Hickory Shad (*Alosa mediocris*) vs. American Shad (*A. sapidissima*): Comparing Aging Techniques for Congeneric Species

Samantha A. Dowiarz¹ and Roger A. Rulifson²

East Carolina University Department of Biology, Greenville, NC

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### Introduction

#### Life History
- Anadromous and spawn in the spring from the Delaware River, PA to St. John’s River, FL.
- Both species are managed together by the Atlantic States Marine Fisheries Commission (ASMFC).
- Little is known about life history of Hickory Shad.

#### Importance
- If Hickory Shad life history mirrors that of American Shad, they can continue to be managed together.
- Viable research surrogate

### Materials and Methods

#### Scale Preparation
- Scales taken from left side under pectoral fin
- Cleaned with soapy warm water
- Four ten scales mounted on microscope slides, photo taken using dissecting microscope
- Microfiche reader used to indicate spawning marks for repeat spawners

#### Otolith Preparation
- Left and right sagittal otoliths extracted and placed in separate microcentrifuge tubes
- Cleaned in distilled water, dried, and placed sulcus side down in a petri dish with a drop of mineral oil
- Photo taken against a black background with dissecting microscope

#### Scale Aging Protocol
- Annuli are continuous lines that advance past the baseline (Figure 3).
- Annuli are counted from the center outward on a diagonal plane parallel to the radii (if a straight vertical plane is used, the annuli can get "lost" in the circuit).
- The first line is the freshwater zone.
- False annuli do not explicitly continue past the baseline.
- Spawning marks look like annuli being engulfed into the scale, and the circuli are interrupted moving across the mark (Figure 6).
- If the fish is caught during the spawning run, the outside edge is the last annulus/spawning mark.

### Preliminary Results

#### Discussion and Future Studies
- Scales are overestimating the younger fish and underestimating the older fish (Figure 5).
- Larger percentage of younger males in the spawning run compared to females; no males above age five (Figure 7).
- Males and females follow the same trend in terms of percentage of repeat spawning (Figure 7).
- Scales and otoliths are currently being read by two other readers.
- Will use reader agreement of two or more for analyses.

### Acknowledgements

We thank Dr. Patrick Harris at ECU for his knowledge on aging and lab colleague, Ryan Hill, for his support and input. Funding was from the Sport Fish Restoration Act through the North Carolina Wildlife Resources Commission Division of Inland Fisheries. We thank all state and federal agency personnel for collecting Hickory Shad for this project.

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**Figure 1:** Map showing Hickory Shad collection sites during the 2015, 2017, and 2018 spawning runs.

**Figure 2:** Hickory Shad scale indicating the freshwater zone (FWZ point), a false annulus (blue point), and the corresponding annulus (red points) with the outer edge counted as the final annulus (MADMF 2015).

**Figure 3:** American Shad scale indicating the freshwater zone (FWZ point) and the annuli (black points), with the outer edge counted as the final annulus (MADMF 2015).

**Figure 4:** (A) Hickory Shad otolith indicating the annuli on the pararostrum (red points) with the outer edge counted as the final annulus. (B) American Shad otolith with bars meeting the annuli on the pararostrum with the outer edge counted as the final annulus. (C) Hickory Shad scale (FWZ point), a false annulus (blue point), and the corresponding annulus (red points) with the outer edge counted as the final annulus (MADMF 2015).

**Figure 5:** Otolith age and scale age comparison from one reader (n=5). Numbers next to the points indicate the number of individuals aged in each category. This assumes that otolith age is correct. Black line indicates reader agreement between scales and otoliths in a one-to-one ratio.

**Figure 6:** Hickory Shad scale under a microfiche reader to indicate repeat spawning (red points).

**Figure 7:** (A) Percent of previous spawning events by scale age for female Hickory Shad (n=234). (B) Percent of previous spawning events by scale age for male Hickory Shad (n=42). No previous spawning events indicates that they were captured during their first spawning run.