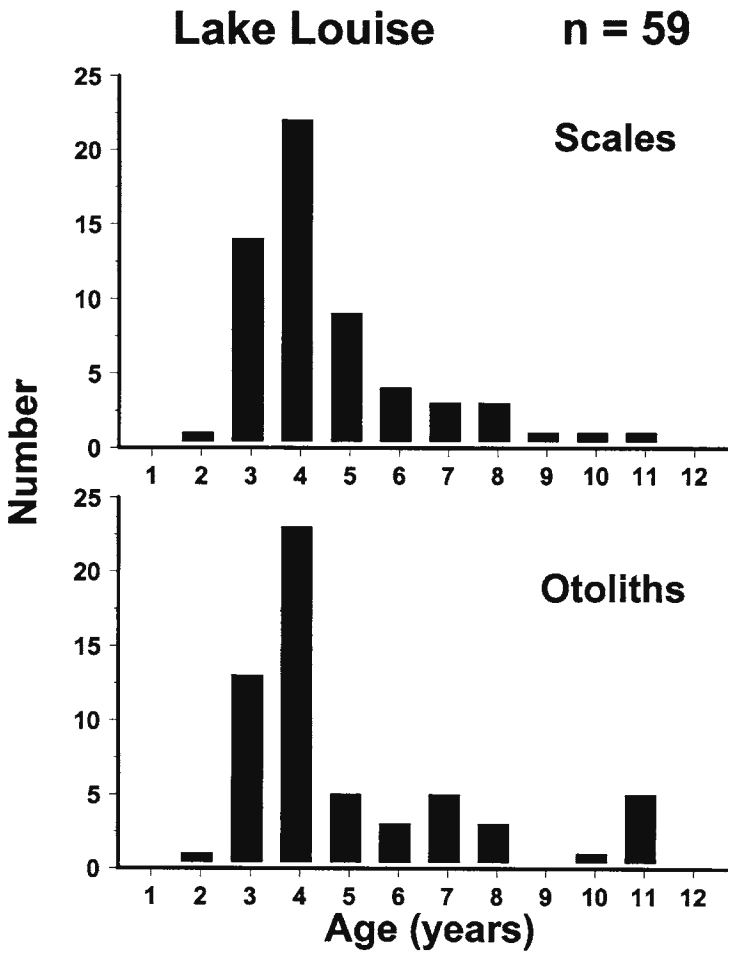

Figure 4. Bluegill age structures based on scales (top) and otoliths (bottom) for fish collected from Lake Louise, South Dakota, June 2004.

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