St. Louis River Walleye Spawning Index Report 2024, Douglas County, WI

by

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Introduction

The Wisconsin Department of Natural Resources (DNR) performed a walleye (Sander vitreus) spawning survey in collaboration with Minnesota Department of Natural Resources (MN DNR) in spring 2024 on the St. Louis River. This 11,500-acre estuary is the border between Minnesota and Wisconsin and our sample site is located downstream of Fond du Lac dam (**Figure 1**). This targeted survey began in 1980 and is now conducted on a three out of five-year rotation. The St. Louis River and Estuary support the largest stock of walleye in Lake Superior, and many of these fish migrate into the lake proper after spawning (Olson et al. 2018). Walleye in this system are solely supported by natural reproduction and managed for both catch-and-release and harvest opportunities to suit diverse local and seasonal anglers. The goal of this survey is to monitor annual walleye size structure and age composition to reinforce a comprehensive population survey that occurs every five years.

FISHING REGULATIONS

Currently, total daily bag for walleye in the St. Louis River is two fish and a 15-inch minimum length requirement. Additionally, this interjurisdictional waterbody has a variety of unique fishing regulations that apply to other fish species within the system. Please visit DNR online regulation resources for more information: https://dnr.wisconsin.gov/topic/fishing/regulations.

Methods

DATA COLLECTION

Adult spawning walleye were captured through daytime electrofishing by MN DNR on 4/22/2024 and 4/23/2024. The St. Louis River flow ranged from 3,700 to 4,500 cubic feet per second while water temperature ranged from 43 to 46F during the sampling period (USGS gauge 04024000, Scanlon, MN). All walleye were measured to the nearest millimeter, and sex and spawning condition (e.g. ripe or spent) were recorded. All adult walleye that was successfully sexed or unknowns ≥ 15 inches were marked with a caudal fin clip. A sub-sample of dorsal spines were collected and separated by sex (ten fish per 13 mm length bin) and aged by DNR via methods in Breeggemann 2011. Although some uncertainty exists in the accuracy of older ages when using dorsal spines (Logsdon 2007), bias was reduced using an experienced ageing technician, incorporating side illumination to the spine section and provided a flexible fiber light guide to better examine crowded annuli near the spine's outer edge (Dembkowski et al. 2017 and Isermann 2003).

DATA ANALYSIS

An age-length key was constructed using a size-stratified sub-sample of dorsal spines and applied to all un-aged fish collected throughout this survey. Using this age-length key, both male and female growth rates were estimated by a fitted von Bertalanffy growth model (1938) where:

$$l_t = L_\infty (1 - e^{-K(t-t_0)})$$

Where l_t is the total length at age *t*; L_∞ is the asymptotic average length at age , *K* relates to how quickly the functions approaches L_∞, *t* is time (years) and t_0 is the x-intercept.

All collected data followed DNR data workflows and best data management practices. Data were input, analyzed, quality checked and reviewed prior to statistical analyses. All statistics were computed and visualized in Program R (R Core Team 2024, version: 4.3.3).

Results and Discussion

A total of 1,033 walleye were captured, consisting of 82% males, 17% females and <1% unknown or not determined (**Table 1**). Average length of all walleye was 533 millimeters (mm), and the largest walleye was 778 mm in length. Dorsal spines were collected and aged by DNR (N=262). Ages ranged from three to 19 for males and five to 19 for females (**Table 1**). Notably, Age-6 or 450 mm walleye made up most fish captured (**Figure 2** and **Figure 3**). Over 68% of the spawning run consisted of fish between 400 and 500 mm, indicating that the 2018 year-class represented a substantial proportion of adult fish contributing to the spawning run (**Figure 3**). Although the median size composition of the 2024 survey was smaller than in previous years, previous results indicate normal fluctuations in spawning population size (**Figure 3**). Additionally, beyond Age-6, females grew faster and sustained larger total lengths than males (**Figure 4**). Together with the 2018 year-class contributions, the 2024 spawning survey also found 16 additional year classes present, highlighting a diverse, stable and healthy natural spawning population (**Figure 5**) and was overall consistent with previous St. Louis River spawning walleye index surveys (DNR unpublished files).

References

R Core Team (2024). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Von Bertalanffy, L. 1938. A quantitative theory of organic growth (inquiries on growth laws. II). Human biology 10:181-213.

Table 1. Summary statistics table (in mm) of adult spawning walleye collected during the 2024 spring survey.

Sex	Total Number	Mean Length	Length Range		Age Range	
			Min	Max	Min	Max
Female	171	594	392	772	5	19
Male	854	480	350	670	3	19

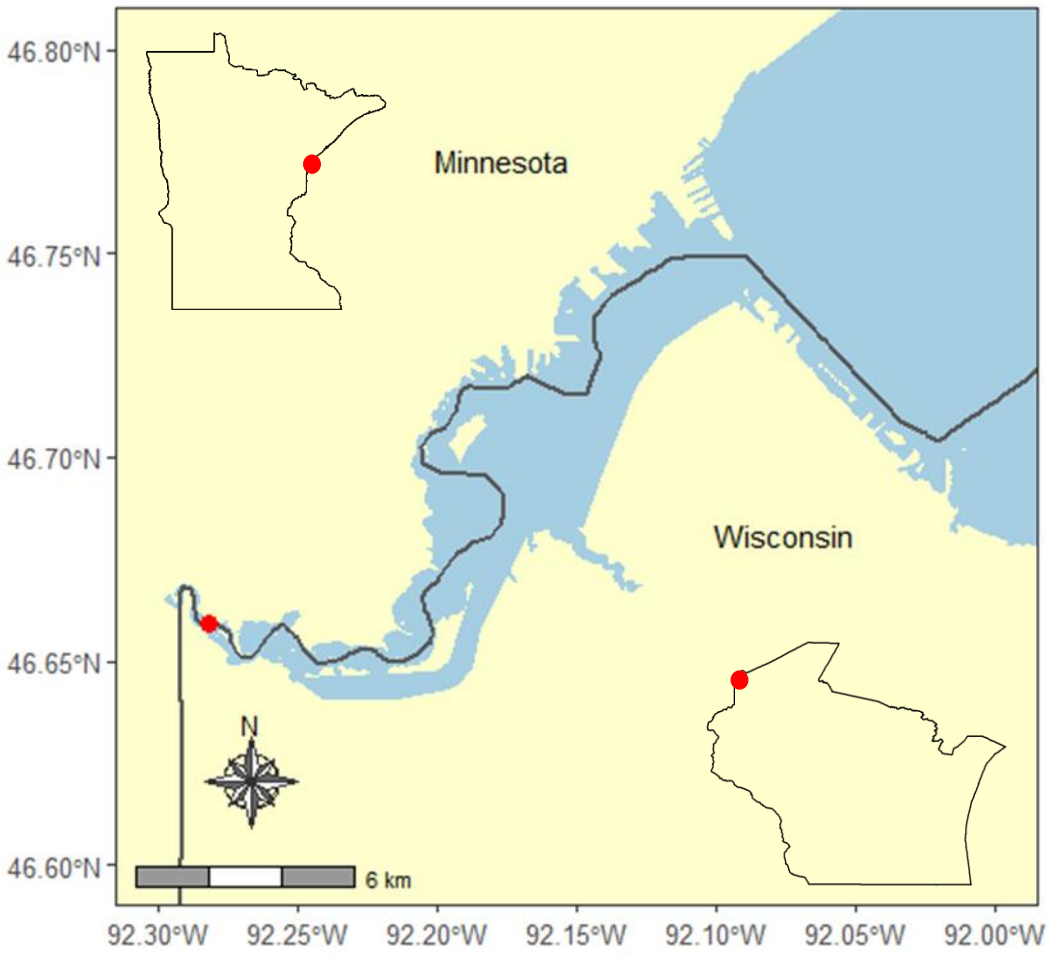

Figure 1. Map denoting survey sampling location on the St. Louis River (red dot).

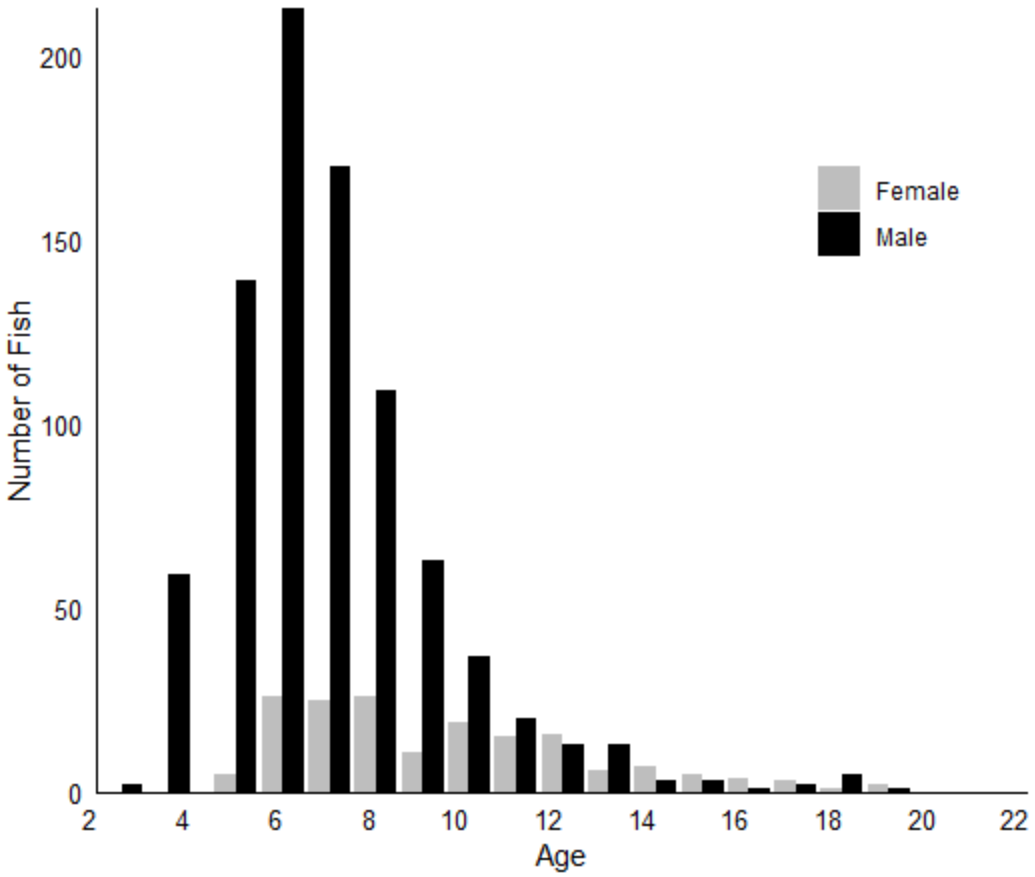

Figure 2. Age distribution of walleye, separated by sex (Female = gray and Male = black). Ages were estimated using a subset of dorsal spines (N = 262) and assigned to all un-aged fish using an age-length key.

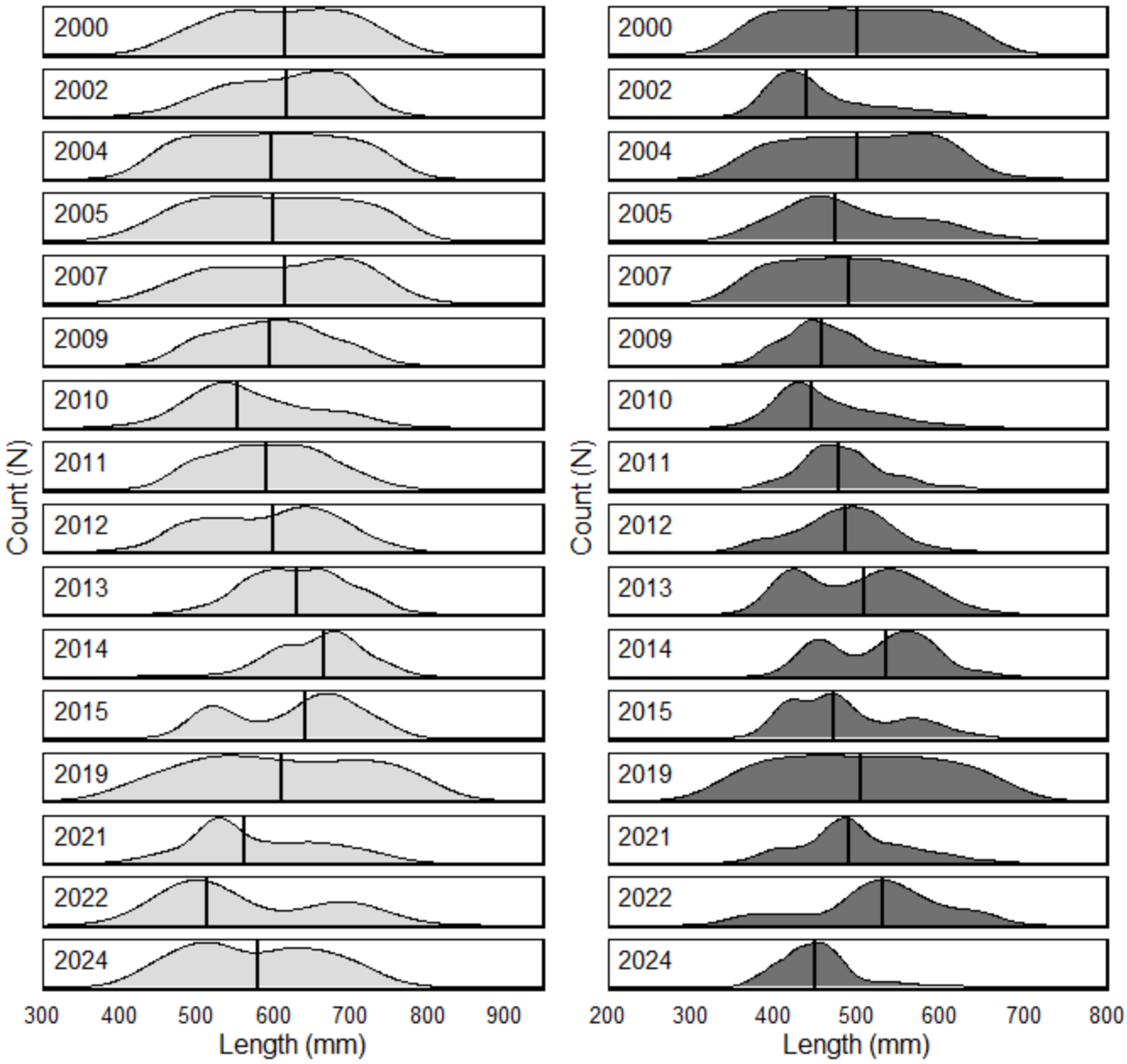

Figure 3. Time series of adult spawning walleye length frequencies in the St. Louis River. Colors (light and dark gray) denote female and male length distributions, respectively. Vertical lines represent the median total length sampled each year.

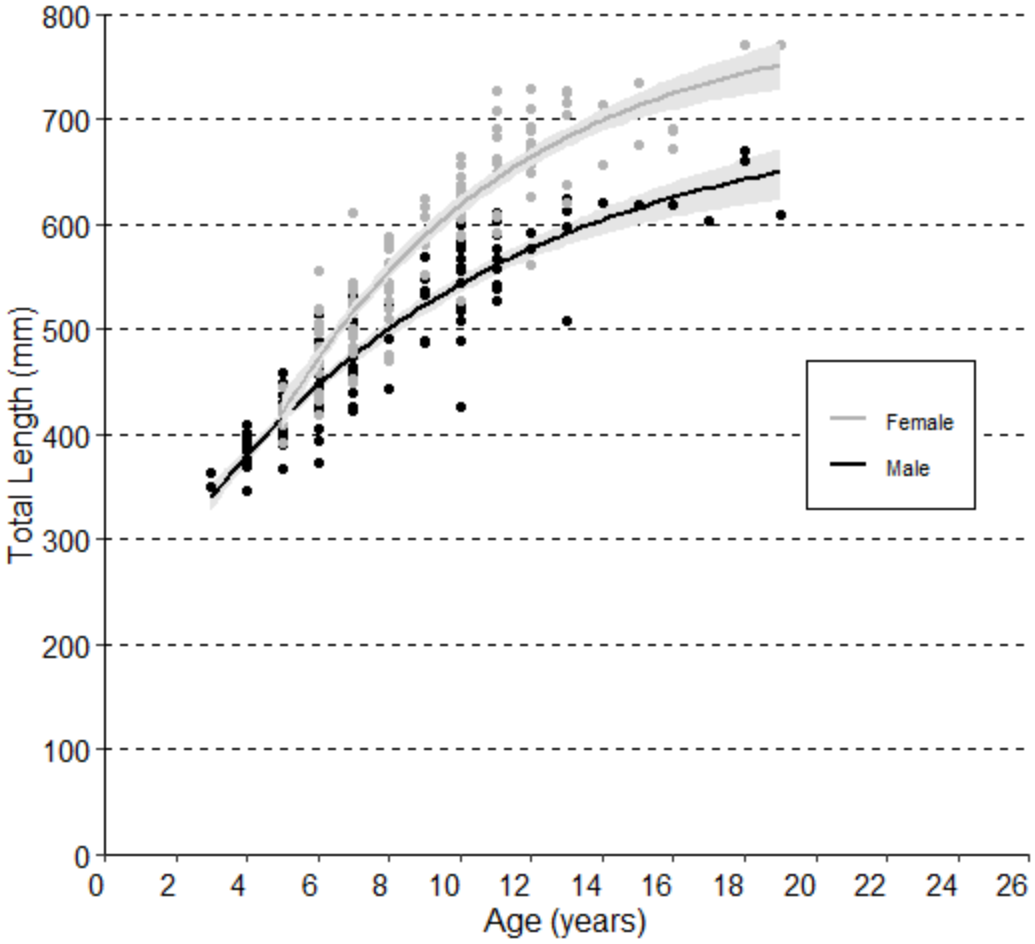

Figure 4. Calculated total length (mm) at age (years) of female (gray) and male (black) walleye spines (N=262) extracted during the 2024 survey.

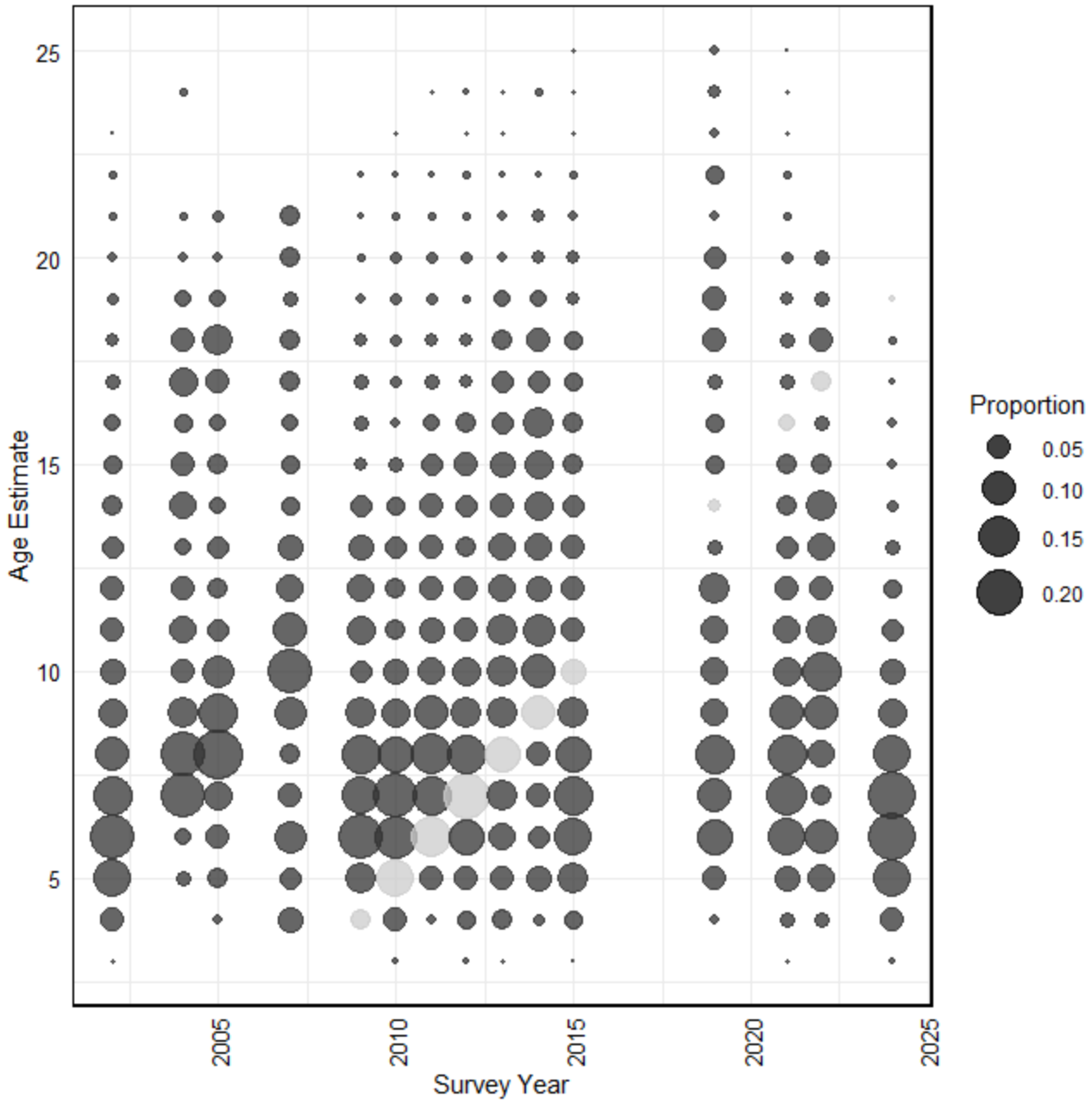

Figure 5. Compositions of spawning walleye within each survey year (2001-2024). Size of bubbles represents the proportion of each year class within each year. The 2005-year class (gray) is highlighted to show change in year class proportion through time. Gaps in timeline denote years data was not collected. Spine-aged data was used each year to assign an estimated age based on length for all fish collected during the survey (see 'Data Collection' section above).