

Roanoke River Striped Bass Creel Survey, 2016–2024



Federal Aid in Sport Fish Restoration
Project F-108
Final Report

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Inland Fisheries Division
Raleigh

2025



Keywords: Striped Bass, Roanoke River, creel survey, recreational harvest

Recommended Citation

McCargo, J. W. 2025. Roanoke River Striped Bass Creel Survey, 2016–2024. North Carolina Wildlife Resources Commission, Federal Aid in Sport Fish Restoration, Project F-108, Final Report, Raleigh.

This project was funded under the Federal Aid in Sport Fish Restoration Program utilizing state fishing license money and federal grant funds derived from federal excise taxes on fishing tackle and other fishing related expenditures. Funds from the Sport Fish Restoration Program are used for fisheries management and research, aquatic education, and boating access facilities. The program is administered cooperatively by the N.C. Wildlife Resources Commission and the U.S. Fish and Wildlife Service.

Abstract. This report encompasses Roanoke River Striped Bass *Morone saxatilis* creel survey estimates as well as angler origin information and trip expenditures 2016 through 2024. The creel survey uses a non-uniform probability, stratified access-access design to estimate recreational fishing effort (anglers and angler-hours), harvest (fish and kg), and releases (fish) of Striped Bass from the Roanoke River Management Area. Creel clerks conducted 5,940 interviews and intercepted 14,468 anglers from 2016 through 2024. The estimated number of anglers targeting Striped Bass ranged 3,644–27,218 and estimated Striped Bass fishing effort ranged 18,794–140,925 angler-hours. Estimated Striped Bass harvest ranged 3,030–29,351 kg (6,680–64,706 lb), and the estimated harvest of fish ranged 2,136–21,073 fish from 2016–2023. The harvest season was closed in 2024. In general, fishing effort for Striped Bass declined during the survey period and was the lowest on record in 2024. Catch of Striped Bass also declined during the last three years of the survey but the mean catch rate (fish per angler-hour), especially in the upper zone, varied without a discernable trend. Estimated expenditures (adjusted for inflation to 2024 dollars) declined through the survey period from \$1.49 million in 2016 to \$490,617 in 2024. The reduction in fishing effort and subsequent reduction in Striped Bass catch as well as trip expenditures is likely due to the reduced harvest seasons resulting from stock assessments that indicate overfished status of the stock. Stock recovery that leads to larger year-classes and increased harvest opportunities should result in increases in fishing effort and catch in the future.

The North Carolina Wildlife Resources Commission (NCWRC) cooperatively manages the Albemarle-Roanoke Striped Bass *Morone saxatilis* stock with the North Carolina Division of Marine Fisheries (NCDMF) under the auspices of the Atlantic States Marine Fisheries Commission (ASMFC). The Albemarle-Roanoke stock is managed separately from the Atlantic migratory stock as described in Amendment 7 of the interstate fisheries management plan for Atlantic Striped Bass (ASMFC 2022). The NCWRC is responsible for the annual monitoring and reporting of the recreational harvest of Striped Bass as well as the fishery-independent spawning stock survey in the Roanoke River Management Area (RRMA). Assessment of the recreational harvest is summarized each year and submitted to the NCDMF who compiles the information for updates to the North Carolina Estuarine Striped Bass Fishery Management Plan (FMP; NCDMF 2022) and for annual ASMFC compliance reports. Annual harvest monitoring is necessary to protect and enhance the Albemarle-Roanoke stock of Striped Bass for the benefit of recreational and commercial fishermen.

Striped Bass harvest of the Albemarle-Roanoke stock is managed with a Total Allowable Landings (TAL) that is set by periodic stock assessments to maintain sustainable harvest and limit overfishing (NCDMF 2022). The annual TAL for the Albemarle-Roanoke stock is equally divided between commercial and recreational fisheries, and the recreational fishery TAL is further equally divided between the Albemarle Sound Management Area (ASMA) and RRMA. To ensure Striped Bass harvest does not exceed the RRMA TAL, the recreational fishery in the Roanoke River is regulated through a limited open harvest season, daily possession limits, and length limits. The harvest season of March 1–April 30 is set in rule, but the season may be opened or closed by proclamation to maintain harvest within the TAL. Since 1997, anglers have been required to use only a single, barbless hook during April 1–June 30 between the Roanoke Rapids Dam and the US Hwy 258 Bridge, and beginning in 2023, anglers fishing with live or natural bait were required to use barbless circle hooks upstream of the US Hwy 258 Bridge. The single barbless hook regulation, circle hook regulation, and angler education efforts (distribution of catch-and-release brochures and numerous popular articles) were implemented to minimize catch-and-release mortality of Striped Bass while they are in the RRMA. The objectives of the RRMA Striped Bass creel survey are to estimate annual recreational fishing effort, catch, and harvest, document length distributions and sex ratios of harvested fish, bait use, as well as angler demographics and expenditures.

This report encompasses estimates of Striped Bass effort, catch, and harvest as well as trip expenditures and angler origin for the RRMA fishery for 2016 through 2024. Although most of these estimates have been reported in Amendment 2 of the NC Estuarine Stiped Bass FMP, annual NCDMF FMP updates, and ASMFC compliance reports, this report will serve to document methodologies from each year and compile creel survey results in one document.

Methods

Study area. The RRMA includes the Roanoke River from Roanoke Rapids Lake dam at river kilometer (rkm) 227 downstream to Albemarle Sound including the Cashie, Middle, and Eastmost rivers and tributaries (Figure 1). The creel survey occurred at publicly accessible boating access areas within the RRMA.

Harvest Regulations. The TAL for the RRMA was 31,184 kg (68,750 lb) in 2016–2020, 5,808 kg (12,804 lb) in 2021–2023, and 947 kg (2,087 lb) in 2024 (Table 1, NCDMF 2024). Harvest seasons varied throughout the study period due to reductions in the TAL. The harvest season was open for 61 days (March 1–April 30) according to rule in 2016, 2019, and 2020. The harvest season in rule was extended by proclamation in the entire RRMA by 7 days in 2017 (March 1–May 7) and 6 days in 2018 (March 1–May 6). In 2021, the harvest season was shortened to 7 days (April 10–16) in the lower RRMA downstream of the U.S. Highway 258 bridge and 7 days (April 24–30) in the upper RRMA. In 2022, the harvest season was open in the entire RRMA for only 4 days (April 23, 24, 28, and 29). In 2023, harvest was open in the entire RRMA for 6 days (April 14–17, 22, and 23), and in 2024, the harvest season in the RRMA was closed by proclamation due to the low TAL. From 2016–2021, harvest was regulated with a 2-fish daily creel limit, a minimum length limit of 18 inches and a prohibitive slot limit of 22–27 inches; only one of the 2-fish daily creel limit could be greater than 27 inches. In 2022–2024, the daily creel limit was reduced to 1 fish, and in 2024, the provision allowing one fish greater than 27 inches was removed so that only fish between 18 and 22 inches could be harvested. The use of single barbless hooks in the upper zone during April 1 through June 30 was mandatory during the survey period, and the use of single, barbless circle hooks with live and natural bait was mandatory in the upper zone April 1–June 30 in 2023 and 2024.

Study design. The Roanoke River Striped Bass creel survey uses a non-uniform probability, stratified access-access creel survey design (Pollock et al. 1994) to estimate recreational fishing effort (anglers and angler-hours), harvest (fish and kg), and releases (fish) of Striped Bass from the RRMA. The length of the fishing day was defined as 30 minutes before sunrise to one hour after sunset. The creel survey was stratified by area (upper and lower zones), time of day (early and late AM; early and late PM), and type of day (weekdays and weekend days). The upper zone included the river segment from Roanoke Rapids Lake dam downstream to the U.S. Highway 258 Bridge near Scotland Neck, and the lower zone extended from U.S. Highway 258 Bridge downstream to Albemarle Sound. Because past analyses depict differential effort and catch rates throughout the progression of the spring migration season, the survey was further stratified into sample periods. During most years, sample periods were approximately two weeks long, but in years with shortened harvest seasons, sample periods were smaller groups of open and closed harvest dates (Table 1). Within periods, the survey was further stratified by type of day because fishing effort and catch is also known to vary on weekdays and weekends. Monday through Friday were classified as weekdays, whereas Saturday and Sunday were weekends. Selection of available boating access areas where interviews occurred was based on sample site probabilities generated from expected usage using knowledge from prior RRMA creel surveys, wildlife enforcement officer input, and biologist discretion regarding timing of the spawning migration (see Appendix A). Boating access areas with expected use probabilities less than 0.05 were grouped into a low probability selection “wheel”, and if the wheel was selected then one of the access areas was randomly selected for the scheduled sampled site. Time-of-day probabilities were estimated based upon trailer counts and prior experience with the RRMA Striped Bass fishery. For 2016 through 2022, early and late AM time of day probabilities were 0.2, and early and late PM probabilities were 0.3 in March sample periods, while all other time probabilities were 0.25 for remaining sample periods after March. After examining extensive trailer count data to inform boat ramp use in 2020 and 2021, time-of-day probabilities for early

and late AM periods were set at 0.2 and early and late PM probabilities were set at 0.3 for all sample periods in 2023 and 2024.

Creel Schedule. Interview sessions were scheduled for two random weekdays and both weekend days each week. During open-harvest periods in 2016 through 2021, one 3-hour session was conducted in each zone on each sample day; one session was in the morning and one in the afternoon. During closed-harvest periods, one 6-hour session was conducted each sample day, except in 2021, when closed-harvest sessions were 3 hours due to staff time limitations. The lower zone was not sampled during May unless the harvest season was open by proclamation (2017 and 2018) or the closed-harvest sample period began in April (2023). Two creel clerks worked together at each ramp during open-harvest sessions, and additional staff members assisted the creel clerks to expedite the interview process and limit the number of missed interviews when fishing effort was high on weekends or during short harvest seasons. One creel clerk worked independently during closed-season sessions.

Data Collection. Creel clerks interviewed anglers as they completed fishing trips at boating access areas. Data collected from each interviewed fishing party included date and time of the interview, time the party began fishing, and number of anglers in the party. Creel clerks asked about the total number of Striped Bass caught, the number of Striped Bass harvested, and the number released. Creel clerks measured total length (TL, mm), weight (kg) and determined sex of each Striped Bass harvested, but individual fish data were not collected and a bulk-weight for harvested Striped Bass was recorded for each party if the ramp was busy. As time allowed, creel clerks also requested the number of Striped Bass released by length limit categories (<18 inches, 18–22 inches, 22–27 inches, >27 inches), type of bait used, angler residency, and trip expenditures. Catch and harvest information for additional species such as American Shad *Alosa sapidissima* and Hickory Shad *A. mediocris* was also collected. All session and interview data were recorded on data sheets (Figure A1) and entered into the existing Roanoke River creel survey database in the NCWRC intranet PAWS application.

Expansions. Daily estimates of Striped Bass effort (angler-hours and trips), harvest (numbers and kg), and releases for each zone were calculated by dividing the interview session totals by the sample unit probability (product of the access point probability and time-of-day probability; Pollock et al. 1994). An adjustment factor was also multiplied to the daily estimates to account for the fishing day exceeding 12 hours. The adjustment factors for 3-hr sessions (F_{3hr}) and 6-hr sessions (F_{6hr}) were calculated as:

$$F_{3hr} = (L_{fd}/4 - 3)/(L_{fd}/4) + 1$$

$$F_{6hr} = (L_{fd}/2 - 6)/(L_{fd}/4) + 1$$

Where L_{fd} = length of fishing day in decimal hours. When 3-hr sessions were conducted, the time-of-day probability was selected for the time period in which the session started (early AM, early PM, etc.), and when 6-hr sessions were conducted, time-of-day probabilities were the summation of the probability assigned to the time period for when the session started and the probability assigned to the time period three hours after the session start time. Striped Bass catch, effort, and harvest estimates for weekdays and weekend days were separately averaged by zone and within sample periods. The mean estimates were then multiplied to the total

number of days for each type of day for that sample period. Separate estimates of effort, releases, and harvest were calculated for each zone by summing the strata (day type and sample period) estimates, and total estimates were the sum of the zone estimates. Approximate standard errors (SE) of the estimates (E) within strata were computed as:

$$\hat{SE}(\hat{E}) = \sqrt{N^2 \left(\frac{s^2}{n} \right)}$$

where s^2 is the variance of the estimate observations, n is the number of days sampled, and N is the number of days available for sampling within strata or the estimate period.

Harvested Striped Bass measured for total length during 2016 through 2023 were assigned ages by applying sex-specific, multinomial age-length keys developed with aged fish from NCWRC electrofishing spawning stock assessments using the FSA package in Program R (Venables and Ripley 2002; Isermann and Knight 2005; Gerritsen et al. 2006; Ogle 2015; Ogle et al. 2020). Scale ages from 2016, 2017, and 2018 surveys and otolith ages from 2023 were combined to make one age-length key for each sex (Smith and Potoka 2018; Smith and Potoka 2019; Smith et al. 2023). All available scale and otolith ages were combined to create an age-length key to assign ages to harvested Striped Bass with unknown sex. Age distributions for each year were calculated using the assigned ages and applying the proportional catch to the annual harvest estimate.

Release mortality was calculated by applying the 6.4% short-term (72-hour) catch-and-release mortality rate for Roanoke River Striped Bass based on controlled tank experiments at the former Weldon State Fish Hatchery conducted in 1996 (Nelson 1998). Release mortalities were reported by year and zone as well as for guided and non-guided trips when available.

Trip expenditures. Anglers were asked to report their trip expenditures for food and beverages, ice, bait, boat fuel and oil, vehicle fuel, lodging, and fishing guide fees during 2016–2019 and 2022–2024. Expenditure responses were categorized as private or guided trips, based on whether a fishing guide was hired for the trip. Prior to analysis, all expenditure data were adjusted for inflation relative to the Consumer Price Index for the base year of 2024 (U.S. Bureau of Labor and Statistics; <https://fred.stlouisfed.org/series/CPIAUCSL>) so that all expenditure estimates were reported in 2024 dollars. To obtain total estimated expenditures for each category, trip expenditures for angling parties were broken down into mean expense per angler-hour to match overall effort estimates that were calculated in angler-hours. Angler-hours per trip were obtained by multiplying the number of anglers in the fishing party by the length of time that the party spent fishing. To estimate expense per angler-hour, mean trip expenditures were divided by the mean angler-hours for each trip type (private or guided) for each zone and each year. The average expenditure per angler-hour was then multiplied by the total estimated angler-hours for each trip type for each zone each year to provide the estimated total expenditures for each expenditure type. Annual total expenditures were then calculated by summing expenditure estimates for zones and trip types. Total expenditures were reported for each year of the survey when the data were collected.

Covid-19 impacts during 2020. The creel survey was modified in 2020 due to concerns with staff safety related to Covid-19. Creel survey methodology as described earlier in this report

was used in the first two sample periods, and probability-based expansions were used to estimate Striped Bass effort, releases, and harvest for March. Individual fish lengths and weights of harvested fish were measured by creel clerks through March 18, 2020, but anglers provided estimated fish lengths (inches) of harvested fish March 22–31. An average weight of 1.41 kg was applied to the number of fish harvested per interview when weights were not measured. Angler interviews were not conducted during April or May, but clerks continued to count trailers at Roanoke River boat ramps to document usage as a proxy for fishing effort. Comparisons of trailer count data indicated that usage in April 2020 was similar to 2015 and 2016. Thus, the mean estimates of effort, harvest, and releases for April 2015 (Dockendorf et al. 2016) and 2016 were used as a proxy for April 2020 (see Lee et al. 2022). Estimates of Striped Bass fishing effort or releases were not calculated for May 2020. Caution should be used when interpreting data, summary statistics, and estimates reported for 2020 due to the limited nature of the creel survey during the Covid-19 pandemic.

Results

Creel clerks conducted a total of 5,940 interviews and intercepted 14,468 anglers from 2016 through 2024 (Table 2). Of the total, 4,680 (79%) interviewed parties specifically targeted Striped Bass, and 588 (13%) of those Striped Bass interviews employed the services of a fishing guide. Most Striped Bass interviews, including guided trips, occurred in the upper zone each year, and the total number of Striped Bass interviews declined throughout the survey (Figure 2). The highest number of Striped Bass interviews occurred in 2016 ($N = 809$) and the fewest, excluding 2020, occurred in 2024 ($N = 190$). The percentage of interviews targeting Striped Bass in the lower zone was relatively high in 2016 through 2019 before the harvest restrictions were in place but was much lower in 2021–2024. Notably, only 15 Striped Bass interviews were conducted in the lower zone during 2024 when the harvest season did not open. Most of the guided Striped Bass interviews occurred in the upper zone, and the percentage of Striped Bass guided trips, especially in the upper zone, increased throughout the survey. Missed interviews due to busy ramp conditions or refusal by anglers ranged 1.3–17.1% ($n = 8$ –48) of all interviews in the upper zone and 0.04–3.8% ($n = 1$ –7) of all interviews in the lower zone. In general, the number of missed interviews was similar from 2016–2021 but increased in 2022–2024.

The mean number of anglers fishing per Striped Bass targeted trip ranged 2.35–2.76 for all zones and was higher in the upper zone than in the lower zone each year of the survey excluding 2020 (Table 3; Figure 3). Mean trip length for targeted Striped Bass trips ranged 4.53–5.64 hours and was also higher in the upper zone than the lower zone for all years. Mean Striped Bass catch per targeted trip ranged 13.97–32.97 in the upper zone and 2.33–13.76 in the lower zone, excluding 2020. Mean catch and catch rate in both zones followed similar trends with higher values in 2018, 2019, and 2022 (Figure 4).

The estimated number of anglers targeting Striped Bass ranged 3,644–27,218 and estimated Striped Bass fishing effort ranged 18,794–140,925 angler-hours (Table 4). Fishing effort, in general, decreased throughout the time series with relatively high effort estimates from 2016 through 2020, lower estimates from 2021 through 2023, and much lower effort in 2024 (Figures 5 and 6). Estimated fishing effort was similar in the upper and lower zones during 2016–2020 but was higher in the upper zone during 2021–2024. Guided trips ranged between

11 and 32% of the total trips in the upper zone each year, while few guided trips occurred in the lower zone each year.

In years with open harvest seasons, estimated harvest weight of Striped Bass ranged 3,030–29,351 kg (6,680–64,706 lb), and the estimated harvest of fish ranged 2,136–21,073 fish. Estimated harvest was highest in 2016, decreased in 2017 and 2018, increased in 2019 and 2020, and then sharply declined in 2021, 2022, and 2023 (Figure 7). The harvest estimates were below the established quota for each year except 2021 when harvest was approximately double the quota. Total length (mm) was measured for 4,934 Striped Bass that were observed during interview sessions. Of that total, anglers self-reported total length (inches) for 45 Striped Bass during interviews sessions in late March 2020. Mean TL was 503 mm (SE = 0.44; range = 430–1,015 mm) for all years combined (Table 5). Nearly all harvested fish were within the legal slot limit of 457 to 559 mm each year (N = 4,784; Figure 8). Only 18 harvested fish were larger than the protective slot (>686 mm), 51 were smaller than the minimum length limit (<457 mm), and 81 were within the protective slot (457–559 mm). Mean weight was 1.46 kg (SE=0.0054; range = 0.65–12.5 kg) for 4,858 measured individuals. The male to female sex ratio of harvested Striped Bass was greater than 2.6:1 in 2016, 2017, and 2018 but was approximately 1:1 in 2019, 2021, 2022, and 2023 (Figure 9). The sex ratio in 2020 was 4.2:1, but sex of harvested fish was only measured in March and is not representative of the entire harvest season that year.

Age distributions of harvested fish were calculated for each year (except 2020) with an open harvest season after applying multinomial age-length keys. Each year, the age-3, age-4, and age-5 year-classes combined for at least 95% of harvest and the age-4 year-class supported the highest amount of harvest (Tables 6–12; Figure 10). Very few age-2 and age-6–9 year-classes of Striped Bass were harvested.

Estimated releases of Striped Bass ranged 32,378–159,286 (SE = 13,837–31,734; Figure 11). Estimates of releases were approximately 50,000 to 80,000 fish in most years but were much higher in 2018, 2019, and 2022 and lower in 2024. Estimated releases were higher in the upper zone than in the lower zone for all years. Guided trips accounted for a substantial portion of releases in the upper zone but were minimal in the lower zone, except in 2022 when releases from guided trips represented more than half of all releases in the lower zone. Releases in the lower zone were minimal in 2023 and 2024. Angler-reported size of releases was recorded for 89–99% of interviews with releases of Striped Bass each year (Table 13). The majority (88–98%) of releases were either sub-legal (< 18 inches) or legal length (18–22 inches; Figure 12). The sub-legal length group was the largest group of releases each year except 2016 and 2023. After 2016, however, there was a noticeable decrease in the number of sub-legal fish released and a subsequent increase in legal and protective-slot sized fish. Very few fish greater than 27 inches were reported as released. Estimated release mortalities followed the same trend as releases. After applying the 6.4% mortality rate from Nelson (1998), release mortalities ranged 2,072–10,194 fish (Figure 13). The estimates for Striped Bass releases and release mortalities in 2020 do not include releases for May and are, therefore, underestimated.

Information regarding bait use was collected for nearly all interviews (94.9–100.0%) that targeted Striped Bass each year (Table 14). Bait types were categorized as live bait, cut bait, and artificial bait. Live bait included live fish such as Gizzard Shad *Dorosoma cepedianum*, Threadfin Shad *D. petenense*, Blueback herring *Alosa aestivalis*, Alewife *A. pseudoharengus*, and Golden Shiners *Notemigonus crysoleucas*. Cut bait included dead American Shad, Hickory Shad,

Blueback Herring, and Alewife that was cut into pieces or strips. Artificial bait included jig-style baits like flukes and bucktails, topwater lures, and streamer flies fished with fly rods. In all years except 2020, live bait (62–80% of interviews) was the most prevalent bait type in the upper zone, followed by artificial bait (23–52%), and cut bait (5–10%; Figure 14). In 2020, bait use information was only recorded in March in the upper zone, and the data were not indicative of the full fishing season. In the lower zone, cut bait (48–74% of interviews) was the most prevalent bait type in most years, but live bait was the most prevalent bait type in 2018 (53%) and 2022 (40%), while artificial bait was the most prevalent bait type in 2024 (80%). However, only 15 Striped Bass target interviews were conducted in the lower zone during 2024 when the harvest season was closed. Live and artificial baits comprised similar percentages of bait use in the lower zone during most years when cut bait was the most prevalent bait type.

Angler origin information was collected for 11,607 anglers during the survey period, while origin information was unknown for 216 anglers. The majority of anglers (90%; N = 10,394) were North Carolina residents representing 91 of North Carolina's 100 counties, and the remaining 10% were from 38 other states, the United Kingdom, or Denmark (Table 15). About 22% of anglers (2,537 of 11,607) were from a "local" county bordering the Roanoke River (Bertie, Halifax, Northampton, Martin, or Washington). In the upper zone, the origin of anglers was consistent each year excluding 2020; approximately 16% (range 11–18%) of Striped Bass anglers were from local counties, while about 71% (range 70–74%) were from other North Carolina counties, and 13% (range 8–17%) were from outside North Carolina (Figure 15). For guided trips in the upper zone, there were fewer local anglers and more anglers from outside North Carolina compared to private trips in the upper zone. There were few guided trips in the lower zone. For all trip types combined in the lower zone, local anglers comprised approximately 43% (range 28–67%), anglers from other North Carolina counties comprised 55% (range 23–68%), and anglers from outside North Carolina comprised only 2% (range 1–10%). Notably, the highest percentage of local anglers fishing in the lower zone (67%) and lowest percentage of anglers from other North Carolina counties (23%) occurred in 2024 when few anglers targeted Striped Bass and the harvest season was closed.

In 2016–2019 and 2022–2024, trip expenditure information was collected for approximately 75% (range 34–100%) of interviews targeting Striped Bass in the upper zone and 83% (range 62–100%) in the lower zone; expenditure questions were not asked in either zone in 2020 or 2021 (Table 16). Although most expenditure information came from private trips, the majority of guided trips also provided expenditure information in most years. In the upper zone, average total trip expenditures (inflation-adjusted to 2024 dollars) ranged \$120.12–\$191.56 for private trips and \$613.60–\$744.18 for guided fishing trips (Table 17). In the lower zone, average total trip expenditures ranged \$44.06–\$117.80 for private trips and \$243.61–\$691.45 for guided trips; however, very few guided trips were recorded in the lower zone (Table 18). For private trips in both zones, vehicle fuel was typically the largest single expenditure followed by bait, and food and drink purchases. In the upper zone in 2024, however, food cost was the highest mean trip expenditure followed by vehicle fuel, and lodging cost, while bait was only the fourth highest expenditure. For guided trips, the largest single expenditure was the guide fee, while vehicle fuel, lodging, and food costs were also substantial expenses. Costs recorded for ice, bait, and boat fuel for guided trips should have been included in the guide fee, but some parties provided estimates of all costs for the guided trip. Mean

expenditures per angler-hour in the upper zone ranged \$29.79–\$52.93 for guided trips and \$9.46–\$15.65 for private trips (Table 19), while mean expenditures per angler-hour in the lower zone ranged \$22.80–\$53.60 for guided trips and \$4.68–\$10.87 for private trips (Table 20). In general, the mean expenditures per angler-hour increased during the survey period, with the maximum expenditure per angler-hour for guided and private trips in the upper zone occurring in 2024. Total expenditure estimates ranged between \$490,617 in 2024 to \$1,488,628 in 2016 (Table 21). In the upper zone, expenditures for guided trips were similar throughout the study period with the high occurring in 2019, while the expenditures for private trips declined throughout the time series with a marked decrease in 2024 (Figure 16). In the lower zone, expenditure estimates also decreased throughout the time series, and the estimate in 2024 (\$12,450) was very low compared to all other years. A decreasing trend in total expenditures was also apparent when trip types and zones were combined, and again, a substantial drop was observed in 2024 despite relatively high guide fee expenditures.

Discussion

The Roanoke River Striped Bass fishery has been one of North Carolina’s most popular fisheries for many years despite its short duration during the spring of each year, but fishing effort dropped to an unprecedented level during this study. Targeted Striped Bass fishing effort from 2016 through 2020, both in number of trips and angler-hours, was relatively high and similar to previously high years of the 2000s and 2010s (NCDMF 2022). Effort declined substantially from 2021 through 2024, when estimated Striped Bass fishing effort (18,794 angler-hours; 3,644 angler-trips) was the lowest on record since the inception of the Roanoke River Striped Bass creel survey in 1989 and was approximately 10 times less than the highest effort on record in 2004. The decline in Striped Bass fishing effort during the survey period was especially evident in the lower zone. Effort in the lower zone dropped substantially in 2021, remained low through 2023, and was nearly absent in 2024. In the upper zone, however, Striped Bass fishing effort remained steady from 2016 through 2023 but dropped significantly in 2024. The decline in effort, especially in the lower zone, was most likely due to the decrease in harvest season from 61 days in 2016–2020 to 7 days in 2021, 4 days in 2022, 6 days in 2023, and 0 days in 2024. Anglers in the lower zone appear to prefer harvest opportunities rather than catch-and-release, whereas anglers in the upper zone focus on both.

Season length and daily creel limits are used to constrain harvest within the limits of the TAL as specified by the Striped Bass FMP and agreed upon by NCDMF and NCWRC staff. Due to overfishing status determined from Striped Bass stock assessment analysis, the RRMA TAL was reduced from 68,750 lb in 2016–2020 to 12,804 lb in 2021–2023 and 2,087 lb in 2024. Consequently, harvest seasons were reduced to constrain harvest within the reduced TAL. Estimated harvest in the RRMA was below the TAL in 2016–2020 as well as 2022–2023, but the harvest estimate in 2021 (27,546 lb; SE = 2,804) surpassed the TAL by greater than 100%. The daily creel limit was two fish per angler in 2021, and it is likely that harvest-oriented anglers were able to fish in both zones open to harvest because the open seasons were staggered and each zone was open at different times. Thus, harvest was higher than it would have been if the creel limit had been reduced to one fish and the entire river was open for one 7-day period. The shortened harvest seasons held concurrently throughout the river, along with the one-fish per

day creel limit, were able to constrain harvest under the low TAL in 2022 and 2023. The harvest season was not open in 2024 because the extremely small TAL of 2,087 lb could have been caught in one day if fishing conditions allowed based on daily harvest rates estimated for previous years.

The harvest season timing and restrictive length limits are designed to primarily focus harvest on male Striped Bass ages 3–5. Compliance with the length limits was high as only 3% (150 of 4,934) of the Striped Bass observed during the survey were not of legal size. Nearly all harvested fish were between 457 and 559 mm each year, and after applying age-length keys from the electrofishing surveys, fish in this size range were estimated to be ages 3–5, with the peak occurring at age 4 each year. Despite the allowance for one fish greater than 27 inches prior to 2023, only 18 fish greater than 27 inches were measured indicating very little harvest of fish older than age 5 during the survey period. The sex ratio of harvested fish was skewed towards males in 2016–2018, but equal numbers of males and females were harvested in 2019–2023. Although anglers could have been culling to keep the largest fish possible, especially during 2021–2023 when the harvest season was short, it is more likely that fewer young males were available due to smaller year-classes. Additionally, the reported size range of released fish shifted from a majority of sub-legal fish in 2017–2020 towards more keeper-sized fish in 2021–2024, which is another indication of fewer younger fish in the population.

Catch rates in the upper zone were higher than the lower zone in all years and were variable in both zones during the survey period. Catch per effort (fish per trip and fish per angler-hour) in the upper zone peaked in 2018, 2019, and 2022 but was lower in all other years in the survey period. The variability in catch rates makes it difficult to discern any trend in catch rate during the survey period, but the peaks and valleys in angling catch rate in the upper zone tend to coincide with age-3 abundance in the spawning grounds electrofishing survey (Smith et al. 2023). This correlation suggests that the strength of age-3 cohorts drives catch rates in the recreational fishery on the upper Roanoke River. Although fishery independent stock assessments and electrofishing survey results indicate a reduction in population size during the survey period (NCDMF 2022; Smith et al. 2023), angling catch rates in the upper zone suggest the number of Striped Bass making spawning migrations still provided successful catch-and-release fishing opportunities. However, the decreased fishing effort in the lower zone in 2021–2024 and in the upper zone in 2024 resulted in lower Striped Bass catch estimates in 2021, 2023, and 2024.

Due to season closures and restrictive creel and size limits, the majority of caught Striped Bass are released. Releases follow the same trend as overall catch, peaking in 2018 and decreasing through the end of the survey period with the lowest release estimate in 2024. Because release mortalities were estimated as a constant proportion of releases (6.4%; Nelson 1998), estimated release mortalities coincided with the release estimate. Despite reductions to harvest seasons, an additional 2,072 to 10,194 Striped Bass were estimated to have died during the survey period, and most estimated mortalities were in the upper zone. Release mortality rates have been shown to increase with higher water temperature and hooking injury and can be substantially higher than 6.4% (Nelson 1998; McCargo et al. 2024). Data collection for hooking location and degree of bleeding for released fish along with incorporation of water temperature are needed to more accurately estimate release mortalities in the RRMA in the future.

Guided trips for Striped Bass have been prevalent at Weldon for many years. Results from this survey confirm that most guided trips occur in the upper zone, and despite reduced overall effort, guided trips remained relatively stable through the survey period until 2024 when all effort decreased substantially. Estimated effort for guided trips was less than 33% of effort in the upper zone each year but estimated Striped Bass releases for guided trips was a substantial proportion of all releases in the upper zone (20–46%). Thus, catch rates for guided trips were higher than for private boat trips. Although few guided trips were recorded and estimated in the lower zone, the Striped Bass release estimate for guided trips in the lower zone was extraordinarily high in 2022. One interview of a guided trip reported 250 released fish in the lower zone during 2022; it is likely this reported catch was inaccurate and, therefore, the inflated catch estimate was also inaccurate. In all other years, Striped Bass catch, effort, and harvest from guided trips were uncommon in the lower zone. Angler log books or observers could be used to substantiate release estimates for all trip types.

Bait use followed the same trend found in previous creel surveys (Dockendorf et al. 2016). Cut bait was more prevalent in the lower zone in all years of this survey, while live bait was predominant in the upper zone. Artificial bait use was similar in both zones during most years, but the percentage of anglers using artificial bait in the lower zone increased in 2024. Nelson (1998) showed that live bait with J-hooks resulted in more deep-hooking injuries than artificial lures, and, therefore, recommended different hook designs like circle hooks to reduce deep-hooking. Using circle hooks with live and natural bait was mandated in the upper zone by a regulation change in 2024. In the initial year of an ongoing study, McCargo et al. (2024) found that release mortality was higher with artificial lures than live bait used with circle hooks. Additional years of data will further inform catch-and-release mortality of Striped Bass on the Roanoke River, but future creel survey analyses should examine effects of bait type on catch rates and release mortality estimates using updated catch-and-release mortality models.

The popularity of the Roanoke River Striped Bass fishery extends throughout North Carolina and beyond. Anglers fishing for Striped Bass in the upper zone were primarily from North Carolina counties outside of the local area, and the makeup of angler origin remained consistent throughout the survey period suggesting that anglers were willing to drive to Weldon or other upper zone boat ramps despite the shortened harvest seasons and reduced catch. The proportion of non-NC anglers remained consistent in the upper zone as well. Local residents comprised a much higher portion of Striped Bass anglers in the lower zone in most years, and anglers from outside North Carolina typically did not fish in the lower zone. Because the Roanoke River Striped Bass fishery is important to anglers from many locations in North Carolina, input should be sought from anglers throughout the state when public comment is requested for future management changes.

The Roanoke River Striped Bass fishery is important to the local and statewide economy. Previous estimates of expenditures by Roanoke River Striped Bass anglers were \$1.56 million in 2006 and \$1.22 million in 2015 (McCargo et al. 2007; Dockendorf et al. 2016), but when adjusted for inflation to 2024 dollars with U.S. Bureau of Labor and Statistics CPI Inflation Calculator (https://www.bls.gov/data/inflation_calculator.htm), expenditure estimates were \$2.42 million and \$1.61 million, respectively. Estimated expenditures in 2016 (\$1.49 million) were similar to 2015, but all expenditure estimates were much lower than the inflation-adjusted estimate in 2006. Notably, the total expenditure estimate in 2024 (\$490,617) was the

lowest of the time series despite an increase in expenditures per angler-hour. The decline in estimated expenditures, especially in the lower zone, was caused by reduced effort in the lower zone in 2021–2024 and in the upper zone in 2024. Guide fees and vehicle fuel comprised most expenditures each year, and bait costs were a substantial cost as well. The guide fees were an even more substantial portion of total expenditures in 2024 because private trip effort substantially decreased and, therefore, vehicle fuel and bait expenditures decreased. Guide fee cost per guided trip and estimated guide fee expenditures remained similar throughout the survey. Guide fees are incorporated into the local economy as most guides pay for vehicle fuel, boat fuel, food, and lodging (camping) expenses in Halifax County and surrounding areas during the fishing season. If private trip effort continues to decline faster than guided trips in future years, guided trips will likely become even more influential to the economy of Striped Bass fishing on the Roanoke River. The reduction in overall expenditures is due to lower fishing effort, which, in turn, appears to be caused by reduced harvest seasons. Recent stock assessments have indicated overfished stock status, and measures to reduce fishing mortality were necessary to rebuild the stock (NCDMF 2024). Recovery that leads to larger year-classes and increased harvest opportunities should result in future increases of fishing effort, Striped Bass catch, and expenditures in the RRMA.

In general, Striped Bass anglers on the Roanoke River were willing to participate in the creel survey. From 2016 through 2021, relatively few missed interviews were recorded during scheduled creel sessions. A notable increase in the number and percentage of missed interviews occurred in the last three years of the study period, and the percentage of missed interviews was highest in 2024 despite the relatively small number of interviews. It is unknown if the missed interviews were Striped Bass fishing trips. On some occasions, however, the creel clerk noted that some anglers in the upper zone were perturbed by the harvest season closure and refused to provide information when requested in 2024. Wildlife enforcement officers are often present during creel survey sessions to assist with traffic control and angler compliance, but officer assistance was not requested during 2024 because fishing effort was reduced and the harvest season was closed. Estimates were not adjusted to account for the missed interviews during the survey period, but if high rates of missed interviews similar to 2024 are observed in future surveys, methods to add effort and catch for missed interviews may need to be developed to improve estimates. Although participation in the creel survey is voluntary, additional outreach efforts as well as a stronger presence by wildlife enforcement officers could increase participation in future surveys.

Management Recommendations

1. Continue annual Striped Bass creel surveys in the Roanoke River Management Area.
2. Continue to refine catch-and-release mortality estimates and develop creel survey questions to enumerate release of injured or bleeding fish.
3. Develop angler log books or observer program to verify release estimates.
4. Continue angler education on creel survey results, management decisions, as well as handling and release practices to reduce catch and release mortality.
5. Incorporate statewide input when regulation or management changes are proposed.

Acknowledgments

I greatly appreciate the assistance from all anglers who provided information during this survey, and I am indebted to the numerous creel clerks who professionally interviewed anglers and diligently collected and recorded the data. Assistance from Patrick Railey (2016–2019), James Castelloe (2016–2019), Carl Hatcher (2017–2019), Terry Boyce (2020–2021), Audrey Keen (2022), Rob Jones (2020–2023), and Matt Long (2024) ensured this creel survey was possible. In addition, I greatly appreciate the numerous piedmont and coastal region fisheries management staff as well as headquarters staff who assisted with the creel survey during busy fishing days. I am grateful to the Wildlife Enforcement Officers who assisted during the creel survey, and I appreciate the help from NCWRC IT staff for improvements to the creel survey database. Input and reviews from Kevin Dockendorf, Chris Smith, Deon Kerr, and Ben Ricks improved this report.

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TABLE 1. Sample periods, harvest seasons, and total allowable landings (TAL) for the Roanoke River Striped Bass creel survey, 2016–2024.

Year	Sample Period	Start Date	End Date	Days in Period	Harvest Season
2016 (TAL = 31,184 kg)	1	1-Mar	15-Mar	15	open
	2	16-Mar	31-Mar	16	open
	3	1-Apr	15-Apr	15	open
	4	16-Apr	30-Apr	15	open
	5	1-May	20-May	20	closed
2017 (TAL = 31,184 kg)	1	1-Mar	15-Mar	15	open
	2	16-Mar	31-Mar	16	open
	3	1-Apr	15-Apr	15	open
	4	16-Apr	30-Apr	15	open
	5	1-May	7-May	7	open
	6	8-May	24-May	17	closed
2018 (TAL = 31,184 kg)	1	1-Mar	15-Mar	15	open
	2	16-Mar	31-Mar	16	open
	3	1-Apr	15-Apr	15	open
	4	16-Apr	30-Apr	15	open
	5	1-May	6-May	6	open
	6	7-May	20-May	14	closed
2019 (TAL = 31,184 kg)	1	1-Mar	15-Mar	15	open
	2	16-Mar	31-Mar	16	open
	3	1-Apr	15-Apr	15	open
	4	16-Apr	30-Apr	15	open
	5	1-May	19-May	19	closed
2020 ^l (TAL = 31,184 kg)	1	1-Mar	15-Mar	15	open
	2	16-Mar	31-Mar	16	open
	3	1-Apr	15-Apr	15	open
	4	16-Apr	30-Apr	15	open
2021* (TAL = 5,808 kg)	1	1-Mar	15-Mar	15	closed
	2	16-Mar	31-Mar	16	closed
	3	1-Apr	9-Apr	9	closed
	4	10-Apr	16-Apr	7	open
	5	17-Apr	23-Apr	7	closed
	6	24-Apr	30-Apr	7	open
	7	1-May	15-May	15	closed
	8	16-May	22-May	7	closed

TABLE 1. (cont.)

Year	Sample Period	Start Date	End Date	Days in Period	Harvest Season
2022 (TAL = 5,808 kg)	1	1-Mar	15-Mar	15	closed
	2	16-Mar	31-Mar	16	closed
	3	1-Apr	15-Apr	15	closed
	4	16-Apr	22-Apr	7	closed
	5	23-Apr	24-Apr	2	open
	6	25-Apr	27-Apr	3	closed
	7	28-Apr	29-Apr	2	open
	8	30-Apr	15-May	16	closed
	9	16-May	22-May	7	closed
2023 (TAL = 5,808 kg)	2	14-Mar	28-Mar	15	closed
	3	29-Mar	13-Apr	16	closed
	4	14-Apr	17-Apr	4	open
	5	18-Apr	21-Apr	4	closed
	6	22-Apr	23-Apr	2	open
	7	24-Apr	7-May	14	closed
	8	8-May	21-May	14	closed
	2024 (TAL = 947 kg)	1	1-Mar	15-Mar	15
2		16-Mar	31-Mar	16	closed
3		1-Apr	15-Apr	15	closed
4		16-Apr	30-Apr	15	closed
5		1-May	19-May	19	closed

¹Interview sessions were only conducted during Period 1 and Period 2 in 2020 due to social-distancing requirements of the Covid-19 pandemic.

*In 2021, the harvest season was open only in the lower zone during Period 4 and only in the upper zone during Period 6.

TABLE 2. Interview totals for the Roanoke River Striped Bass creel survey, 2016–2024. Missed interviews were either refusals or interviews that could not be obtained due to busy conditions.

Year	Interviews	Missed Interviews	Anglers	Striped Bass Interviews	Striped Bass Interviews (%)	Guided Striped Bass Trips	Guided Striped Bass Trips (%)
<i>Upper Zone</i>							
2016	609	14	1,641	553	91	58	10
2017	470	9	1,180	405	86	39	10
2018	596	8	1,496	525	88	58	11
2019	614	12	1,551	557	91	102	18
2020	97	0	215	32	33	0	0
2021	524	10	1,335	391	75	76	19
2022	491	29	1,281	415	85	98	24
2023	539	27	1,473	456	85	89	20
2024	280	48	679	175	63	51	29
<i>Lower Zone</i>							
2016	301	3	665	256	85	5	2
2017	192	1	377	168	88	0	0
2018	161	3	315	132	82	1	1
2019	226	2	468	205	91	2	1
2020	136	2	306	87	64	0	0
2021	226	1	479	111	49	8	7
2022	183	7	375	79	43	1	1
2023	183	6	421	118	65	0	0
2024	112	3	211	15	13	0	0
<i>Total</i>							
2016	910	17	2,306	809	89	63	8
2017	662	10	1,557	573	87	39	7
2018	757	11	1,811	657	87	59	9
2019	840	14	2,019	762	91	104	14
2020	233	2	521	119	51	0	0
2021	750	11	1,814	502	67	84	17
2022	674	36	1,656	494	73	99	20
2023	722	33	1,894	574	80	89	16
2024	392	51	890	190	49	51	27

TABLE 3. Summary statistics for angling parties targeting Striped Bass during the Roanoke River Striped Bass creel survey, 2016–2024.

Year	Interviews	Mean Anglers (SE)	Mean Trip Hours (SE)	Mean Angler-hours (SE)	Mean Striped Bass Catch per trip (SE)	Mean Striped Bass Catch per Angler-hours (SE)
<i>Upper Zone</i>						
2016	553	2.73 (0.05)	5.71 (0.09)	15.83 (0.40)	13.97 (0.74)	0.99 (0.05)
2017	405	2.57 (0.05)	6.16 (0.12)	16.33 (0.52)	17.51 (1.10)	1.16 (0.08)
2018	525	2.54 (0.04)	5.86 (0.10)	15.18 (0.38)	32.97 (1.99)	2.29 (0.13)
2019	557	2.55 (0.04)	5.12 (0.08)	13.26 (0.32)	28.46 (1.36)	2.38 (0.12)
2020	32	2.31 (0.12)	4.72 (0.47)	11.24 (1.56)	3.88 (1.07)	0.44 (0.12)
2021	391	2.67 (0.06)	5.39 (0.11)	14.52 (0.44)	16.46 (0.93)	1.33 (0.09)
2022	415	2.67 (0.05)	5.36 (0.09)	14.20 (0.36)	30.42 (1.68)	2.40 (0.15)
2023	456	2.82 (0.06)	5.66 (0.10)	16.16 (0.43)	16.48 (0.97)	1.03 (0.06)
2024	175	2.47 (0.07)	5.14 (0.12)	12.77 (0.49)	18.51 (1.77)	1.57 (0.17)
<i>Lower Zone</i>						
2016	256	2.22 (0.05)	4.75 (0.13)	10.88 (0.44)	3.39 (0.28)	0.38 (0.03)
2017	168	1.99 (0.06)	4.40 (0.13)	8.83 (0.37)	4.13 (0.50)	0.56 (0.08)
2018	132	1.98 (0.08)	4.13 (0.17)	8.44 (0.6)	9.70 (1.47)	1.25 (0.15)
2019	205	2.12 (0.06)	4.39 (0.12)	9.49 (0.38)	8.46 (0.73)	1.05 (0.09)
2020	87	2.37 (0.10)	4.46 (0.15)	10.39 (0.53)	3.72 (0.61)	0.43 (0.09)
2021	111	2.29 (0.08)	5.09 (0.23)	11.87 (0.77)	7.24 (0.99)	0.71 (0.08)
2022	79	2.33 (0.11)	4.69 (0.20)	10.86 (0.65)	13.76 (3.37)	1.41 (0.29)
2023	118	2.50 (0.09)	4.54 (0.17)	11.38 (0.59)	4.50 (0.47)	0.56 (0.07)
2024	15	2.00 (0.17)	4.87 (0.47)	9.83 (1.29)	2.33 (1.39)	0.19 (0.12)
<i>Total</i>						
2016	809	2.57 (0.04)	5.41 (0.08)	14.26 (0.32)	10.62 (0.54)	0.80 (0.04)
2017	573	2.40 (0.04)	5.64 (0.10)	14.12 (0.41)	13.59 (0.83)	0.98 (0.06)
2018	657	2.43 (0.04)	5.51 (0.09)	13.82 (0.34)	28.30 (1.66)	2.08 (0.11)
2019	762	2.43 (0.04)	4.92 (0.07)	12.25 (0.26)	23.08 (1.07)	2.03 (0.09)
2020	119	2.35 (0.08)	4.53 (0.17)	10.62 (0.57)	3.76 (0.53)	0.43 (0.07)
2021	502	2.58 (0.05)	5.32 (0.10)	13.94 (0.38)	14.42 (0.78)	1.19 (0.07)
2022	494	2.61 (0.05)	5.25 (0.08)	13.67 (0.33)	27.76 (1.54)	2.25 (0.13)
2023	574	2.76 (0.05)	5.43 (0.09)	15.17 (0.37)	14.02 (0.81)	0.94 (0.05)
2024	190	2.44 (0.07)	5.12 (0.12)	12.54 (0.47)	17.23 (1.66)	1.46 (0.16)

TABLE 4. Annual estimates (standard error) of targeted Striped Bass effort, harvest, releases, total catch, and release mortality for the Roanoke River Striped Bass creel survey, 2016–2024. Estimates for 2020 are the summation of expanded estimates for March 2020 and the mean estimates for April 2015 and April 2016. Estimates for 2020 do not include the catch-and-release season in May, and standard errors are not available for 2020 or mortality estimates.

Year	Effort anglers (SE)	Effort angler- hours (SE)	Harvest kg (SE)	Harvest lb (SE)	Harvest fish (SE)	Released fish (SE)	Total Catch fish (SE)	Mortality fish
2016	27,218 (3,677)	140,925 (19,046)	29,351 (3,467)	64,706 (7,643)	21,073 (3,751)	54,072 (8,642)	75,145 (10,362)	3,461 -
2017	20,475 (3,041)	106,354 (16,621)	14,476 (2,670)	31,915 (5,887)	9,654 (2,843)	75,853 (14,435)	85,507 (15,826)	4,855 -
2018	19,147 (2,066)	100,933 (19,066)	12,148 (1,730)	26,781 (3,815)	8,741 (1,971)	159,286 (31,734)	168,027 (33,623)	10,194 -
2019	23,353 (3,032)	113,016 (14,340)	24,315 (2,452)	53,605 (5,406)	16,655 (2,861)	153,702 (24,418)	170,358 (27,188)	9,837 -
2020	26,648 -	131,408 -	27,953 -	61,626 -	20,376 -	54,611 -	74,987 -	3,495 -
2021	12,782 (2,244)	68,642 (12,729)	12,495 (1,272)	27,546 (2,804)	7,800 (2,001)	56,819 (10,338)	64,620 (11,421)	3,636 -
2022	10,307 (1,388)	52,682 (10,780)	3,030 (433)	6,680 (955)	2,136 (642)	127,066 (23,551)	129,202 (24,222)	8,132 -
2023	11,514 (1,940)	63,019 (14,635)	4,299 (581)	9,477 (1,280)	2,778 (872)	56,085 (13,382)	58,863 (13,780)	3,589 -
2024	3,644 (1,531)	18,794 (7,733)	0 -	0 -	0 -	32,378 (13,837)	32,378 (13,837)	2,072 -

TABLE 5. Summary data for total length (mm) and weight (kg) including sample size (N) for Striped Bass measured during the Roanoke River Striped Bass creel survey, 2016–2024.

Year	Total Length (mm)				Weight (kg)			
	N	Mean (SE)	Min	Max	N	Mean (SE)	Min	Max
<i>Female</i>								
2016	289	514 (1.3)	460	596	288	1.5 (0.01)	1.0	2.5
2017	135	532 (3.8)	460	855	135	1.7 (0.06)	1.0	8.2
2018	127	508 (3.1)	456	722	127	1.5 (0.04)	0.9	4.3
2019	502	505 (1.3)	430	720	499	1.5 (0.01)	0.7	4.8
2020	19	499 (5.2)	470	562	19	1.5 (0.06)	1.2	2.2
2021	314	523 (1.7)	456	722	314	1.7 (0.02)	0.9	5.3
2022	180	512 (2.9)	446	715	180	1.5 (0.03)	0.7	4.3
2023	202	517 (2.4)	460	732	202	1.6 (0.03)	0.9	4.9
<i>Male</i>								
2016	826	495 (0.8)	440	740	814	1.3 (0.01)	0.9	4.3
2017	355	503 (1.5)	442	589	355	1.4 (0.01)	0.9	2.1
2018	547	495 (1.1)	442	574	547	1.4 (0.01)	1.0	2.4
2019	525	493 (1.2)	442	750	520	1.4 (0.01)	1.0	5.1
2020	79	490 (2.5)	452	550	78	1.4 (0.03)	1.0	2.1
2021	304	504 (2.2)	457	1,014	304	1.5 (0.04)	0.9	12.5
2022	194	494 (2.1)	448	558	194	1.4 (0.02)	1.0	2.2
2023	262	498 (1.6)	448	558	262	1.5 (0.02)	1.0	2.3
<i>Unknown</i>								
2016	5	516 (11.4)	490	550	5	1.5 (0.09)	1.2	1.7
2017	1	–	532	532	1	–	1.9	1.9
2018	6	486 (16.0)	450	550	6	1.3 (0.14)	1.0	1.9
2019	5	501 (12.5)	470	530	5	1.3 (0.08)	1.1	1.5
2020	44	482 (2.8)	457	546	0	–	–	–
2021	13	500 (5.1)	462	533	3	1.4 (0.1)	1.2	1.6
<i>Total</i>								
2016	1,120	500 (0.7)	440	740	1,107	1.4 (0.01)	0.9	4.3
2017	491	511 (1.6)	442	855	491	1.5 (0.02)	0.9	8.2
2018	680	497 (1.0)	442	722	680	1.4 (0.01)	0.9	4.3
2019	1,032	499 (0.9)	430	750	1,024	1.5 (0.01)	0.7	5.1
2020	142	489 (1.8)	452	562	97	1.4 (0.02)	1.0	2.2
2021	631	513 (1.4)	456	1,014	621	1.6 (0.02)	0.9	12.5
2022	374	502 (1.8)	446	715	374	1.4 (0.02)	0.7	4.3
2023	464	506 (1.5)	448	732	464	1.5 (0.02)	0.9	4.9

TABLE 6. Age distribution of female, male, and unknown sex Striped Bass harvested by Roanoke River anglers, 2016. The estimated number in the recreational harvest was calculated by applying the proportional age distribution to the total Striped Bass harvest estimate.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2013	3	27	9.3	2.4	508
2012	4	160	55.4	14.3	3,010
2011	5	95	32.9	8.5	1,787
2010	6	7	2.4	0.6	132
	Total	289	100.0	25.8	5,438
<i>Male</i>					
2013	3	182	22.0	16.2	3,424
2012	4	446	54.0	39.8	8,392
2011	5	179	21.7	16.0	3,368
2010	6	16	1.9	1.4	301
2009	7	1	0.1	0.1	19
2008	8	0	0.0	0.0	0
2007	9	2	0.2	0.2	38
	Total	826	99.9	73.7	15,541
<i>Unknown</i>					
2013	3	1	20.0	0.1	19
2012	4	2	40.0	0.2	38
2011	5	2	40.0	0.2	38
	Total	5	100.0	0.5	94

TABLE 7. Age distribution of female, male, and unknown sex Striped Bass harvested by Roanoke River anglers, 2017.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2014	3	6	4.4	1.2	118
2013	4	73	54.1	14.9	1,435
2012	5	49	36.3	10.0	963
2011	6	4	3.0	0.8	79
2010	7	0	0.0	0.0	0
2009	8	2	1.5	0.4	39
2008	9	1	0.7	0.2	20
	Total	135	100.0	27.5	2,654
<i>Male</i>					
2015	2	1	0.3	0.2	20
2014	3	64	18.0	13.0	1,258
2013	4	182	51.3	37.1	3,578
2012	5	91	25.6	18.5	1,789
2011	6	16	4.5	3.3	315
2010	7	1	0.3	0.2	20
	Total	355	100.0	72.3	6,980
<i>Unknown</i>					
2013	4	1	100.0	0.2	20
	Total	1	100.0	0.2	20

TABLE 8. Age distribution of female, male, and unknown sex Striped Bass harvested by Roanoke River anglers, 2018.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2015	3	21	16.5	3.1	270
2014	4	60	47.2	8.8	771
2013	5	41	32.3	6.0	527
2012	6	4	3.1	0.6	51
2011	7	1	0.8	0.1	13
	Total	127	99.9	18.6	1,633
<i>Male</i>					
2016	2	1	0.2	0.1	13
2015	3	150	27.4	22.1	1,928
2014	4	275	50.3	40.4	3,535
2013	5	104	19.0	15.3	1,337
2012	6	14	2.6	2.1	180
2011	7	3	0.5	0.4	39
	Total	547	100.0	80.4	7,031
<i>Unknown</i>					
2015	3	1	16.7	0.1	13
2014	4	4	66.6	0.6	51
2013	5	0	0.0	0.0	0
2012	6	1	16.7	0.1	13
	Total	6	100.0	0.8	77

TABLE 9. Age distribution by sex for Striped Bass harvested by Roanoke River anglers, 2019.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2016	3	63	12.5	6.1	1,017
2015	4	304	60.6	29.5	4,906
2014	5	130	25.9	12.6	2,098
2013	6	4	0.8	0.4	65
2012	7	1	0.2	0.1	16
	Total	502	100.0	48.7	8,102
<i>Male</i>					
2016	3	139	26.5	13.5	2,243
2015	4	249	47.4	24.1	4,019
2014	5	117	22.3	11.3	1,888
2013	6	18	3.4	1.7	290
2012	7	1	0.2	0.1	16
2011	8	1	0.2	0.1	16
	Total	525	100.0	50.8	8,473
<i>Unknown</i>					
2015	4	4	80.0	0.4	65
2014	5	1	20.0	0.1	16
	Total	5	100.0	0.5	81

TABLE 10. Age distribution by sex for Striped Bass harvested by Roanoke River anglers, 2021.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2018	3	14	4.5	2.2	173
2017	4	171	54.5	27.1	2,114
2016	5	118	37.6	18.7	1,459
2015	6	8	2.5	1.3	99
2014	7	3	1.0	0.5	37
	Total	314	100.1	49.8	3,881
<i>Male</i>					
2019	2	1	0.3	0.2	12
2018	3	55	18.1	8.7	680
2017	4	141	46.4	22.3	1,743
2016	5	90	29.6	14.3	1,113
2015	6	14	4.6	2.2	173
2014	7	2	0.7	0.3	25
2013	8	0	0.0	0.0	0
2012	9	1	0.3	0.2	12
	Total	304	100.0	48.2	3,758
<i>Unknown</i>					
2018	3	4	30.8	0.6	49
2017	4	7	53.8	1.1	87
2016	5	2	15.4	0.3	25
	Total	13	100.0	2.0	161

TABLE 11. Age distribution by sex for Striped Bass harvested by Roanoke River anglers, 2022.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2019	3	15	8.3	4.0	86
2018	4	106	58.9	28.3	605
2017	5	52	28.9	13.9	297
2016	6	5	2.8	1.3	29
2015	7	0	0.0	0.0	0
2014	8	1	0.6	0.3	6
2013	9	1	0.6	0.3	6
	Total	180	100.1	48.1	1,028
<i>Male</i>					
2019	3	64	33.0	17.1	366
2018	4	73	37.6	19.5	417
2017	5	45	23.2	12.0	257
2016	6	11	5.7	2.9	63
2015	7	1	0.5	0.3	6
	Total	194	100.0	51.8	1,108

TABLE 12. Age distribution by sex for Striped Bass harvested by Roanoke River anglers, 2023.

Year-class	Age	N	Percent Composition by Sex	Overall Percent Composition	Estimated Number in Recreational Harvest
<i>Female</i>					
2020	3	17	8.4	3.7	102
2019	4	111	55.0	23.9	665
2018	5	67	33.2	14.4	401
2017	6	5	2.5	1.1	30
2016	7	1	0.5	0.2	6
2015	8	1	0.5	0.2	6
	Total	202	100.1	43.5	1,209
<i>Male</i>					
2020	3	53	20.2	11.4	317
2019	4	136	51.9	29.3	814
2018	5	58	22.1	12.5	347
2017	6	11	4.2	2.4	66
2016	7	4	1.5	0.9	24
	Total	262	99.9	56.5	1,569

TABLE 13. Length composition of Striped Bass released by Roanoke River anglers, 2016–2024.

Year	Interviews	Interviews with Striped Bass Releases	Percentage of Interviews with Releases by Size	Reported Releases	Release Size Category			
					< 18 inches	18–22 inches	22–27 inches	> 27 inches
2016	910	597	94%	7,449	36%	55%	8%	1%
2017	662	462	98%	7,274	83%	13%	4%	0%
2018	757	557	99%	17,915	82%	16%	2%	0%
2019	840	654	96%	16,528	72%	24%	4%	0%
2020	233	73	82%	318	79%	20%	1%	0%
2021	750	452	89%	6,657	59%	30%	10%	1%
2022	674	472	89%	13,539	53%	40%	8%	0%
2023	722	480	95%	7,563	43%	46%	11%	0%
2024	392	180	91%	3,336	52%	36%	11%	1%

TABLE 14. Bait use by Striped Bass anglers in upper and lower zones of the Roanoke River, 2016–2024.

Year	Striped Bass Interviews	Percentage of Interviews with Bait Information	Interviews by Bait Type			Percentage of Interviews		
			Live	Cut	Artificial	Live	Cut	Artificial
<i>Upper Zone</i>								
2016	553	99.8%	42	50	126	77%	9%	23%
2017	405	99.8%	29	38	150	71%	9%	37%
2018	525	99.8%	41	27	123	80%	5%	24%
2019	557	100.0%	37	33	195	68%	6%	35%
2020	32	100.0%	5	14	18	16%	44%	56%
2021	391	100.0%	24	24	163	62%	6%	42%
2022	415	99.0%	26	22	177	65%	5%	43%
2023	456	98.2%	29	43	176	67%	10%	39%
2024	175	100.0%	10	13	91	62%	7%	52%
<i>Lower Zone</i>								
2016	256	99.6%	63	152	73	25%	60%	29%
2017	168	98.8%	58	97	38	35%	58%	23%
2018	132	100.0%	70	34	40	53%	26%	30%
2019	205	99.5%	57	97	69	28%	48%	34%
2020	87	100.0%	7	61	21	8%	70%	24%
2021	111	100.0%	17	67	37	15%	60%	33%
2022	79	94.9%	30	28	23	40%	37%	31%
2023	118	97.5%	28	85	13	24%	74%	11%
2024	15	100.0%	7	4	12	47%	27%	80%

TABLE 15. Origin information for anglers targeting Striped Bass in the Roanoke River, 2016–2024. Local anglers are from counties bordering the Roanoke River (Halifax, Northampton, Bertie, Martin, Washington), non-local anglers are from any other county in North Carolina, and non-NC anglers are from another state or country.

Year	Guided Trips			Private Trips			All Trips Combined		
	Local	Non-Local	Non-NC	Local	Non-Local	Non-NC	Local	Non-Local	Non-NC
<i>Upper Zone</i>									
2016	7	144	51	235	913	144	242	1,057	195
2017	11	96	25	176	612	92	187	708	117
2018	16	139	26	222	831	84	238	970	110
2019	32	201	74	200	783	117	232	984	191
2020	-	-	-	34	40	0	34	40	0
2021	19	173	38	112	544	121	131	717	159
2022	27	217	46	109	565	106	136	782	152
2023	31	204	63	158	689	101	189	893	164
2024	10	102	27	37	209	48	47	311	75
<i>Lower Zone</i>									
2016	0	7	5	259	290	3	259	297	8
2017	0	0	0	125	198	3	125	198	3
2018	0	3	0	125	129	5	125	132	5
2019	4	2	2	230	186	9	234	188	11
2020	-	-	-	85	121	0	85	121	0
2021	5	19	3	84	139	7	89	158	10
2022	0	3	0	50	118	6	50	121	6
2023	0	0	0	114	173	4	114	173	4
2024	0	0	0	20	7	3	20	7	3
Total	162	1,310	360	2,375	6,547	853	2,537	7,857	1,213

TABLE 16. Number of interviews and expenditure interviews conducted for anglers targeting Striped Bass during the Roanoke River Striped Bass Creel Survey, 2016–2024.

Year	Guided Trips		Private Trips		All Trips Combined		Percent Expense Interviews
	Interviews	Expense Interviews	Interviews	Expense Interviews	Interviews	Expense Interviews	
<i>Upper Zone</i>							
2016	59	56	494	459	553	515	93%
2017	41	36	364	335	405	371	92%
2018	58	52	467	384	525	436	83%
2019	102	98	455	294	557	392	70%
2020	0	0	32	0	32	0	0%
2021	76	0	315	0	391	0	0%
2022	98	37	317	106	415	143	34%
2023	89	50	367	221	456	271	59%
2024	51	51	124	124	175	175	100%
<i>Lower Zone</i>							
2016	5	4	251	217	256	221	86%
2017	0	0	168	162	168	162	96%
2018	1	1	131	126	132	127	96%
2019	2	2	203	126	205	128	62%
2020	0	0	87	0	87	0	0%
2021	8	0	103	0	111	0	0%
2022	1	1	78	55	79	56	71%
2023	0	0	118	94	118	94	80%
2024	0	0	15	15	15	15	100%
<i>Combined</i>							
2016	64	60	745	676	809	736	91%
2017	41	36	532	497	573	533	93%
2018	59	53	598	510	657	563	86%
2019	104	100	658	420	762	520	68%
2020	0	0	119	0	119	0	0%
2021	84	0	418	0	502	0	0%
2022	99	38	395	161	494	199	40%
2023	89	50	485	315	574	365	64%
2024	51	51	139	139	190	190	100%

TABLE 17. Mean expenditures per trip for anglers targeting Striped Bass in the upper zone during the Roanoke River Creel Survey, 2016–2024. Expenses were adjusted for inflation and reported in 2024 dollars. Expenditure information was not collected in 2020 or 2021. Standard errors are in parentheses.

Year	Interviews	Lodging Cost (SE)	Food Cost (SE)	Ice Cost (SE)	Bait Cost (SE)	Boat Fuel Cost (SE)	Vehicle Fuel Cost (SE)	Guide Fee Cost (SE)	Total Cost (SE)
<i>Guided Trips</i>									
2016	56	\$52.24 (13.73)	\$19.63 (5.33)	\$0.05 (0.05)	\$ 0.00 (0.00)	\$ 0.47 (0.47)	\$30.30 (4.48)	\$641.85 (22.66)	\$744.53 (30.11)
2017	36	\$19.45 (7.49)	\$21.51 (4.84)	\$1.00 (0.64)	\$ 3.34 (2.87)	\$ 3.02 (1.85)	\$32.42 (6.09)	\$576.61 (35.82)	\$657.34 (38.31)
2018	52	\$22.61 (8.19)	\$2.28 (1.23)	\$0.00 (0.00)	\$ 1.44 (1.44)	\$ 0.48 (0.34)	\$41.27 (11.35)	\$681.11 (30.22)	\$749.19 (31.73)
2019	98	\$25.69 (6.32)	\$8.09 (2.17)	\$0.00 (0.00)	\$ 1.60 (1.60)	\$ 0.69 (0.35)	\$38.89 (8.89)	\$681.76 (13.75)	\$756.73 (16.93)
2022	37	\$52.06 (16.03)	\$22.60 (7.36)	\$0.78 (0.33)	\$ 6.61 (4.39)	\$ 4.55 (1.58)	\$38.80 (9.62)	\$488.20 (44.68)	\$613.60 (48.54)
2023	50	\$38.69 (9.11)	\$ 7.41 (3.44)	\$0.56 (0.27)	\$16.70 (5.77)	\$ 7.41 (1.61)	\$18.45 (4.92)	\$574.47 (32.70)	\$663.69 (34.49)
2024	51	\$49.90 (10.87)	\$72.75 (7.61)	\$1.53 (1.18)	\$ 1.18 (1.18)	\$ 1.57 (1.23)	\$58.43 (15.21)	\$558.82 (23.29)	\$744.18 (25.56)
<i>Private Trips</i>									
2016	459	\$29.08 (2.84)	\$22.55 (1.47)	\$2.09 (0.18)	\$38.60 (2.15)	\$17.71 (0.81)	\$50.45 (2.61)	-	\$160.48 (6.43)
2017	335	\$25.69 (3.03)	\$31.62 (2.42)	\$2.15 (0.26)	\$31.04 (2.06)	\$16.21 (0.76)	\$48.83 (2.13)	-	\$155.54 (7.28)
2018	384	\$28.66 (3.45)	\$9.73 (1.19)	\$0.43 (0.09)	\$39.02 (2.37)	\$14.71 (0.66)	\$51.84 (2.24)	-	\$144.39 (6.57)
2019	294	\$21.16 (3.67)	\$6.24 (1.27)	\$0.13 (0.09)	\$31.65 (2.49)	\$11.23 (0.75)	\$49.71 (3.01)	-	\$120.12 (6.84)
2022	106	\$21.63 (6.43)	\$24.70 (4.74)	\$2.22 (0.40)	\$24.37 (3.59)	\$24.71 (1.92)	\$67.47 (6.30)	-	\$165.10 (14.78)
2023	221	\$28.02 (4.08)	\$28.10 (3.07)	\$2.63 (0.61)	\$35.12 (3.23)	\$18.43 (1.58)	\$63.95 (3.52)	-	\$176.25 (10.75)
2024	124	\$36.19 (6.25)	\$75.45 (9.12)	\$4.69 (0.91)	\$25.64 (4.53)	\$11.95 (1.18)	\$37.65 (3.04)	-	\$191.56 (18.77)

TABLE 18. Mean expenditures per trip for anglers targeting Striped Bass in the lower zone during the Roanoke River Creel Survey, 2016–2024. Expenses were adjusted for inflation and reported in 2024 dollars. Expenditure information was not collected in 2020 or 2021. Standard errors are in parentheses.

Year	Interviews	Lodging Cost (SE)	Food Cost (SE)	Ice Cost (SE)	Bait Cost (SE)	Boat Fuel Cost (SE)	Vehicle Fuel Cost (SE)	Guide Fee Cost (SE)	Total Cost (SE)
<i>Guided Trips</i>									
2016	4	\$24.51 (24.51)	\$16.34 (16.34)	\$0.00 (0.00)	\$ 0.00 (0.00)	\$ 0.00 (0.00)	\$ 0.00 (0.00)	\$562.03 (31.11)	\$602.87 (71.61)
2017	0	-	-	-	-	-	-	-	-
2018	1	\$0.00 (-)	\$18.74 (-)	\$0.00 (-)	\$0.00 (-)	\$18.74 (-)	\$49.97 (-)	\$156.16 (-)	\$243.61 (-)
2019	2	\$0.00 (0.00)	\$0.00 (0.00)	\$0.00 (0.00)	\$13.50 (13.50)	\$9.20 (9.20)	\$18.41 (18.41)	\$337.44 (337.44)	\$378.54 (296.33)
2022	1	\$0.00 (-)	\$80.40 (-)	\$0.00 (-)	\$ 0.00 (-)	\$21.44 (-)	\$53.60 (-)	\$536.01 (-)	\$691.45 (-)
2023	0	-	-	-	-	-	-	-	-
2024	0	-	-	-	-	-	-	-	-
<i>Private Trips</i>									
2016	217	\$3.43 (1.34)	\$14.90 (1.87)	\$2.24 (0.26)	\$10.81 (0.98)	\$15.72 (0.98)	\$28.06 (1.73)	\$0.00 (0.00)	\$ 75.16 (4.75)
2017	162	\$2.21 (1.07)	\$15.62 (2.61)	\$1.61 (0.24)	\$11.69 (1.42)	\$11.96 (0.86)	\$28.06 (1.97)	\$0.00 (0.00)	\$71.15 (5.79)
2018	126	\$6.20 (2.71)	\$ 6.28 (1.25)	\$0.48 (0.16)	\$9.14 (1.12)	\$ 9.44 (0.98)	\$28.61 (3.27)	\$0.00 (0.00)	\$ 60.14 (7.16)
2019	126	\$0.73 (0.73)	\$2.78 (0.86)	\$0.26 (0.13)	\$11.66 (1.20)	\$7.57 (0.74)	\$21.06 (2.10)	\$0.00 (0.00)	\$ 44.06 (3.64)
2022	55	\$5.46 (4.17)	\$18.98 (3.36)	\$2.96 (0.61)	\$23.82 (3.89)	\$20.76 (4.33)	\$45.82 (5.52)	\$0.00 (0.00)	\$117.80 (13.85)
2023	94	\$6.92 (2.58)	\$11.14 (1.54)	\$2.69 (0.39)	\$20.56 (3.61)	\$19.21 (2.35)	\$35.59 (4.06)	\$0.00 (0.00)	\$96.11 (9.01)
2024	15	\$8.00 (8.00)	\$35.67 (19.36)	\$4.47 (1.58)	\$7.73 (3.75)	\$15.07 (6.24)	\$19.80 (12.97)	\$0.00 (0.00)	\$90.73 (50.81)

TABLE 19. Estimated expenditures for anglers targeting Striped Bass in the upper zone of the Roanoke River, 2016–2024. Expenses were adjusted for inflation and reported in 2024 dollars. Estimates are not available for 2020 and 2021.

Year	Angler-hours	Mean Expenditures per angler-hour	Total Cost	Lodging	Food	Ice	Bait	Boat Fuel	Vehicle Fuel	Guide Fee
<i>Guided Trips</i>										
2016	7,357	\$34.00	\$250,163	\$17,551	\$6,595	\$16	\$0	\$157	\$10,179	\$215,665
2017	7,336	\$28.04	\$205,727	\$6,086	\$6,731	\$312	\$1,046	\$946	\$10,147	\$180,461
2018	8,781	\$36.27	\$318,500	\$9,611	\$970	\$0	\$613	\$204	\$17,547	\$289,555
2019	10,173	\$48.11	\$489,433	\$16,618	\$5,231	\$0	\$1,037	\$445	\$25,153	\$440,949
2022	8,389	\$36.37	\$305,089	\$25,888	\$11,237	\$389	\$3,285	\$2,262	\$19,290	\$242,740
2023	14,006	\$29.79	\$417,192	\$24,320	\$4,659	\$349	\$10,497	\$4,659	\$11,597	\$361,110
2024	5,503	\$52.93	\$291,274	\$19,532	\$28,473	\$599	\$460	\$614	\$22,870	\$218,726
<i>Private Trips</i>										
2016	61,660	\$10.62	\$654,941	\$118,689	\$92,018	\$8,524	\$157,540	\$72,262	\$205,908	\$0
2017	55,397	\$10.01	\$554,315	\$91,574	\$112,677	\$7,665	\$110,621	\$57,768	\$174,011	\$0
2018	62,567	\$9.95	\$622,709	\$123,613	\$41,953	\$1,852	\$168,273	\$63,434	\$223,584	\$0
2019	47,417	\$9.46	\$448,456	\$78,999	\$23,310	\$467	\$118,156	\$41,930	\$185,593	\$0
2022	32,806	\$12.34	\$404,973	\$53,062	\$60,578	\$5,458	\$59,785	\$60,603	\$165,487	\$0
2023	34,568	\$12.01	\$415,293	\$66,013	\$66,211	\$6,196	\$82,763	\$43,423	\$150,686	\$0
2024	11,942	\$15.65	\$186,892	\$35,304	\$73,615	\$4,571	\$25,013	\$11,661	\$36,729	\$0
<i>All Trips Combined</i>										
2016	69,017	-	\$905,104	\$136,240	\$98,614	\$8,540	\$157,540	\$72,419	\$216,087	\$215,665
2017	62,733	-	\$760,042	\$97,659	\$119,408	\$7,977	\$111,667	\$58,714	\$184,158	\$180,461
2018	71,349	-	\$941,209	\$133,224	\$42,923	\$1,852	\$168,886	\$63,638	\$241,131	\$289,555
2019	57,590	-	\$937,889	\$95,617	\$28,542	\$467	\$119,192	\$42,376	\$210,746	\$440,949
2022	41,195	-	\$710,062	\$78,950	\$71,815	\$5,846	\$63,069	\$62,865	\$184,777	\$242,740
2023	48,574	-	\$832,485	\$90,333	\$70,870	\$6,546	\$93,260	\$48,083	\$162,283	\$361,110
2024	17,445	-	\$478,167	\$54,836	\$102,087	\$5,170	\$25,473	\$12,275	\$59,599	\$218,726

TABLE 20. Estimated expenditures for anglers targeting Striped Bass in the lower zone of the Roanoke River, 2016–2024. Expenses were adjusted for inflation and reported in 2024 dollars. Estimates are not available for 2020 and 2021.

Year	Angler-hours	Mean Expenditures per angler-hour	Total Cost	Lodging	Food	Ice	Bait	Boat Fuel	Vehicle Fuel	Guide Fee
<i>Guided Trips</i>										
2016	3,104	\$32.62	\$101,276	\$4,117	\$2,745	\$0	\$0	\$0	\$0	\$94,415
2017	0	-	-	-	-	-	-	-	-	-
2018	211	\$26.19	\$5,515	\$0	\$424	\$0	\$0	\$424	\$1,131	\$3,535
2019	816	\$22.80	\$18,613	\$0	\$0	\$0	\$664	\$452	\$905	\$16,591
2022	1,338	\$53.60	\$71,743	\$0	\$8,342	\$0	\$0	\$2,225	\$5,561	\$55,615
2023	0	-	-	-	-	-	-	-	-	-
2024	0	-	-	-	-	-	-	-	-	-
<i>Private Trips</i>										
2016	68,804	\$7.01	\$482,248	\$22,028	\$95,569	\$14,376	\$69,367	\$100,863	\$180,046	\$0
2017	43,621	\$8.06	\$351,447	\$10,926	\$77,145	\$7,960	\$57,752	\$59,060	\$138,604	\$0
2018	29,374	\$7.13	\$209,446	\$21,580	\$21,856	\$1,657	\$31,835	\$32,871	\$99,647	\$0
2019	54,609	\$4.68	\$255,477	\$4,235	\$16,094	\$1,525	\$67,596	\$43,878	\$122,148	\$0
2022	10,148	\$10.87	\$110,330	\$5,111	\$17,780	\$2,775	\$22,307	\$19,441	\$42,916	\$0
2023	14,445	\$8.45	\$122,040	\$8,789	\$14,143	\$3,414	\$26,103	\$24,393	\$45,197	\$0
2024	1,349	\$9.23	\$12,450	\$1,098	\$4,894	\$613	\$1,061	\$2,067	\$2,717	\$0
<i>All Trips Combined</i>										
2016	71,908	-	\$583,525	\$26,144	\$98,313	\$14,376	\$69,367	\$100,863	\$180,046	\$94,415
2017	43,621	-	\$351,447	\$10,926	\$77,145	\$7,960	\$57,752	\$59,060	\$138,604	\$0
2018	29,585	-	\$214,961	\$21,580	\$22,280	\$1,657	\$31,835	\$33,295	\$100,779	\$3,535
2019	55,425	-	\$274,089	\$4,235	\$16,094	\$1,525	\$68,260	\$44,331	\$123,053	\$16,591
2022	11,486	-	\$182,073	\$5,111	\$26,122	\$2,775	\$22,307	\$21,666	\$48,478	\$55,615
2023	14,445	-	\$122,040	\$8,789	\$14,143	\$3,414	\$26,103	\$24,393	\$45,197	\$0
2024	1,349	-	\$12,450	\$1,098	\$4,894	\$613	\$1,061	\$2,067	\$2,717	\$0

TABLE 21. Estimated expenditures for anglers targeting Striped Bass in both zones of the Roanoke River, 2016–2024. Expenses were adjusted for inflation and reported in 2024 dollars. Estimates are not available for 2020 and 2021.

Year	Angler-hours	Total Cost	Lodging	Food	Ice	Bait	Boat Fuel	Vehicle Fuel	Guide Fee
<i>Guided Trips</i>									
2016	10,462	\$351,440	\$21,668	\$9,340	\$16	\$0	\$157	\$10,179	\$310,080
2017	7,336	\$205,727	\$6,086	\$6,731	\$312	\$1,046	\$946	\$10,147	\$180,461
2018	8,992	\$324,016	\$9,611	\$1,395	\$0	\$613	\$629	\$18,678	\$293,090
2019	10,990	\$508,046	\$16,618	\$5,231	\$0	\$1,700	\$898	\$26,058	\$457,541
2022	9,728	\$376,833	\$25,888	\$19,579	\$389	\$3,285	\$4,486	\$24,851	\$298,355
2023	14,006	\$417,192	\$24,320	\$4,659	\$349	\$10,497	\$4,659	\$11,597	\$361,110
2024	5,503	\$291,274	\$19,532	\$28,473	\$599	\$460	\$614	\$22,870	\$218,726
<i>Private Trips</i>									
2016	130,464	\$1,137,189	\$140,717	\$187,587	\$22,900	\$226,907	\$173,125	\$385,954	\$0
2017	99,018	\$905,762	\$102,500	\$189,822	\$15,626	\$168,372	\$116,828	\$312,616	\$0
2018	91,941	\$832,155	\$145,193	\$63,809	\$3,509	\$200,108	\$96,305	\$323,231	\$0
2019	102,026	\$703,933	\$83,234	\$39,405	\$1,992	\$185,752	\$85,809	\$307,741	\$0
2022	42,954	\$515,303	\$58,173	\$78,358	\$8,232	\$82,092	\$80,044	\$208,403	\$0
2023	49,013	\$537,333	\$74,802	\$80,354	\$9,610	\$108,867	\$67,816	\$195,884	\$0
2024	13,291	\$199,342	\$36,402	\$78,509	\$5,184	\$26,074	\$13,728	\$39,445	\$0
<i>All Trips Combined</i>									
2016	140,925	\$1,488,628	\$162,385	\$196,927	\$22,916	\$226,907	\$173,282	\$396,133	\$310,080
2017	106,354	\$1,111,490	\$108,585	\$196,553	\$15,937	\$169,418	\$117,773	\$322,762	\$180,461
2018	100,933	\$1,156,170	\$154,804	\$65,203	\$3,509	\$200,721	\$96,933	\$341,909	\$293,090
2019	113,016	\$1,211,979	\$99,852	\$44,636	\$1,992	\$187,452	\$86,706	\$333,799	\$457,541
2022	52,681	\$892,136	\$84,061	\$97,937	\$8,621	\$85,376	\$84,531	\$233,254	\$298,355
2023	63,020	\$954,525	\$99,122	\$85,013	\$9,960	\$119,363	\$72,475	\$207,481	\$361,110
2024	18,794	\$490,617	\$55,934	\$106,981	\$5,783	\$26,534	\$14,342	\$62,316	\$218,726

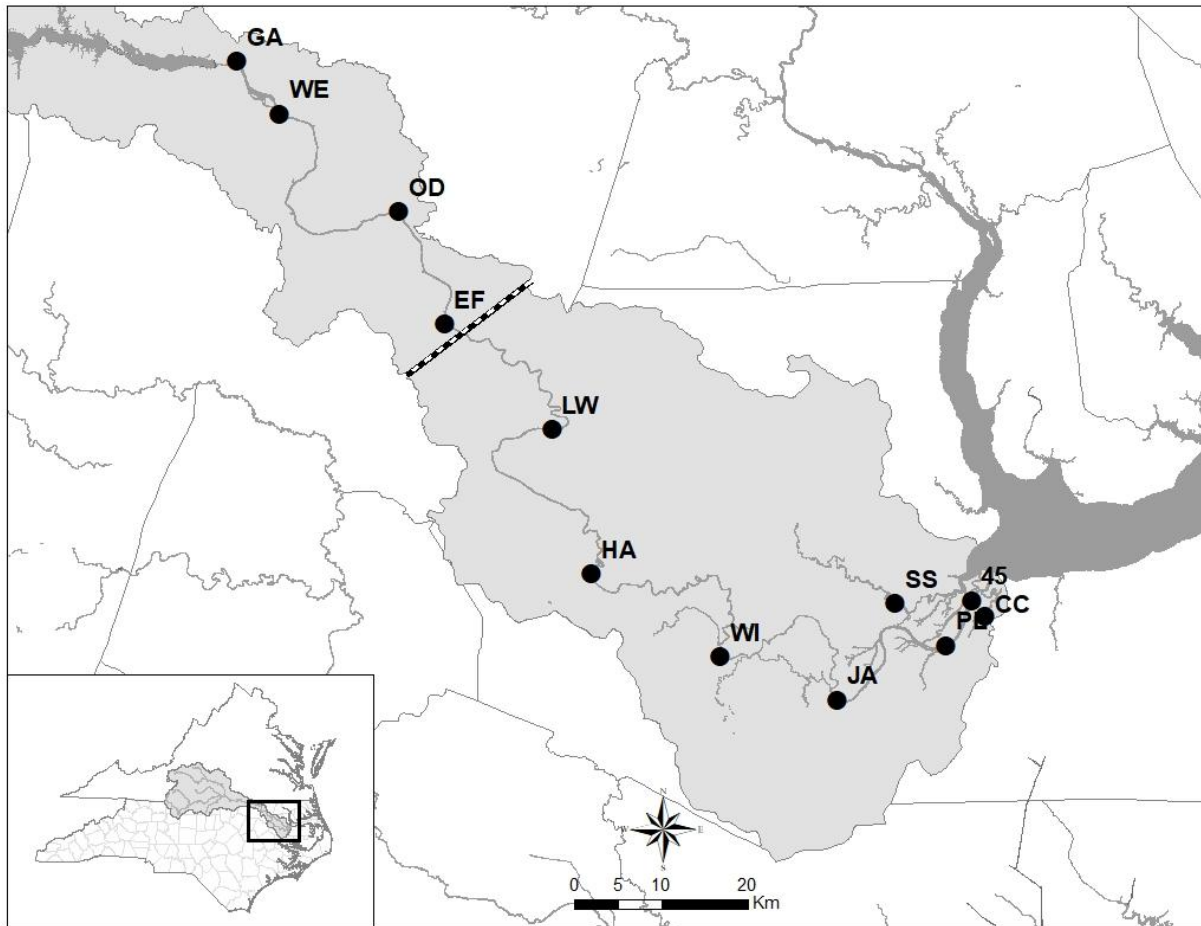


FIGURE 1. Boating access areas included in the Roanoke River Striped Bass creel survey, 2016–2024. Access areas are labeled as follows: GA = Gaston, WE = Weldon, OD = Odom, EF = Edward’s Ferry, LW = Lewiston-Woodville, HA = Hamilton, WI = Williamston, JA = Astoria Landing, PL = Plymouth, 45 = Highway 45, CC = Conaby Creek, and SS = Sans Souci. The Odom access area was added in 2022. The dashed line indicates the demarcation point of upper and lower zones for creel design. The Edward’s Ferry access area was considered an upper zone ramp except for the sample period when harvest was open only in the lower zone during 2021.

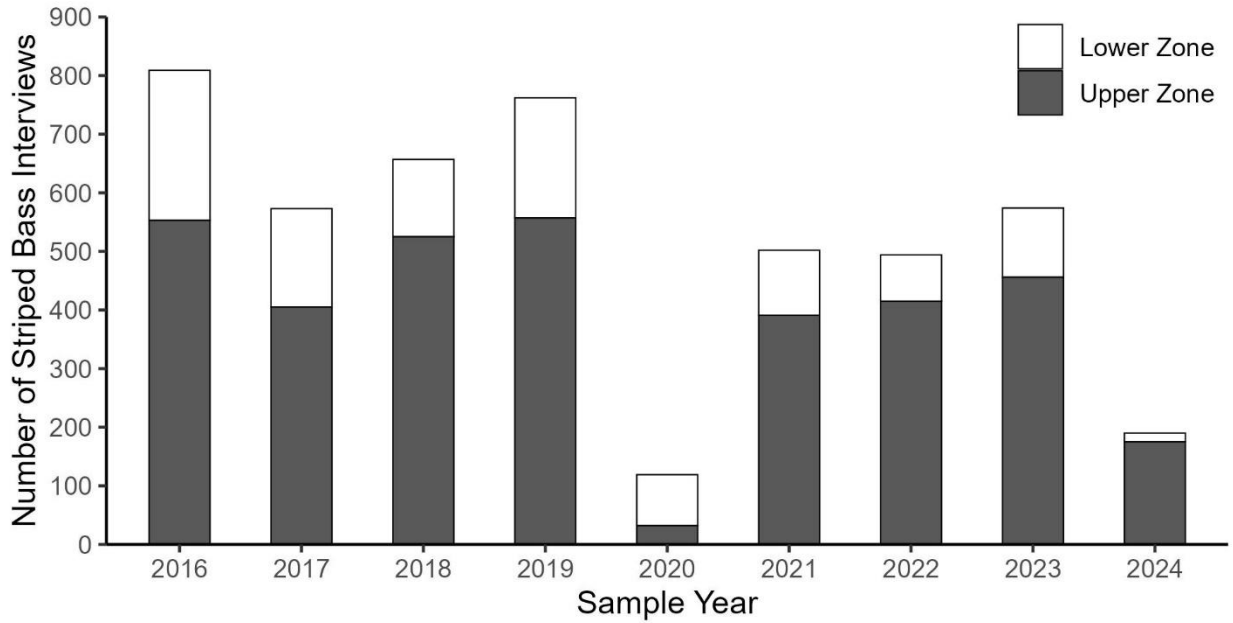


FIGURE 2. Number of Striped Bass interviews conducted in each zone during the Roanoke River Striped Bass creel survey, 2016–2024. In 2020, interviews only occurred during March due to social distancing requirements of the Covid-19 pandemic.

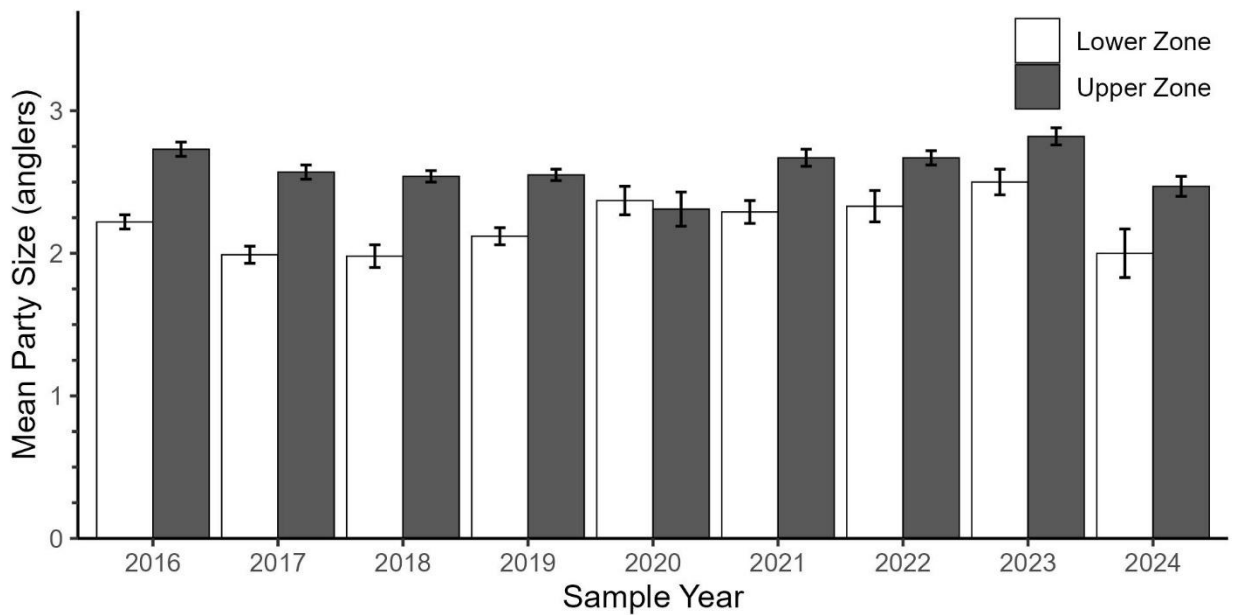


FIGURE 3. Mean party size in anglers for interviews that targeted Striped Bass during the Roanoke River Striped Bass creel survey, 2016–2024. Error bars represent standard error of the mean.

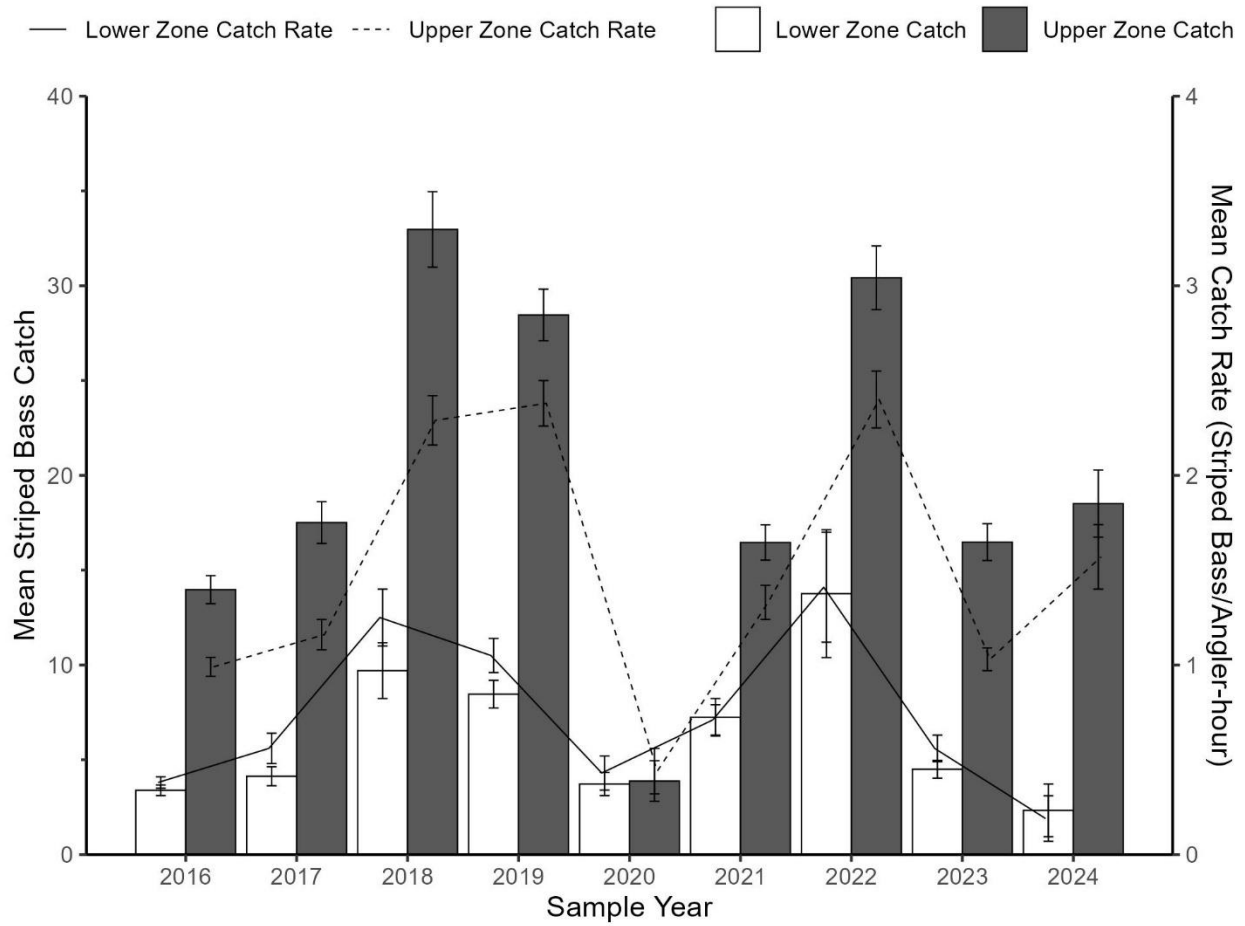


FIGURE 4. Mean Striped Bass catch (fish per trip) and catch rate (fish per angler-hour) for anglers targeting Striped Bass in the upper and lower zones during the Roanoke River Striped Bass creel survey, 2016–2024. Error bars represent standard error of the mean estimates.

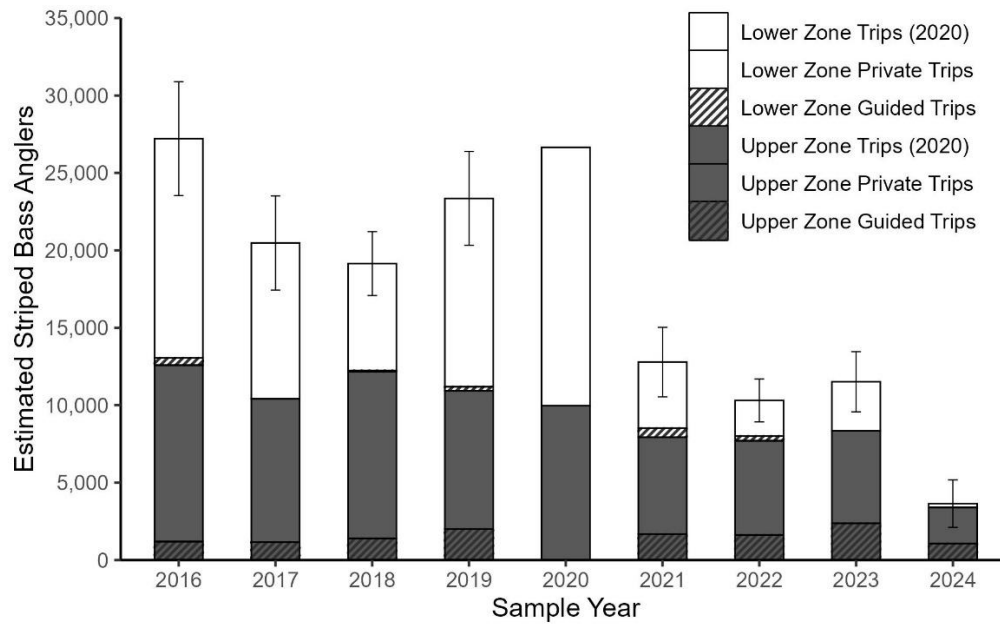


FIGURE 5. Estimated number of anglers targeting Striped Bass during the Roanoke River Striped Bass creel survey, 2016–2024. Error bars represent standard error of the total estimate for private and guided trips in both zones combined. Guided trips were not identified in 2020, and standard errors are not available for the 2020 estimate.

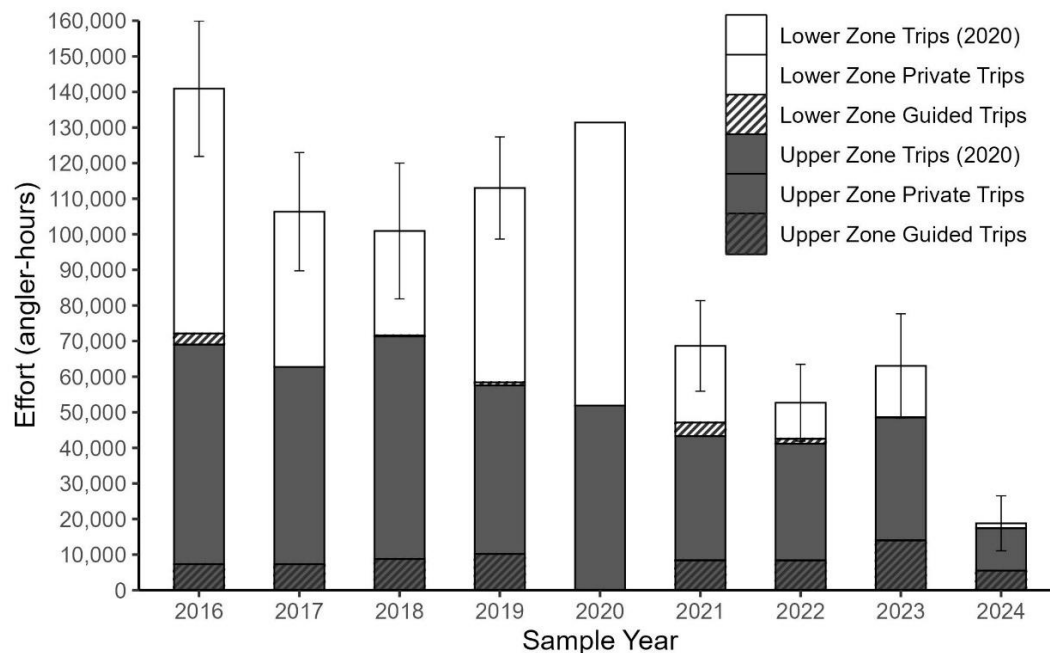


FIGURE 6. Estimated fishing effort targeting Striped Bass during the Roanoke River Striped Bass creel survey, 2016–2024. Error bars represent standard error of the total estimate for private and guided trips in both zones combined. Guided trips were not identified in 2020, and standard errors are not available for the 2020 estimate.

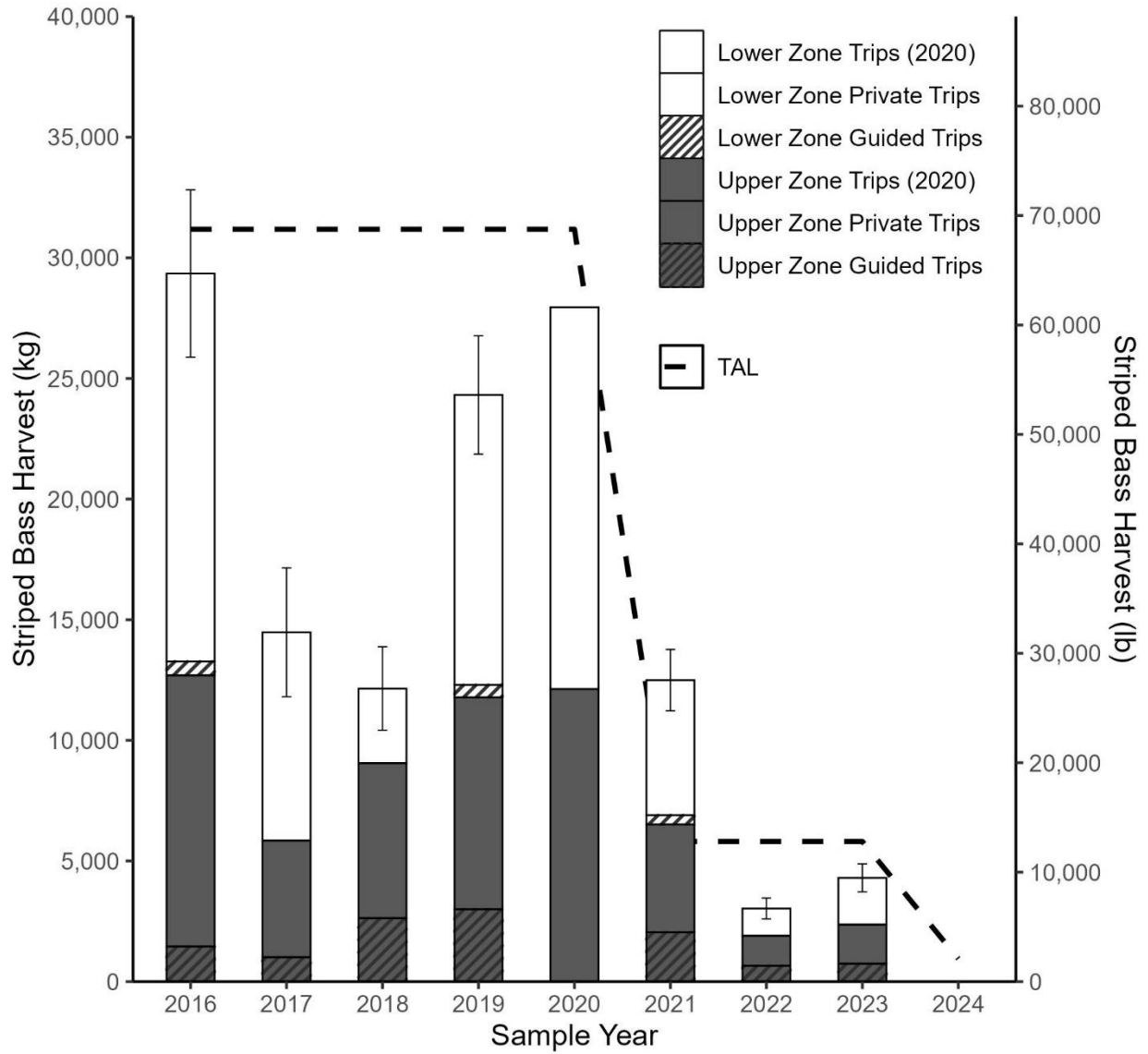


FIGURE 7. Estimated Striped Bass harvest and RRMA total allowable landings (TAL) during the Roanoke River Striped Bass creel survey, 2016–2024. Error bars represent standard error of the total estimate for private and guided trips in both zones combined. Guided trips were not identified in 2020, and standard errors are not available for the 2020 estimate.

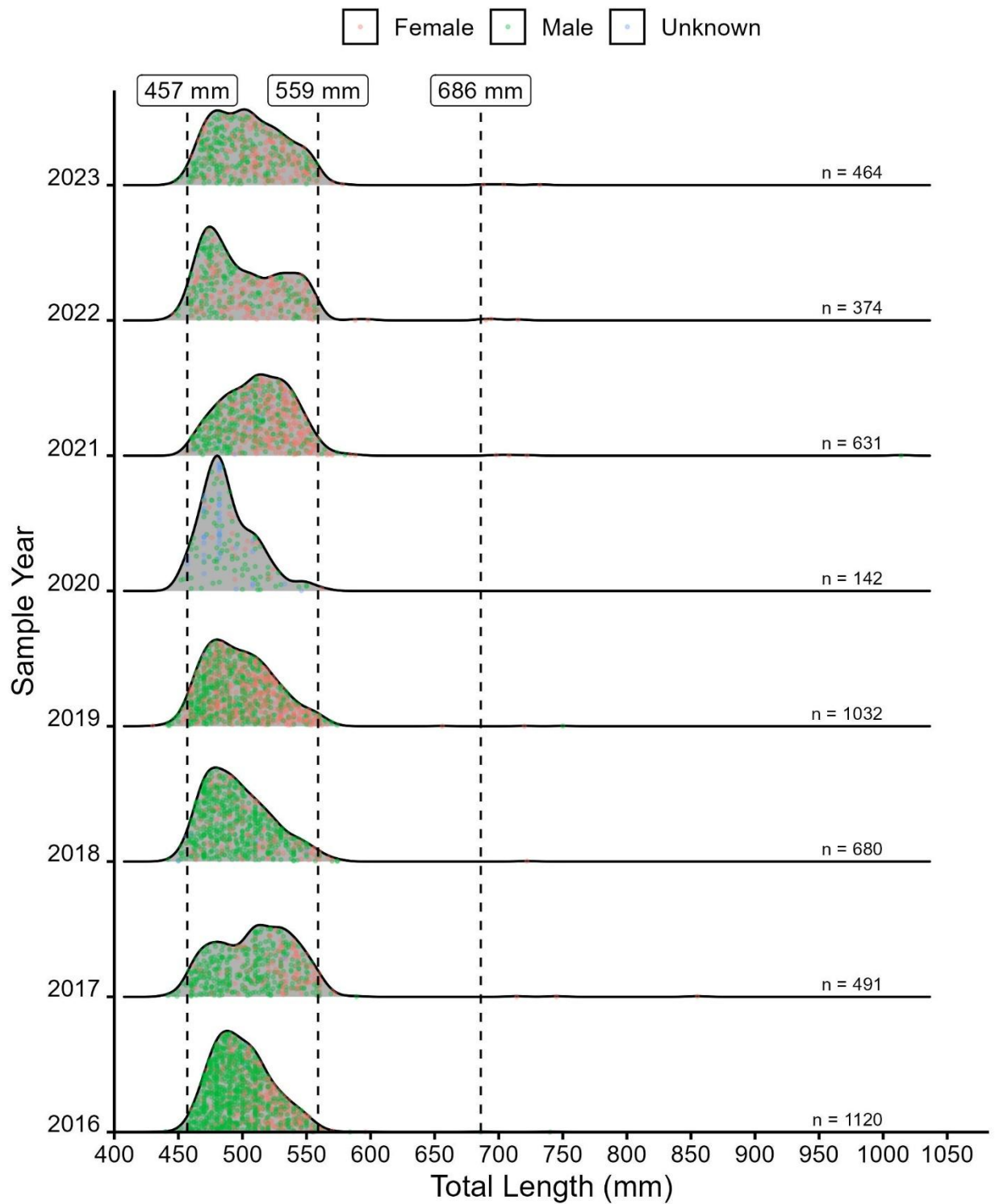


FIGURE 8. Length-frequency distribution density plots and individual lengths for harvested Striped Bass measured during the Roanoke River Striped Bass creel survey, 2016–2023. Harvest was not allowed in 2024. Dashed lines represent the length limit regulations in place during the harvest seasons. Fish less than 457 mm or between 559 and 686 mm were illegally harvested.

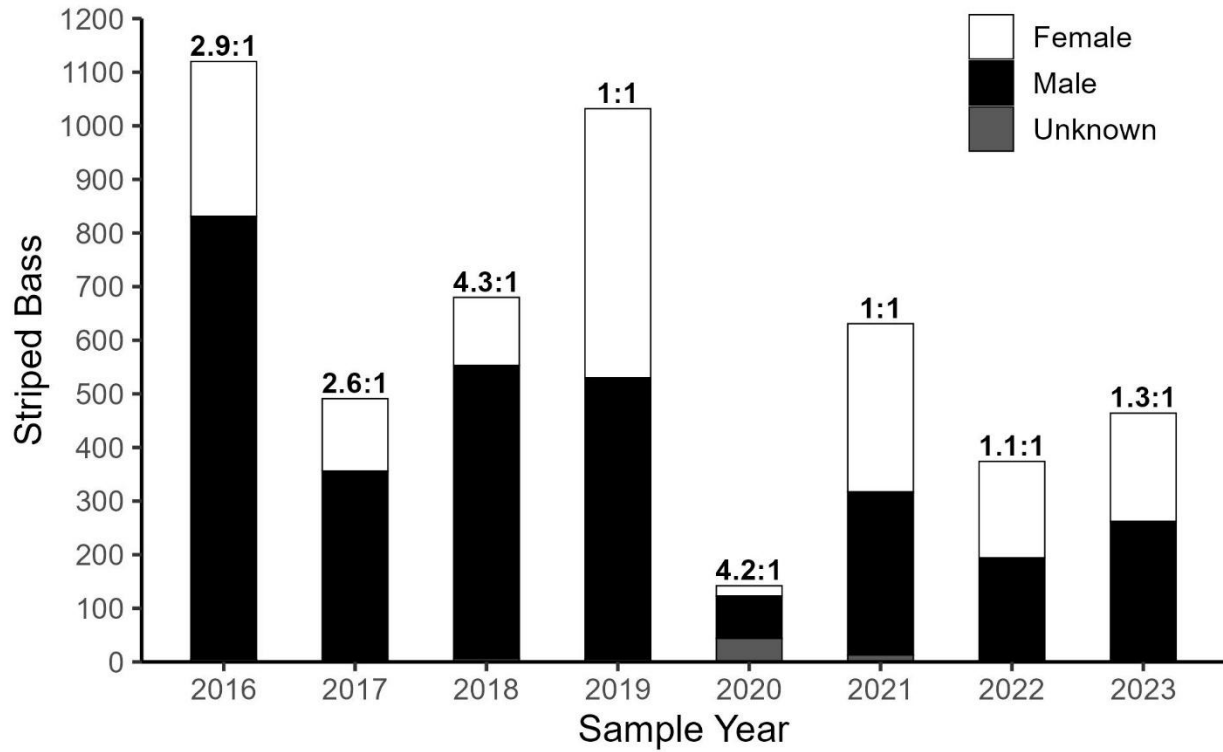


FIGURE 9. Number of harvested Striped Bass measured for total length during the Roanoke River Striped Bass creel survey, 2016–2023. Male to female sex ratios are listed above each column. In 2020, fish were only measured for total length and sex in March, so caution should be used when comparing 2020 to other years.

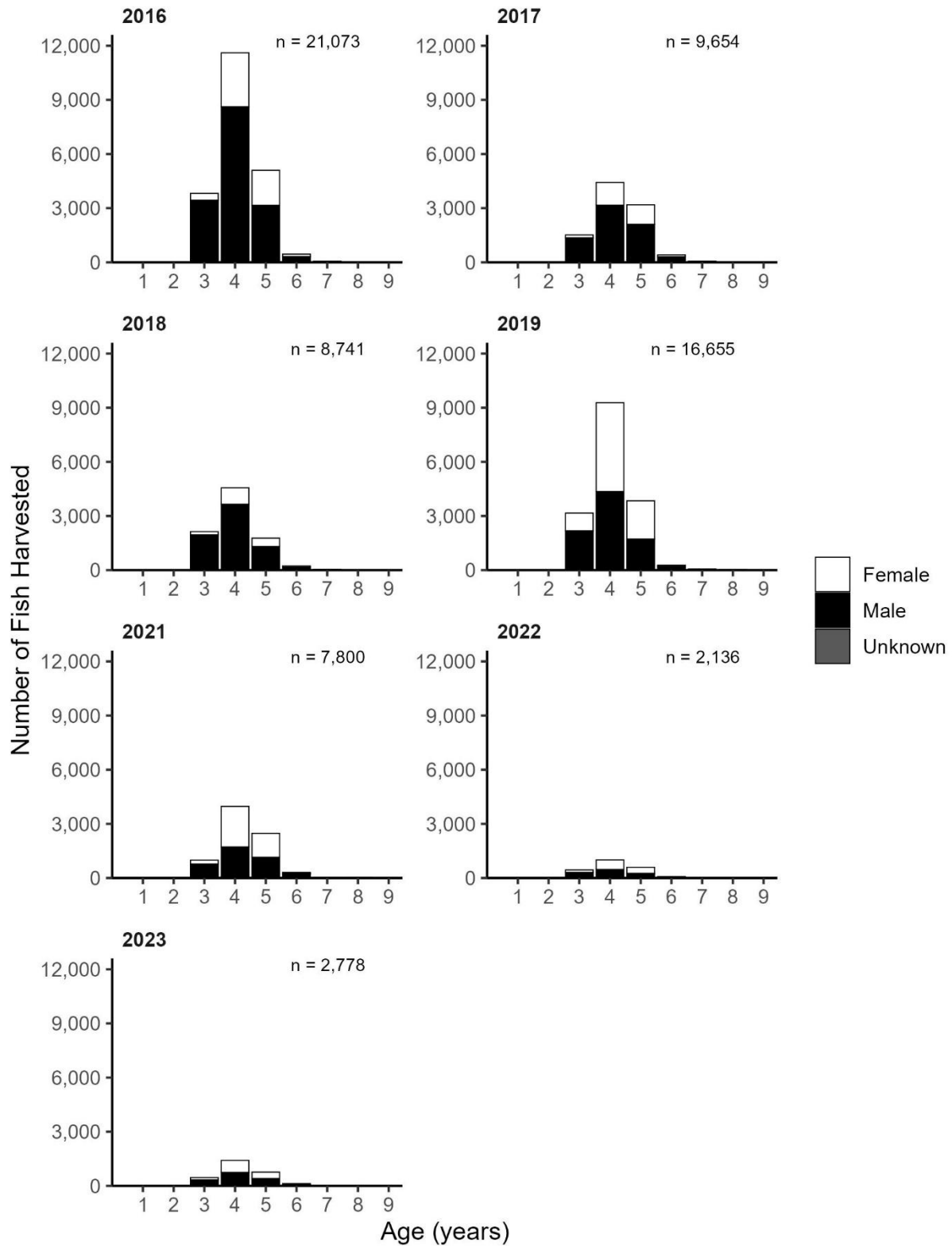


FIGURE 10. Age distributions of Striped Bass harvested from the Roanoke River, 2016–2023. Results from the 2020 sample year are not included due to the limited number of fish measured during the Covid-19 Pandemic.

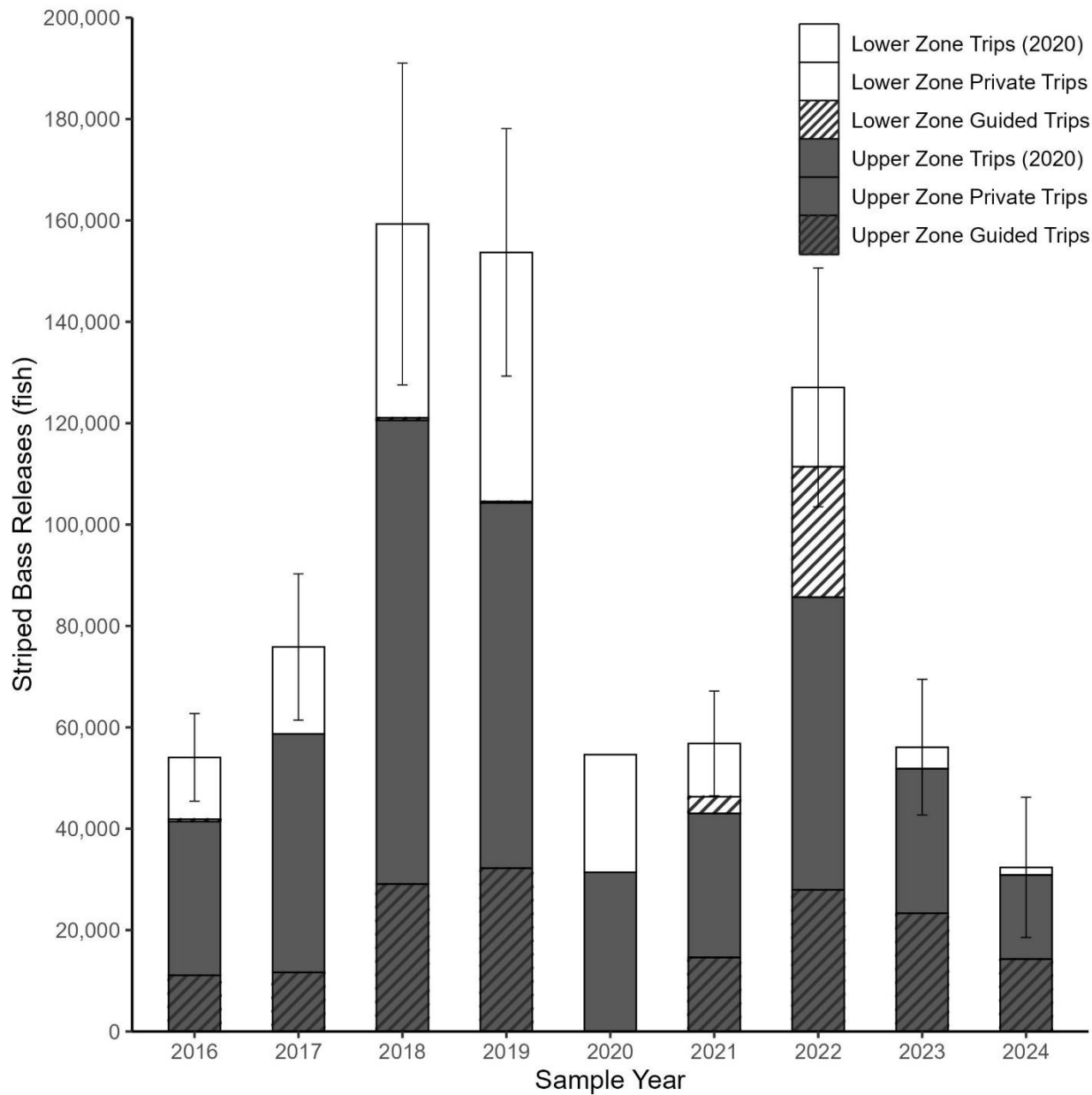


FIGURE 11. Estimated releases of Striped Bass during the Roanoke River Striped Bass creel survey, 2016–2024. Error bars represent standard error of the total estimate for private and guided trips in both zones combined. Guided trips were not identified in 2020, and standard errors are not available for the 2020 estimate.

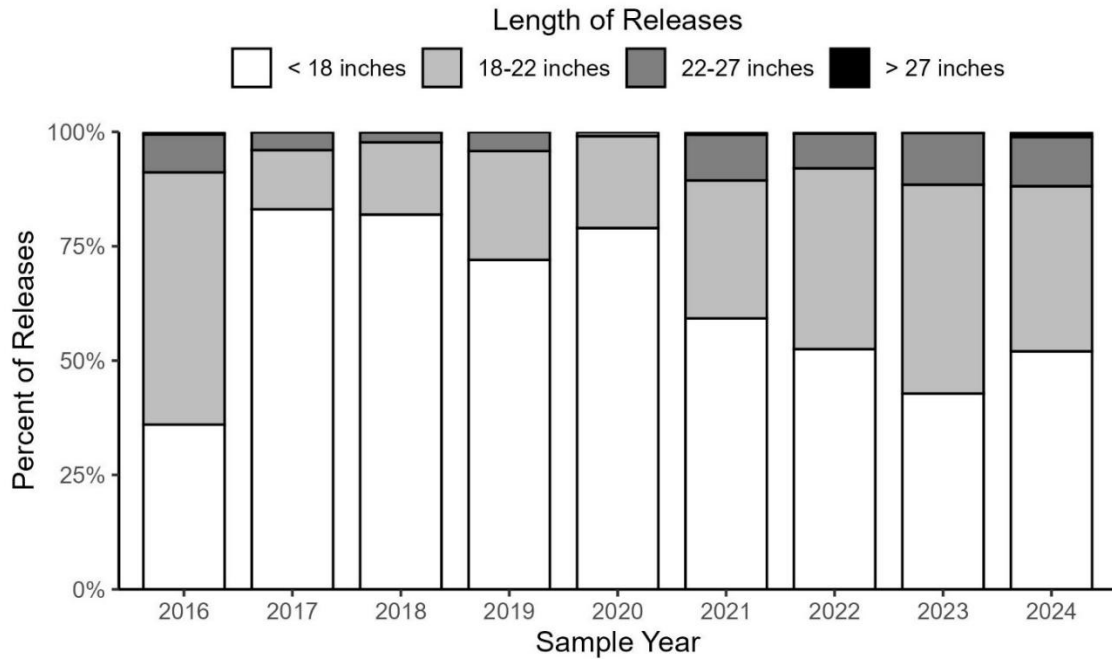


FIGURE 12. Percent composition for size ranges of Striped Bass caught and released by Roanoke River anglers, 2016–2024.

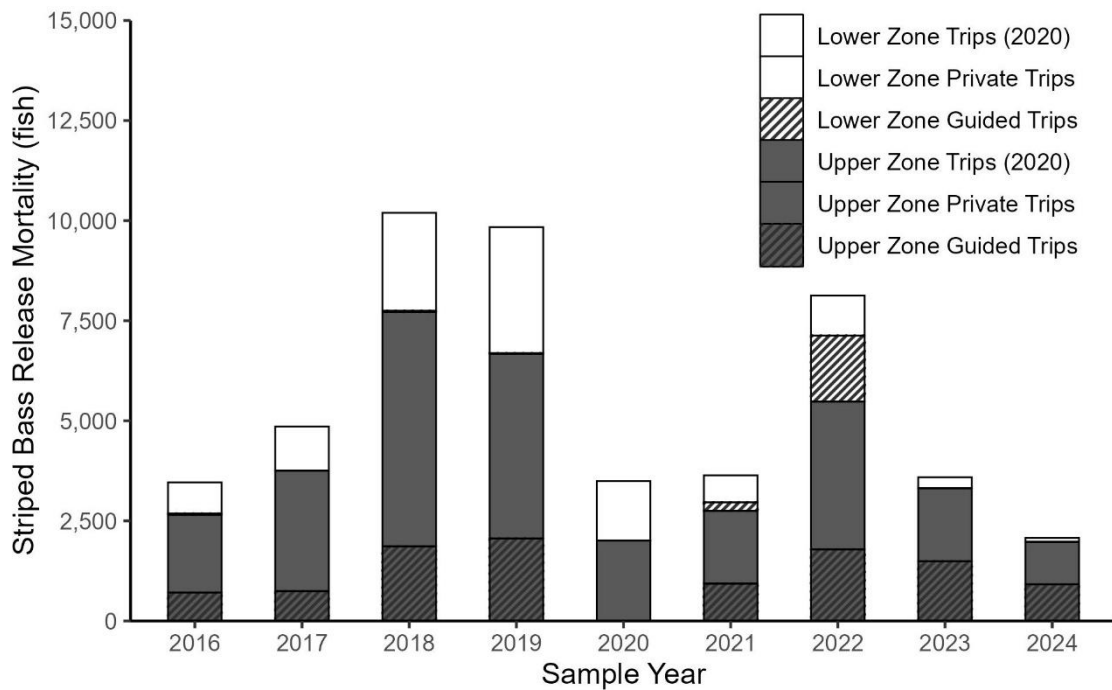


FIGURE 13. Estimated Striped Bass release mortalities during the Roanoke River creel survey, 2016–2024.

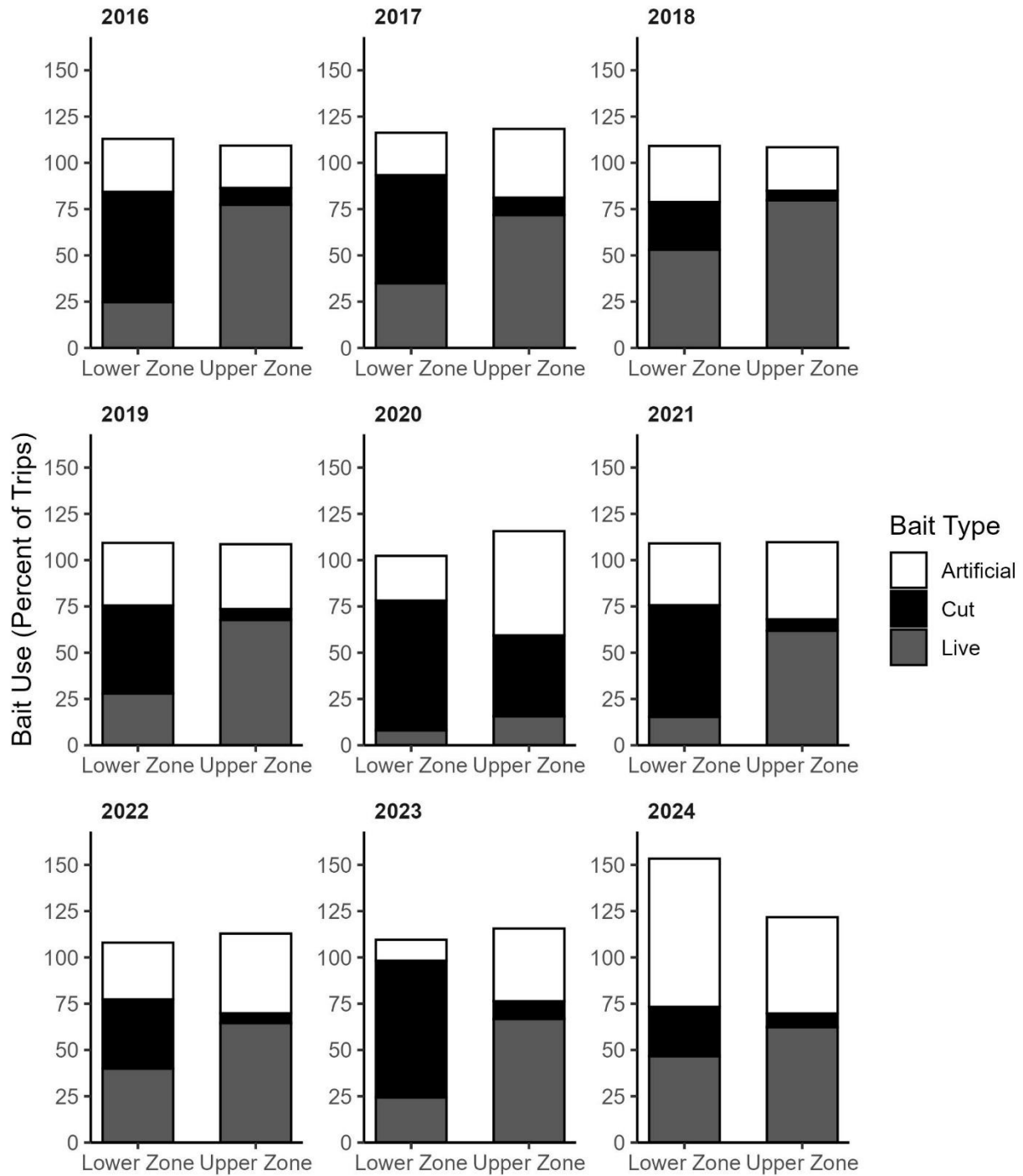


FIGURE 14. Bait type used by anglers fishing for Striped Bass in the Roanoke River, 2016–2024. Each zone may total more than 100% because some trips used multiple bait types.

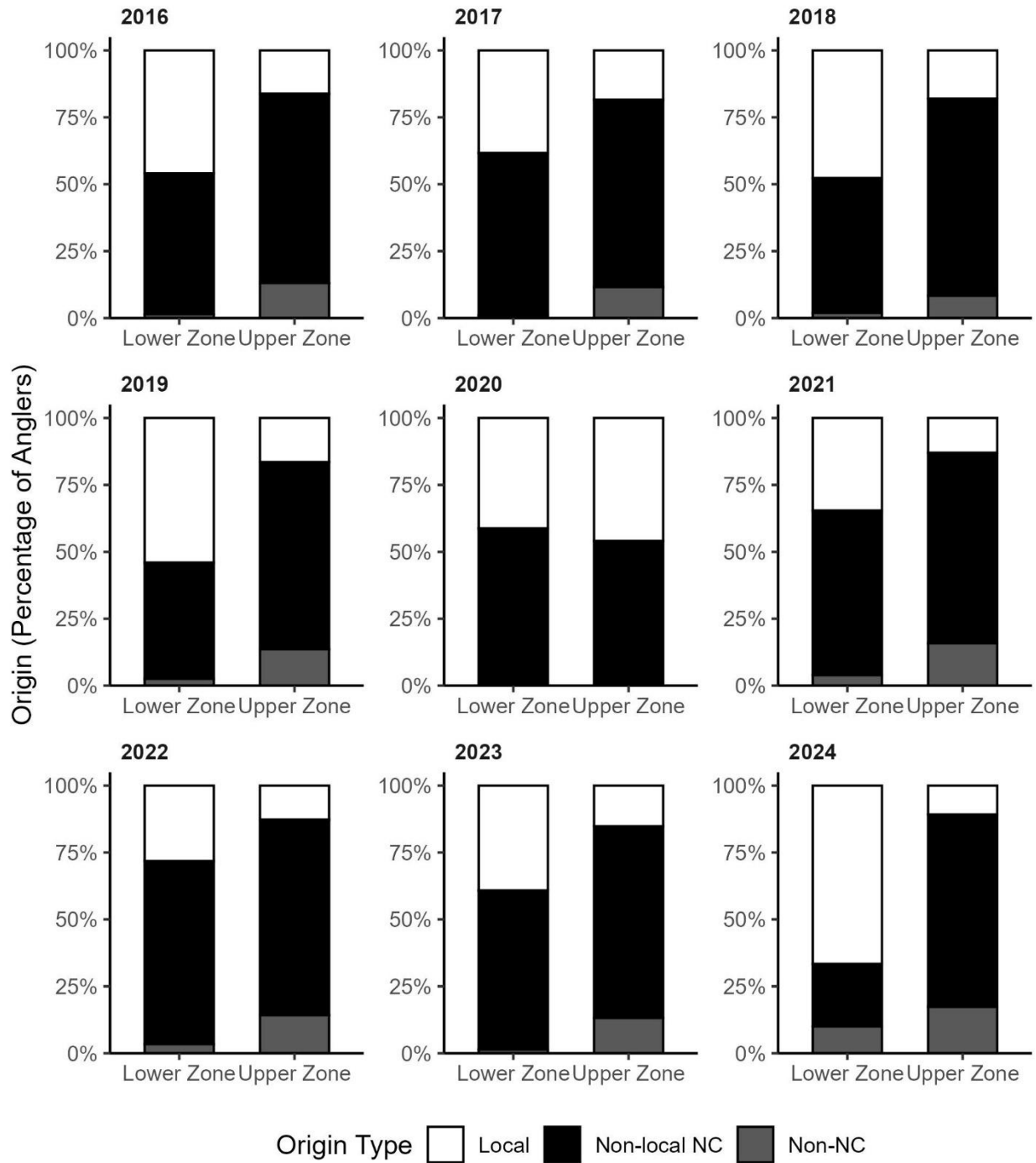


FIGURE 15. Origin of anglers fishing for Striped Bass in the Roanoke River, 2016–2024. Local anglers are from counties that border the Roanoke River (Halifax, Northampton, Bertie, Martin, and Washington), non-local NC anglers are from other counties in North Carolina, and non-NC anglers are from other states as well as the United Kingdom or Denmark.

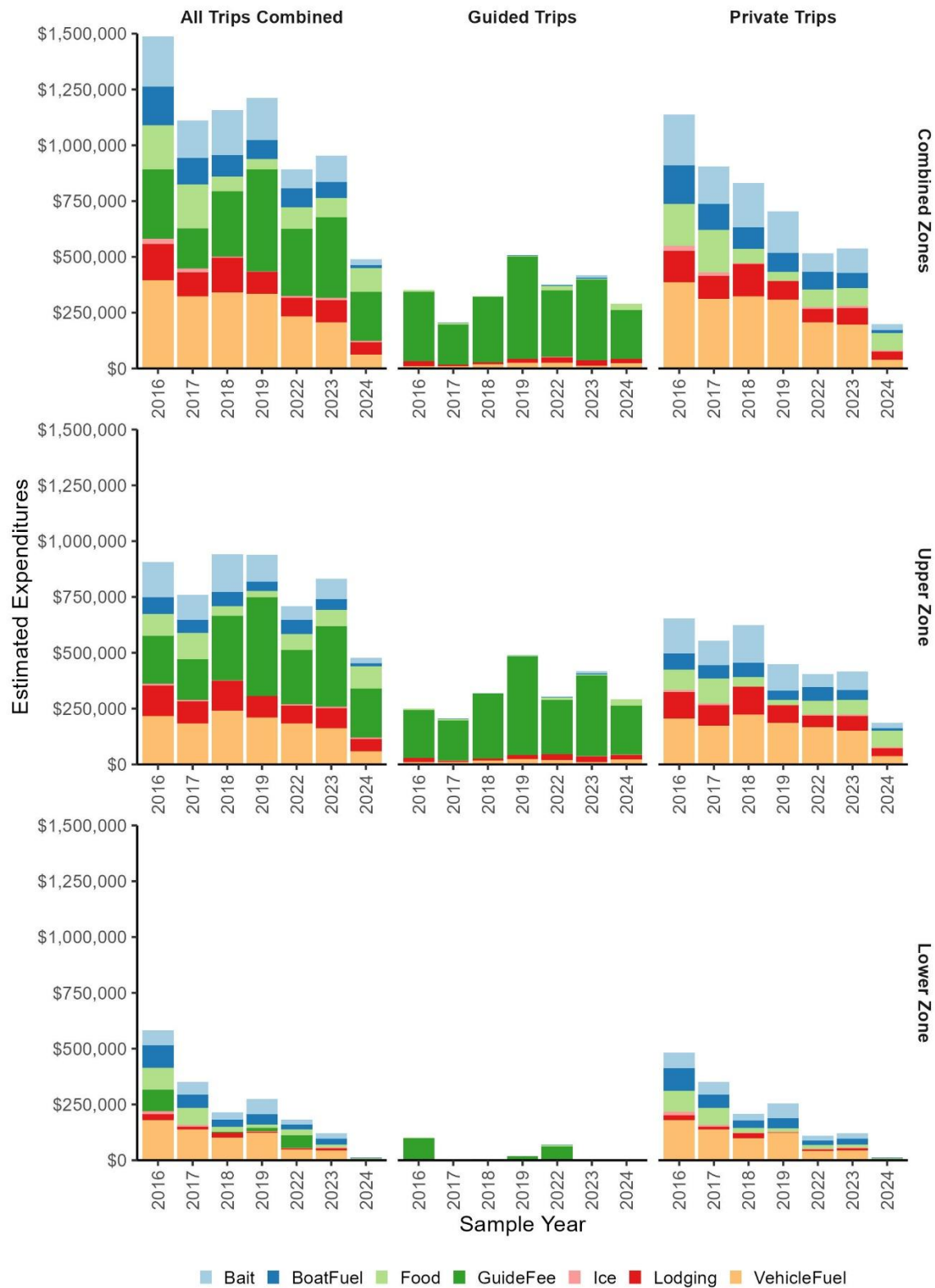


FIGURE 16. Expenditure estimates (adjusted for inflation and reported in 2024 dollars) for Striped Bass anglers in the Roanoke River, 2016–2024. Expenditure data were not collected in 2020 and 2021.

Table A1. Access area probabilities for the Roanoke River Striped Bass creel survey, 2016–2024.

Year	Zone	Creel Site	Sample Period								
			1	2	3	4	5	6	7	8	9
2016	Upper	Gaston	0.20	0.10	0.05	0.05	0.00	-	-	-	-
		Weldon	0.50	0.60	0.81	0.86	1.00	-	-	-	-
		Edwards Ferry	0.30	0.30	0.14	0.09	0.00	-	-	-	-
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.10	-	-	-	-	-
		Hamilton	0.05	0.05	0.20	0.20	-	-	-	-	-
		Williamston	0.15	0.20	0.25	0.30	-	-	-	-	-
		Astoria Landing	0.25	0.25	0.20	0.25	-	-	-	-	-
		Plymouth-WRC	0.20	0.15	0.10	0.05	-	-	-	-	-
		HWY 45	0.25	0.25	0.15	0.05	-	-	-	-	-
		Low Probability ⁺	0.05	0.05	0.05	0.05	-	-	-	-	-
2017	Upper	Gaston	0.10	0.10	0.05	0.05	0.20	0.00	-	-	-
		Weldon	0.65	0.65	0.80	0.85	0.75	1.00	-	-	-
		Edwards Ferry	0.25	0.25	0.15	0.10	0.05	0.00	-	-	-
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.10	0.05	-	-	-	-
		Hamilton	0.05	0.05	0.15	0.20	0.35	-	-	-	-
		Williamston	0.15	0.20	0.30	0.40	0.40	-	-	-	-
		Astoria Landing	0.25	0.30	0.25	0.15	0.19	-	-	-	-
		Plymouth-WRC	0.15	0.10	0.10	0.05	0.00	-	-	-	-
		HWY 45	0.30	0.25	0.10	0.05	0.01	-	-	-	-
		Low Probability ⁺	0.05	0.05	0.05	0.05	0.00	-	-	-	-
2018	Upper	Gaston	0.10	0.10	0.05	0.05	0.05	0.00	-	-	-
		Weldon	0.65	0.65	0.80	0.85	0.90	1.00	-	-	-
		Edwards Ferry	0.25	0.25	0.15	0.10	0.05	0.00	-	-	-
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.10	0.05	-	-	-	-
		Hamilton	0.05	0.05	0.15	0.20	0.20	-	-	-	-
		Williamston	0.15	0.20	0.30	0.40	0.65	-	-	-	-
		Astoria Landing	0.25	0.30	0.25	0.15	0.10	-	-	-	-
		Plymouth-WRC	0.15	0.10	0.10	0.05	0.00	-	-	-	-
		HWY 45	0.30	0.25	0.10	0.05	0.00	-	-	-	-
		Low Probability ⁺	0.05	0.05	0.05	0.05	0.00	-	-	-	-

TABLE A1. (cont.)

Year	Zone	Creel Site	Sample Period								
			1	2	3	4	5	6	7	8	9
2019	Upper	Gaston	0.65	0.10	0.05	0.05	0.01	-	-	-	-
		Weldon	0.10	0.65	0.80	0.85	0.98	-	-	-	-
		Edwards Ferry	0.25	0.25	0.15	0.10	0.01	-	-	-	-
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.10	-	-	-	-	-
		Hamilton	0.05	0.05	0.15	0.20	-	-	-	-	-
		Williamston	0.15	0.20	0.30	0.40	-	-	-	-	-
		Astoria Landing	0.25	0.30	0.25	0.15	-	-	-	-	-
		Plymouth-WRC	0.15	0.10	0.10	0.05	-	-	-	-	-
		HWY 45	0.30	0.25	0.10	0.05	-	-	-	-	-
		Low Probability ⁺	0.05	0.05	0.05	0.05	-	-	-	-	-
2020	Upper	Gaston	0.65	0.10	0.05	0.05	-	-	-	-	-
		Weldon	0.10	0.65	0.80	0.85	-	-	-	-	-
		Edwards Ferry	0.25	0.25	0.15	0.10	-	-	-	-	-
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.10	-	-	-	-	-
		Hamilton	0.05	0.05	0.15	0.20	-	-	-	-	-
		Williamston	0.15	0.20	0.30	0.40	-	-	-	-	-
		Astoria Landing	0.25	0.30	0.25	0.15	-	-	-	-	-
		Plymouth-WRC	0.15	0.10	0.10	0.05	-	-	-	-	-
		HWY 45	0.30	0.25	0.10	0.05	-	-	-	-	-
		Low Probability ⁺	0.05	0.05	0.05	0.05	-	-	-	-	-
2021	Upper	Gaston	0.20	0.15	0.10	0.15	0.05	0.05	0.05	0.00	-
		Weldon	0.70	0.75	0.60	0.85	0.75	0.85	0.90	1.00	-
		Edwards Ferry	0.10	0.10	0.30	0.00	0.20	0.10	0.05	0.00	-
	Lower	Edwards Ferry ⁺	0.00	0.00	0.00	0.15	0.00	0.00	-	-	-
		Lewiston-Woodville	0.00	0.00	0.00	0.00	0.00	0.05	-	-	-
		Hamilton	0.05	0.05	0.15	0.15	0.25	0.25	-	-	-
		Williamston	0.15	0.20	0.30	0.30	0.40	0.40	-	-	-
		Astoria Landing	0.35	0.35	0.30	0.25	0.20	0.20	-	-	-
		Plymouth-WRC	0.15	0.15	0.10	0.05	0.05	0.05	-	-	-
		HWY 45	0.25	0.20	0.10	0.05	0.05	0.05	-	-	-
Low Probability ⁺	0.05	0.05	0.05	0.05	0.05	0.00	-	-	-		

TABLE A1. (cont.)

Year	Zone	Creel Site	Sample Period								
			1	2	3	4	5	6	7	8	9
2022	Upper	Gaston	0.15	0.15	0.15	0.10	0.05	0.05	0.05	0.05	0.05
		Weldon	0.75	0.75	0.75	0.75	0.70	0.75	0.75	0.75	0.90
		Odom*	0.05	0.05	0.05	0.05	0.10	0.05	0.05	0.10	0.00
		Edwards Ferry	0.05	0.05	0.05	0.10	0.15	0.15	0.15	0.10	0.05
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-
		Hamilton	0.05	0.05	0.10	0.15	0.20	0.20	0.25	-	-
		Williamston	0.15	0.20	0.30	0.35	0.35	0.40	0.30	-	-
		Astoria Landing	0.35	0.35	0.30	0.25	0.20	0.20	0.25	-	-
		Plymouth-WRC	0.10	0.10	0.10	0.05	0.05	0.05	0.05	-	-
		HWY 45	0.25	0.20	0.10	0.10	0.10	0.05	0.05	-	-
Low Probability ⁺	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-		
2023	Upper	Gaston	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		Weldon	0.85	0.85	0.75	0.75	0.80	0.75	0.85	0.85	0.90
		Odom	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
		Edwards Ferry	0.05	0.05	0.15	0.15	0.10	0.15	0.05	0.05	0.00
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-
		Hamilton	0.05	0.05	0.10	0.15	0.20	0.20	0.20	-	-
		Williamston	0.15	0.20	0.30	0.35	0.40	0.40	0.40	-	-
		Astoria Landing	0.35	0.35	0.30	0.25	0.20	0.20	0.20	-	-
		Plymouth-WRC	0.10	0.10	0.10	0.05	0.05	0.05	0.05	-	-
		HWY 45	0.25	0.20	0.10	0.10	0.05	0.05	0.05	-	-
Low Probability ⁺	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-		
2024	Upper	Gaston	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-
		Weldon	0.85	0.85	0.75	0.75	0.85	0.90	-	-	-
		Odom	0.05	0.05	0.05	0.05	0.05	0.05	-	-	-
		Edwards Ferry	0.05	0.05	0.15	0.15	0.05	0.00	-	-	-
	Lower	Lewiston-Woodville	0.05	0.05	0.05	0.05	-	-	-	-	-
		Hamilton	0.05	0.05	0.10	0.15	-	-	-	-	-
		Williamston	0.15	0.25	0.30	0.40	-	-	-	-	-
		Astoria Landing	0.35	0.35	0.30	0.20	-	-	-	-	-
		Plymouth-WRC	0.10	0.10	0.10	0.10	-	-	-	-	-
		HWY 45	0.25	0.15	0.10	0.05	-	-	-	-	-
Low Probability ⁺	0.05	0.05	0.05	0.05	-	-	-	-	-		

TABLE A2. Mean expenditures per trip (unadjusted for inflation) for anglers targeting Striped Bass in the upper zone during the Roanoke River Creel Survey, 2016–2024. Expenditure information was not collected in 2020 or 2021. Standard errors are in parentheses.

Year	Interviews	Lodging Cost (SE)	Food Cost (SE)	Ice Cost (SE)	Bait Cost (SE)	Boat Fuel Cost (SE)	Vehicle Fuel Cost (SE)	Guide Fee Cost (SE)	Total Cost (SE)
<i>Guided Trips</i>									
2016	56	\$39.96 (10.50)	\$15.02 (4.08)	\$0.04 (0.04)	\$ 0.00 (0.00)	\$ 0.36 (0.36)	\$23.18 (3.43)	\$491.07 (17.33)	\$569.62 (23.04)
2017	36	\$15.19 (5.85)	\$16.81 (3.78)	\$0.78 (0.50)	\$ 2.61 (2.25)	\$ 2.36 (1.44)	\$25.33 (4.76)	\$450.56 (27.99)	\$513.64 (29.94)
2018	52	\$18.10 (6.56)	\$1.83 (0.98)	\$0.00 (0.00)	\$ 1.15 (1.15)	\$ 0.38 (0.27)	\$33.04 (9.09)	\$545.19 (24.19)	\$599.69 (25.40)
2019	98	\$20.94 (5.15)	\$6.59 (1.77)	\$0.00 (0.00)	\$ 1.31 (1.31)	\$0.56 (0.29)	\$31.69 (7.25)	\$555.61 (11.21)	\$616.70 (13.80)
2022	37	\$48.57 (14.95)	\$21.08 (6.86)	\$0.73 (0.31)	\$ 6.16 (4.09)	\$ 4.24 (1.47)	\$36.19 (8.97)	\$455.41 (41.68)	\$572.38 (45.27)
2023	50	\$37.58 (8.85)	\$ 7.20 (3.34)	\$0.54 (0.26)	\$16.22 (5.61)	\$ 7.20 (1.56)	\$17.92 (4.78)	\$558.00 (31.76)	\$644.66 (33.50)
2024	51	\$49.90 (10.87)	\$72.75 (7.61)	\$1.53 (1.18)	\$ 1.18 (1.18)	\$ 1.57 (1.23)	\$58.43 (15.21)	\$558.82 (23.29)	\$744.18 (25.56)
<i>Private Trips</i>									
2016	459	\$22.25 (2.18)	\$17.25 (1.12)	\$1.60 (0.14)	\$29.53 (1.64)	\$13.55 (0.62)	\$38.60 (1.99)	\$ 0.00 (0.00)	\$122.78 (4.92)
2017	335	\$20.08 (2.37)	\$24.70 (1.89)	\$1.68 (0.21)	\$24.25 (1.61)	\$12.67 (0.59)	\$38.15 (1.67)	\$ 0.00 (0.00)	\$121.53 (5.69)
2018	384	\$22.94 (2.76)	\$7.79 (0.95)	\$0.34 (0.07)	\$31.23 (1.90)	\$11.77 (0.52)	\$41.50 (1.79)	\$ 0.00 (0.00)	\$115.58 (5.26)
2019	294	\$17.24 (2.99)	\$5.09 (1.03)	\$0.10 (0.08)	\$25.79 (2.03)	\$9.15 (0.61)	\$40.51 (2.46)	\$ 0.00 (0.00)	\$ 97.89 (5.57)
2022	106	\$20.18 (5.99)	\$23.04 (4.42)	\$2.08 (0.37)	\$22.74 (3.35)	\$23.05 (1.79)	\$62.93 (5.88)	\$ 0.00 (0.00)	\$154.01 (13.78)
2023	221	\$27.21 (3.97)	\$27.29 (2.98)	\$2.55 (0.59)	\$34.12 (3.14)	\$17.90 (1.54)	\$62.12 (3.42)	\$ 0.00 (0.00)	\$171.20 (10.44)
2024	124	\$36.19 (6.25)	\$75.45 (9.12)	\$4.69 (0.91)	\$25.64 (4.53)	\$11.95 (1.18)	\$37.65 (3.04)	\$ 0.00 (0.00)	\$191.56 (18.77)

TABLE A3. Mean expenditures per trip (unadjusted for inflation) for anglers targeting Striped Bass in the lower zone during the Roanoke River Creel Survey, 2016–2024. Expenditure information was not collected in 2020 or 2021. Standard errors are in parentheses.

Year	Interviews	Lodging Cost (SE)	Food Cost (SE)	Ice Cost (SE)	Bait Cost (SE)	Boat Fuel Cost (SE)	Vehicle Fuel Cost (SE)	Guide Fee Cost (SE)	Total Cost (SE)
<i>Guided Trips</i>									
2016	4	\$18.75 (18.75)	\$12.50 (12.50)	\$0.00 (0.00)	\$0.00 (0.00)	\$0.00 (0.00)	\$0.00 (0.00)	\$430.00 (23.80)	\$461.25 (54.79)
2017	0	-	-	-	-	-	-	-	-
2018	1	\$0.00 (-)	\$15.00 (-)	\$0.00 (-)	\$0.00 (-)	\$15.00 (-)	\$40.00 (-)	\$125.00 (-)	\$195.00 (-)
2019	2	\$0.00 (0.00)	\$0.00 (0.00)	\$0.00 (0.00)	\$11.00 (11.00)	\$7.50 (7.50)	\$15.00 (15.00)	\$275.00 (275.00)	\$308.50 (241.50)
2022	1	\$0.00 (-)	\$75.00 (-)	\$0.00 (-)	\$0.00 (-)	\$20.00 (-)	\$50.00 (-)	\$500.00 (-)	\$645.00 (-)
2023	0	-	-	-	-	-	-	-	-
2024	0	-	-	-	-	-	-	-	-
<i>Private Trips</i>									
2016	217	\$2.63 (1.02)	\$11.40 (1.43)	\$1.71 (0.20)	\$8.27 (0.75)	\$12.03 (0.75)	\$21.47 (1.32)	\$0.00 (0.00)	\$57.51 (3.64)
2017	162	\$1.73 (0.84)	\$12.20 (2.04)	\$1.26 (0.19)	\$9.14 (1.11)	\$9.34 (0.67)	\$21.93 (1.54)	\$0.00 (0.00)	\$55.60 (4.52)
2018	126	\$4.96 (2.17)	\$5.02 (1.00)	\$0.38 (0.13)	\$7.32 (0.90)	\$7.56 (0.78)	\$22.90 (2.62)	\$0.00 (0.00)	\$48.14 (5.73)
2019	126	\$0.60 (0.60)	\$2.26 (0.70)	\$0.21 (0.10)	\$9.50 (0.97)	\$6.17 (0.61)	\$17.17 (1.71)	\$0.00 (0.00)	\$35.90 (2.97)
2022	55	\$5.09 (3.89)	\$17.71 (3.13)	\$2.76 (0.57)	\$22.22 (3.63)	\$19.36 (4.04)	\$42.75 (5.15)	\$0.00 (0.00)	\$109.89 (12.92)
2023	94	\$6.72 (2.51)	\$10.82 (1.50)	\$2.61 (0.38)	\$19.97 (3.51)	\$18.66 (2.28)	\$34.57 (3.95)	\$0.00 (0.00)	\$93.36 (8.75)
2024	15	\$8.00 (8.00)	\$35.67 (19.36)	\$4.47 (1.58)	\$7.73 (3.75)	\$15.07 (6.24)	\$19.80 (12.97)	\$0.00 (0.00)	\$90.73 (50.81)

TABLE A4. Estimated expenditures (unadjusted for inflation) for anglers targeting Striped Bass in the upper zone of the Roanoke River, 2016–2024. Estimates are not available for 2020 and 2021.

Year	Angler-hours	Mean Expenditures per angler-hour	Total Cost	Lodging	Food	Ice	Bait	Boat Fuel	Vehicle Fuel	Guide Fee
<i>Guided Trips</i>										
2016	7,357	\$26.01	\$191,396	\$13,428	\$5,046	\$12	\$0	\$120	\$7,788	\$165,002
2017	7,336	\$21.91	\$160,754	\$4,755	\$5,260	\$243	\$817	\$739	\$7,929	\$141,010
2018	8,781	\$29.03	\$254,944	\$7,693	\$777	\$0	\$491	\$164	\$14,045	\$231,774
2019	10,173	\$39.21	\$398,871	\$13,543	\$4,263	\$0	\$845	\$363	\$20,499	\$359,358
2022	8,389	\$33.92	\$284,595	\$24,149	\$10,482	\$363	\$3,064	\$2,110	\$17,994	\$226,435
2023	14,006	\$28.93	\$405,231	\$23,623	\$4,526	\$339	\$10,196	\$4,526	\$11,264	\$350,757
2024	5,503	\$52.93	\$291,274	\$19,532	\$28,473	\$599	\$460	\$614	\$22,870	\$218,726
<i>Private Trips</i>										
2016	61,660	\$8.13	\$501,085	\$90,807	\$70,402	\$6,522	\$120,531	\$55,286	\$157,537	\$0
2017	55,397	\$7.82	\$433,137	\$71,555	\$88,045	\$5,989	\$86,438	\$45,139	\$135,971	\$0
2018	62,567	\$7.97	\$498,447	\$98,946	\$33,581	\$1,483	\$134,695	\$50,776	\$178,968	\$0
2019	47,417	\$7.71	\$365,476	\$64,381	\$18,997	\$381	\$96,293	\$34,172	\$151,252	\$0
2022	32,806	\$11.52	\$377,769	\$49,498	\$56,509	\$5,091	\$55,769	\$56,532	\$154,370	\$0
2023	34,568	\$11.67	\$403,387	\$64,121	\$64,312	\$6,019	\$80,391	\$42,178	\$146,366	\$0
2024	11,942	\$15.65	\$186,892	\$35,304	\$73,615	\$4,571	\$25,013	\$11,661	\$36,729	\$0
<i>All Trips Combined</i>										
2016	69,017	-	\$692,481	\$104,235	\$75,448	\$6,534	\$120,531	\$55,406	\$165,325	\$165,002
2017	62,733	-	\$593,891	\$76,310	\$93,304	\$6,233	\$87,255	\$45,878	\$143,900	\$141,010
2018	71,349	-	\$753,391	\$106,639	\$34,358	\$1,483	\$135,185	\$50,939	\$193,013	\$231,774
2019	57,590	-	\$764,346	\$77,924	\$23,260	\$381	\$97,138	\$34,535	\$171,751	\$359,358
2022	41,195	-	\$662,364	\$73,646	\$66,991	\$5,454	\$58,833	\$58,642	\$172,364	\$226,435
2023	48,574	-	\$808,618	\$87,743	\$68,838	\$6,358	\$90,586	\$46,704	\$157,631	\$350,757
2024	17,445	-	\$478,167	\$54,836	\$102,087	\$5,170	\$25,473	\$12,275	\$59,599	\$218,726

TABLE A5. Estimated expenditures (unadjusted for inflation) for anglers targeting Striped Bass in the lower zone of the Roanoke River, 2016–2024. Estimates are not available for 2020 and 2021.

Year	Angler-hours	Mean Expenditures per angler-hour	Total Cost	Lodging	Food	Ice	Bait	Boat Fuel	Vehicle Fuel	Guide Fee
<i>Guided Trips</i>										
2016	3,104	\$24.96	\$77,485	\$3,150	\$2,100	\$0	\$0	\$0	\$0	\$72,235
2017	0	-	-	-	-	-	-	-	-	-
2018	211	\$20.97	\$4,415	\$0	\$340	\$0	\$0	\$340	\$906	\$2,830
2019	816	\$18.58	\$15,169	\$0	\$0	\$0	\$541	\$369	\$738	\$13,521
2022	1,338	\$50.00	\$66,924	\$0	\$7,782	\$0	\$0	\$2,075	\$5,188	\$51,879
2023	0	-	-	-	-	-	-	-	-	-
2024	0	-	-	-	-	-	-	-	-	-
<i>Private Trips</i>										
2016	68,804	\$5.36	\$368,961	\$16,853	\$73,118	\$10,999	\$53,072	\$77,169	\$137,750	\$0
2017	43,621	\$6.30	\$274,618	\$8,537	\$60,281	\$6,220	\$45,127	\$46,149	\$108,304	\$0
2018	29,374	\$5.71	\$167,651	\$17,274	\$17,495	\$1,327	\$25,482	\$26,311	\$79,763	\$0
2019	54,609	\$3.81	\$208,204	\$3,452	\$13,116	\$1,243	\$55,089	\$35,759	\$99,546	\$0
2022	10,148	\$10.14	\$102,919	\$4,768	\$16,586	\$2,588	\$20,809	\$18,135	\$40,033	\$0
2023	14,445	\$8.21	\$118,541	\$8,537	\$13,738	\$3,316	\$25,355	\$23,693	\$43,901	\$0
2024	1,349	\$9.23	\$12,450	\$1,098	\$4,894	\$613	\$1,061	\$2,067	\$2,717	\$0
<i>All Trips Combined</i>										
2016	71,908	-	\$446,446	\$20,003	\$75,218	\$10,999	\$53,072	\$77,169	\$137,750	\$72,235
2017	43,621	-	\$274,618	\$8,537	\$60,281	\$6,220	\$45,127	\$46,149	\$108,304	\$0
2018	29,585	-	\$172,066	\$17,274	\$17,834	\$1,327	\$25,482	\$26,651	\$80,668	\$2,830
2019	55,425	-	\$223,373	\$3,452	\$13,116	\$1,243	\$55,629	\$36,128	\$100,284	\$13,521
2022	11,486	-	\$169,843	\$4,768	\$24,367	\$2,588	\$20,809	\$20,210	\$45,221	\$51,879
2023	14,445	-	\$118,541	\$8,537	\$13,738	\$3,316	\$25,355	\$23,693	\$43,901	\$0
2024	1,349	-	\$12,450	\$1,098	\$4,894	\$613	\$1,061	\$2,067	\$2,717	\$0

TABLE A6. Estimated expenditures (unadjusted for inflation) for anglers targeting Striped Bass in both zones of the Roanoke River, 2016–2024. Estimates are not available for 2020 and 2021.

Year	Angler-hours	Total Cost	Lodging	Food	Ice	Bait	Boat Fuel	Vehicle Fuel	Guide Fee
<i>Guided Trips</i>									
2016	10,462	\$268,881	\$16,578	\$7,146	\$12	\$0	\$120	\$7,788	\$237,237
2017	7,336	\$160,754	\$4,755	\$5,260	\$243	\$817	\$739	\$7,929	\$141,010
2018	8,992	\$259,358	\$7,693	\$1,116	\$0	\$491	\$503	\$14,951	\$234,604
2019	10,990	\$414,039	\$13,543	\$4,263	\$0	\$1,386	\$732	\$21,236	\$372,879
2022	9,728	\$351,519	\$24,149	\$18,264	\$363	\$3,064	\$4,185	\$23,182	\$278,314
2023	14,006	\$405,231	\$23,623	\$4,526	\$339	\$10,196	\$4,526	\$11,264	\$350,757
2024	5,503	\$291,274	\$19,532	\$28,473	\$599	\$460	\$614	\$22,870	\$218,726
<i>Private Trips</i>									
2016	130,464	\$870,046	\$107,660	\$143,520	\$17,521	\$173,603	\$132,455	\$295,287	\$0
2017	99,018	\$707,756	\$80,092	\$148,325	\$12,210	\$131,565	\$91,288	\$244,275	\$0
2018	91,941	\$666,098	\$116,220	\$51,076	\$2,809	\$160,177	\$77,087	\$258,730	\$0
2019	102,026	\$573,680	\$67,833	\$32,113	\$1,624	\$151,381	\$69,931	\$250,798	\$0
2022	42,954	\$480,688	\$54,266	\$73,095	\$7,679	\$76,577	\$74,667	\$194,404	\$0
2023	49,013	\$521,928	\$72,658	\$78,050	\$9,335	\$105,745	\$65,872	\$190,268	\$0
2024	13,291	\$199,342	\$36,402	\$78,509	\$5,184	\$26,074	\$13,728	\$39,445	\$0
<i>All Trips Combined</i>									
2016	140,925	\$1,138,927	\$124,238	\$150,666	\$17,533	\$173,603	\$132,575	\$303,075	\$237,237
2017	106,354	\$868,509	\$84,848	\$153,585	\$12,453	\$132,382	\$92,027	\$252,204	\$141,010
2018	100,933	\$925,457	\$123,913	\$52,192	\$2,809	\$160,667	\$77,590	\$273,681	\$234,604
2019	113,016	\$987,719	\$81,376	\$36,377	\$1,624	\$152,767	\$70,663	\$272,034	\$372,879
2022	52,681	\$832,207	\$78,414	\$91,358	\$8,042	\$79,641	\$78,852	\$217,586	\$278,314
2023	63,020	\$927,159	\$96,280	\$82,576	\$9,674	\$115,941	\$70,398	\$201,532	\$350,757
2024	18,794	\$490,617	\$55,934	\$106,981	\$5,783	\$26,534	\$14,342	\$62,316	\$218,726

Roanoke River Creel Survey Data Access Area: _____
 Interview Date ___ / ___ / _____ Angler Interview Sheet #: _____

How many anglers fishing in your party today? Record the Number of Anglers in Party: _____

EFFORT: As you approach the party, Record INTERVIEW TIME: _____ Hours fished: _____
What TIME did you start fishing today? Record START TIME: _____ Min fished: _____

What did you fish for? Anything
 Largemouth Bass White Perch Striped Bass
 Black Crappie Hickory Shad
 North American Freshwater Catfishes
 Other Species: _____

Bait Used? Artificial - lures Artificial - fly
 Live - minnows Live - "Shad"
 Cut - Shad Cut - herring
 Other - Live Other - Cut

What NC county are you from? If not NC, what state? (Enter # of anglers; e.g. 3 Pitt, 2 VA)
Origin: Bertie Halifax Martin Northampton Washington
 Not Given _____ _____ _____

What is the angling trip type? (check one)
 Private boat Kayak/canoe Guided boat
 Bank Albemarle Sound Public Fishing Area
 Other (specify) _____

Species	Catch Any? Keep Any? Weigh Striped Bass				Weight (kg)	Striped Bass Released (number for each length category)	Individual Striped Bass (other species on back)		
	Number Caught	Number Released	Number Kept				TL (mm)	Wt (kg)	Sex
Striped Bass	_____	_____	_____	_____		Smalls	_____	_____	_____
Hickory Shad	_____	_____	_____	_____		<18	_____	_____	_____
American Shad	_____	_____	_____	_____		Legal	_____	_____	_____
Channel Catfish	_____	_____	_____	_____		18-22	_____	_____	_____
Blue Catfish	_____	_____	_____	_____		Slot	_____	_____	_____
White Catfish	_____	_____	_____	_____		22-27	_____	_____	_____
White Perch	_____	_____	_____	_____		Above Slot	_____	_____	_____
Largemouth Bass	_____	_____	_____	_____		27+	_____	_____	_____

How many nights is the trip? _____

How many miles did you travel to get here? _____

How many people who are on the trip are fishing? _____

For your fishing trip today here and back home, how much do you expect to spend on:

Lodging/night	\$ _____
Food/beverage	\$ _____
Ice	\$ _____
Bait	\$ _____
Boat Fuel/Oil	\$ _____
Vehicle Fuel	\$ _____
Guide fee	\$ _____

Comments: _____

Report yellow and red tags online or call NCDMF at 1-800-682-2632. Red tags receive a \$100 award and yellow tags receive \$5 or a hat, fishing towel, etc.




Figure A1. Example of Roanoke River Striped Bass creel survey interview sheet from 2024.