

Summary Report 2023

EXECUTIVE SUMMARY

The largemouth bass fishery of tidal Potomac River is among the most popular in the Mid-Atlantic region and the United States. This fishery is managed by resource agencies from four jurisdictions that include Maryland, Virginia, District of Columbia, and Potomac River Fisheries Commission. Seeking a unified assessment of the fishery, these jurisdictions developed and executed a strategy to monitor the fishery. This summarized report details work during the first period. The objectives were to estimate abundance using a combination of mark-recapture and angler surveys. We also estimated resource use as a proportion of fish caught by anglers relative to population size. The assessment is provided to Potomac River Fisheries Commission and the general public.

This summary report was co-authored by agency staff that formed the interagency cooperative.

*Luke Lyon and Chris Adriance
District Department of Energy and the Environment*

*Joseph W. Love and Dan Goetz
Maryland Department of Natural Resources*

*John Odenkirk and Mike Isel
Virginia Department of Wildlife Resources*



INTERAGENCY COOPERATIVE LARGEMOUTH BASS MONITORING FOR TIDAL POTOMAC RIVER



Introduction

The Largemouth Bass fishery of Potomac River is regulated by four jurisdictions who share the resource. These jurisdictions include: Maryland, Virginia, District of Columbia, and Potomac River Fisheries Commission. Monitoring of the fishery has been done independently, if at all, by these jurisdictions. The goal of the cooperative management strategy is to jointly monitor the Largemouth Bass fishery in tidal freshwater of Potomac River for the purpose of identifying problems in resource sustainability.

The objectives of the cooperative management strategy are:

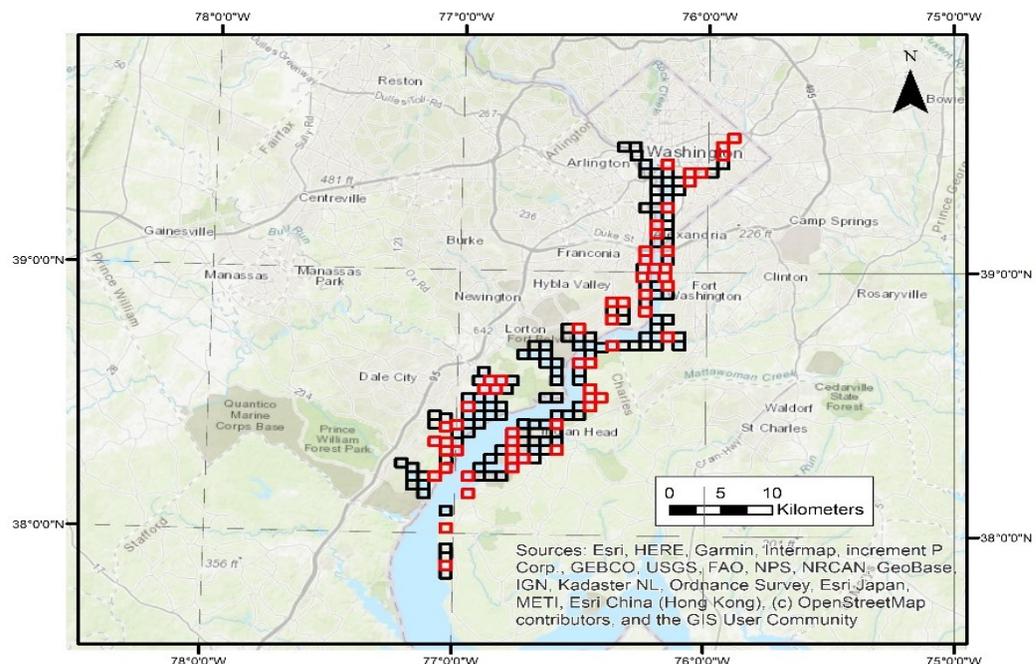
- Estimate abundance of quality (≥ 12 -inch total length) and preferred (≥ 15 -inch total length) size of Largemouth Bass from observations of tagged Largemouth Bass during tournament surveys;
- Estimate exploitation as the proportion of Largemouth Bass caught by anglers for release or harvest relative to total estimated abundance.

Methods

Population Size

Tidally influenced freshwater habitats of Potomac River were surveyed using boat electrofishing mid-March to mid-April 2021 (Figure 1). Sampling areas were divided into one kilometer square quadrants and included areas where Largemouth Bass adults are known to occur. Each quadrant was boat electrofished for 1200 seconds. Of 184 possible quadrants, 60 were randomly selected.

Figure 1. Map of tidal freshwater Potomac River with quadrants covering habitats where Largemouth Bass occur. Red quadrants were surveyed in 2021.



All Largemouth Bass that were equal to or greater than 8-inches total length were tagged near their dorsal fin and in their dorsal muscle using Floy Anchor tags (FD-94, 5/8 inches extra-long, orange color)(Figure 2). We measured, weighed, tagged, and released Largemouth Bass in the area of collection. Between March and April 2021, 710 fish were tagged.

Tags were reported to Virginia Department of Wildlife Resources (1-804-367-2925) and incentivized with random prize drawings held quarterly. Tags were also reported on-line using a Google Form and recorded when staff monitored bass tournaments.



Figure 2. Largemouth Bass with orange tag implanted near dorsal fin.

Abundance of Largemouth Bass was estimated with Schnabel's (1938) modification

of Peterson's population estimator (Equation 1) using data collected from six bass tournaments held in 2022. Of fish marked and at large, the number of marked bass caught during a tournament was recorded. Tournament directors also reported the total number of fish weighed during a tournament. However, not all caught fish during a tournament are weighed because tournament anglers cull (or release) fish throughout the fishing day. A survey of forty tournament participants was conducted to determine the number of culled fish during the fishing day. The proportion of culled fish that were marked, but unreported, was determined by multiplying the number of culled fish with the proportion of marked fish observed during a tournament. It was assumed that the proportion of marked and observed fish was equal to the proportion of marked and unobserved fish.

The number of tagged fish in the population (M_t) was multiplied by the number of fish caught during an angler survey (see below) within the time period (C_t). The sum of the products was divided by the number of tagged fish reported (R_t), summed across time periods, and then added to 1.

Equation 1.

$$N = \frac{\sum C_t M_t}{\sum R_t} + 1$$

The addition of 1 to the denominator in Equation 1 is a modification to address tagging a small proportion of the population and improves accuracy of the population estimate. Variance in the population estimate was computed as,

Equation 2.

$$\text{Variance } 1N = \frac{\sum R_t \sum C_t M_t^2}{(\sum R_t)^2}$$

Upper confidence intervals (UCL) and lower confidence intervals (LCL) were computed from Equation 2 (alpha level = 0.05). The estimate for N should be considered as an estimate of the order of magnitude rather than an accurate estimate of number. Changes in abundance in future years can be detected as changes in order of magnitude, and with confidence intervals.

Exploitation

Exploitation in the fishery was estimated as the proportion of anglers who reported either harvesting or releasing a caught, tagged Largemouth Bass relative to the number of tagged Largemouth Bass available in the population. The number of tagged bass was adjusted for reporting bias, or the proportion of anglers who caught tagged fish but did not report them. Reporting bias was determined by Virginia Department of Wildlife Resources and Maryland Department of Natural Resources during angler surveys in 2022 (Maryland: April – June; Virginia: April – September). Ten fishing locations were identified in Maryland and five in Virginia. The clerk in Maryland visited each location based upon presumed use of the facility whereby the least used access points were attended the least number of times. Surveys were conducted at least three times per week, including all weekends and holidays. Clerks questioned anglers about the tagging project, their fishing effort and their catch.

Results

Angler surveys conducted in Virginia and Maryland in 2022 demonstrated that Largemouth Bass remained the top target for sport fishing in tidal freshwater of Potomac River. In Virginia, Largemouth Bass was the most targeted by 75% of anglers fishing 76,000 angler-hours between April and September. Similarly, Largemouth Bass was targeted by 68% of anglers who fished in Maryland for 40,233 angler-hours between April and June. Maryland recorded data from 39 bass tournaments with anglers fishing 2,313 angler-hours in 2022.

Population Size

Across six tournaments, a total of 13 tags were observed. We estimated 4 additional tags for unobserved fish caught and never weighed (or culled) during tournaments. A total of 3546 fish were caught during these six tournaments. We estimated that 889 additional bass had been culled and not reported during the tournaments. For five tournaments that had a minimum length requirement of 12-inches, we estimated a population size of 115,418 fish of that size and greater (Lower Confidence Limit = 83,363 and Upper Confidence Limit = 228,479). For a single tournament that had a minimum length requirement of 15-inches, we estimated a population size of 91,472 for that size of fish and greater. Density of 12-inch and greater fish was calculated by dividing abundance (115,418) by area water within sampled quadrants (area = 9,301 ha); density was calculated as approximately 12 bass/ha. However, suitable area within quadrants was not quantified and density may be underestimated.

Exploitation

There were 104 reports from recreational anglers who caught a marked Largemouth Bass between April 2021 and March 2022. None of these bass had been harvested during this time frame. Of the anglers who had caught a tagged bass during the survey period, 57% of anglers in Virginia had reported catching the tagged fish, while just 47% of anglers in Maryland reported the tagged fish. Adjusting the number of reported tags for an average reporting bias (0.52), the proportion of caught and released fish, relative to the number of tagged fish (or 710), was estimated as 28.2%.

Ancillary Information

A second method for estimating abundance was used by analyzing monthly reporting history for each fish. However, use of the closed captures Huggin’s Heterogeneity model to estimate population size proved unsuccessful as its abundance estimate was unrealistically low. Therefore, additional effort will be placed on working with bass tournaments to monitor abundance in the fishery, which proved successful. Densities of Largemouth Bass in Potomac River were estimated by Maryland Department of Natural Resources in previous years as between 6 bass/ha (in 1989) and 28.6 bass/ha (in 1993), with the estimate in 2022 falling in-between.

Data collected during angler surveys were analyzed to estimate the number of Largemouth Bass caught and released and the number of Largemouth Bass harvested. Directors of bass tournaments in Maryland additionally provided information on the number of fish that died during tournaments (i.e., harvested) and the number of fish caught and released. These estimates provided a basis for comparing the proportion of the population that was harvested (i.e., harvest exploitation) and the proportion of the population that was caught and later released (i.e., catch-and-release exploitation) to those obtained for the mark-recapture project.

Exploitation estimated as the proportion of reported tags was similar to that estimated from angler surveys. From data reported during the angler surveys, anglers harvested 107 bass in Maryland and 37 bass in Virginia. Harvest exploitation measured during angler surveys was 0.1% of population size. When summed with an estimated loss owed to tournament fishing reported in 2022 (1.5% of 7606, or 114), then 258 or 0.2% of the population had been harvested. This value is similar to that estimated using the proportion of reported tags, which was 0%.

There were 36,701 bass caught and released in Virginia and 28,868 bass caught and released in Maryland. During bass tournaments in Maryland, an additionally reported 7,492 bass had been caught and released. These values over-estimate the number of different individuals caught in the fishery because of an 8.4% recapture probability; mark-recapture data indicated 8 of 95 reported fish had been reported more than once. After adjusting catch for probable recaptures, the proportion of individuals reportedly caught and released was 29% in Virginia, was 23% in Maryland, and was 6% during tournaments in Maryland. Additively, less than 60% of the population is likely caught and released during the bulk of the fishing season. This value is greater than that reported from mark-recapture data, a possible result of poor incentives for reporting or failure to account for tag loss in the study.

Joint Assessment

Year	Abundance (≥ 12-inches)(UCL; LCL)	Abundance (≥ 15-inches)	Exploitation (harvest)	Exploitation (catch-and-release)	Density	Mean Catch per Hour
2021/22	115,418 (83,363; 228,479)	91,472	0%	28.2%	12 bass/ha	N/A

Future Work

- Agency catch of all Largemouth Bass during boat electrofishing for each quadrant should be recorded with electrofishing time per quadrant to generate relative abundance as catch-per-hour per quadrant; relative abundance will be plotted by quadrant using Arc-GIS to generate a map for future reports.
- Agency tagging during spring should include fish that are only 12-inches and greater total length in order to better estimate abundance during bass tournaments that have minimum size possession restrictions.
- Tournament surveys should target multiple tournaments during both 12-inch and 15-inch seasons.
- Surveys during tournaments should quantify the Largemouth Bass greater than 12-inches and/or 15-inches that were released during the fishing day to obtain cull statistics.
- Promotion and incentives must be continued and/or enhanced to better estimate exploitation using mark-recapture work.

For More Information

Please visit these websites for contacts or more information on largemouth bass resources.

dnr.maryland.gov/fisheries

dwr.virginia.gov/fishing

doee.dc.gov/service/fisheries-and-wildlife