

Smallmouth Bass and Muskellunge Fisheries in Three Northwestern Wisconsin Rivers



“Guide to the Future” Pilot Project Report, 2012

Max Wolter and Dave Neuswanger
Wisconsin Department of Natural Resources
Hayward, Wisconsin

and

Cooperating Guides of the Hayward Fly Fishing Company:

Larry Mann, Co-Owner

Wendy Williamson, Co-Owner

Erik Huber, Guide

Brett Nelson, Guide

Cory Andraschko, Guide and Lead Photographer

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Summary of Major Findings

- The Flambeau River produced significantly higher angler catch rates of smallmouth bass (1.6 per hour of directed fishing effort) than segments of the Chippewa (0.9 per hour) and Namekagon (0.8 per hour) rivers, a pattern driven by the smallest size class of fish (7-11 inches). Angler catch rates of preferred-size smallmouths (≥ 14 inches) were somewhat higher in the Chippewa and Namekagon rivers than in the Flambeau.
- Catch rates for smallmouth bass were higher in mid-summer (July) than in late-summer and early fall (August-September).
- Significant differences in catch rates among inexperienced, average, and expert anglers (as discreetly rated by their professional guides) were evident for smallmouth bass but not for muskellunge.
- Muskellunge catch rates and sizes were generally similar among the three rivers. Catch rates were considerably higher than the statewide average for muskellunge and higher than rates for other lakes in the area, indicating a high-quality river fishing experience.
- Around 25% of all muskellunge encounters (follows, strikes, fish hooked and lost, and fish landed) resulted in a successful catch (fish fully subdued and intentionally released).
- Catch rates for muskellunge were variable, and seasonal patterns were not evident.
- Walleyes and largemouth bass were caught rarely and incidentally in all three rivers.
- Northern pike were caught at a higher rate in the Namekagon River than in the Flambeau or Chippewa rivers. It seems there were relatively fewer northern pike than muskellunge in most reaches.

Introduction and Project Objectives

Medium and large rivers often hold exceptional and popular recreational sportfish populations. In northern Wisconsin rivers, smallmouth bass and muskellunge are the dominant sportfish, though northern pike are present and walleye can be important seasonally. Due to a variety of factors including current, water clarity, structural complexity, and access, these river fish populations are not easily (or representatively) sampled by traditional fisheries methods such as netting or electrofishing. On an experimental and voluntary basis the Wisconsin Department of Natural Resources (WDNR) enlisted a group of river fishing guides who completed hundreds of fishing trips on these rivers annually with their clients in 2012 while targeting smallmouth bass and muskellunge using flyfishing gear. Records of the effort and catch from these fishing trips can provide important information on relative abundance and size structure of river populations of smallmouth bass and muskellunge in a manner that is efficient to the monitoring agency (WDNR) and informative to the guides, their clients, and the general public. In the first year of this project, we enlisted five guides from The Hayward Fly Fishing Company to collect data on the Flambeau, Chippewa, and Namekagon rivers (Price, Sawyer, Rusk, Washburn, and Burnett counties). The data can be used to inform management decisions regarding fishing regulations, access, and fish passage.

General Methods

WDNR personnel and guides met and developed the following protocol for data collection. For each trip, the guide recorded the catch for each client (typically one or two people) separately. Because skill level for each angler was expected to vary, guides discreetly rated their clients as inexperienced beginners, average anglers, or experts. These classifications were used later to standardize and interpret data. Each guide recorded daily water temperature, which was measured in a shaded portion of the river near noon. Guides also recorded “mitigating conditions” (foul weather, challenging water level, off-color water, etc.) that they judged may have negatively impacted fishing success. Fly-fishing gear was used exclusively and all terminal tackle was single hook and barbless.

There was no set schedule or locations that guides were asked to follow with their fishing activities. However, as a result of the use of logical access points, fishing trips were assigned to “reaches” within each river with set start and end points. In this report these are labeled with the river name (or abbreviation) and a number corresponding to the relative downstream location of the reach within that river (e.g., Chippewa 4 is downstream from Chippewa 3). To protect the proprietary information of these guides, the specific start and end points of each reach are not presented in this report but are known to WDNR personnel. Individual reaches were rarely fished on sequential days. Data reporting began in late June during the 2012 pilot season, but future collections can and should be made starting in early May. Three rivers were fished enough to provide useful information for this report – the Flambeau (Price, Sawyer, and Rusk counties), Chippewa (Sawyer and Rusk counties), and Namekagon (Sawyer, Washburn, Burnett counties).

Each captured fish was recorded on a labeled 12-key mechanical counter (MC-12 counters purchased at <http://store.controlconceptsusa.com> for \$383.00 each) corresponding to the angler that caught the fish. Four sizes of smallmouth bass (7-11, 11-14, 14-17, and >17 inches) and muskellunge (20-30, 30-40, 40-50, and >50 inches) were recorded. Fish were not always

measured but were assigned to these bins by guides based on their ability to estimate length. Guides also recorded catches, but not sizes, of northern pike, walleye, and largemouth bass.

“Encounters” with muskellunge were recorded whenever a fish followed but did not strike, struck and missed, or was lost after hooking but before landing. Such events are believed to contribute to the quality of fishing for trophy species like muskellunge even when no fish are actually caught. If there were multiple encounters with what was believed to be the same fish, it was recorded only once.

Having two weather-resistant mechanical counters in each drift boat greatly facilitated data recording by guides who needed to remain focused on boat control, client safety, and client satisfaction (measuring and photographing fish) rather than spending time recording individual catches or encounters on paper data forms. Guides found it convenient to simply push a button during moments of peak activity (especially in fast water or bad weather), then complete their data forms carefully after tallying results from the counters at the end of the day.

All data were entered into a database and analyzed by using R software. Trips when guides noted “mitigating conditions” as described above were excluded from all analyses unless specified otherwise. Analysis of variance (ANOVA) with a Tukey means separation technique was used to determine statistical differences in response variables (e.g., catch rate) among levels of class variables (e.g., river). Results of statistical tests were considered significant at P values less than 0.05 (less than a 5% chance of incorrectly concluding a tested difference was real).

Description of Angling Effort



In total, data were recorded from 235 anglers totaling 1,044 hours of smallmouth bass effort and 741 hours of muskellunge effort. Guides felt that 212 hours of smallmouth bass effort and 12 hours of muskellunge effort occurred on days when conditions mitigated angling success. An extended heat wave in July was responsible for most of the trips when guides noted mitigating conditions. Including only days without mitigating conditions, the Flambeau River was fished for 273 hours (94 smallmouth bass and 179 muskellunge), the Chippewa River was fished for 664 hours (294 smallmouth bass and 370 muskellunge), and the Namekagon River was fished for 598 hours (438 smallmouth bass and 160 muskellunge).

Among the three angler skill levels, there were 235 hours fished by inexperienced beginners, 391 hours fished by average anglers, 421 hours fished by expert anglers, and 492 hours that were not assigned a skill level by guides. There were no major differences in the guide-rated skill level of anglers among the three rivers (Figure 1).

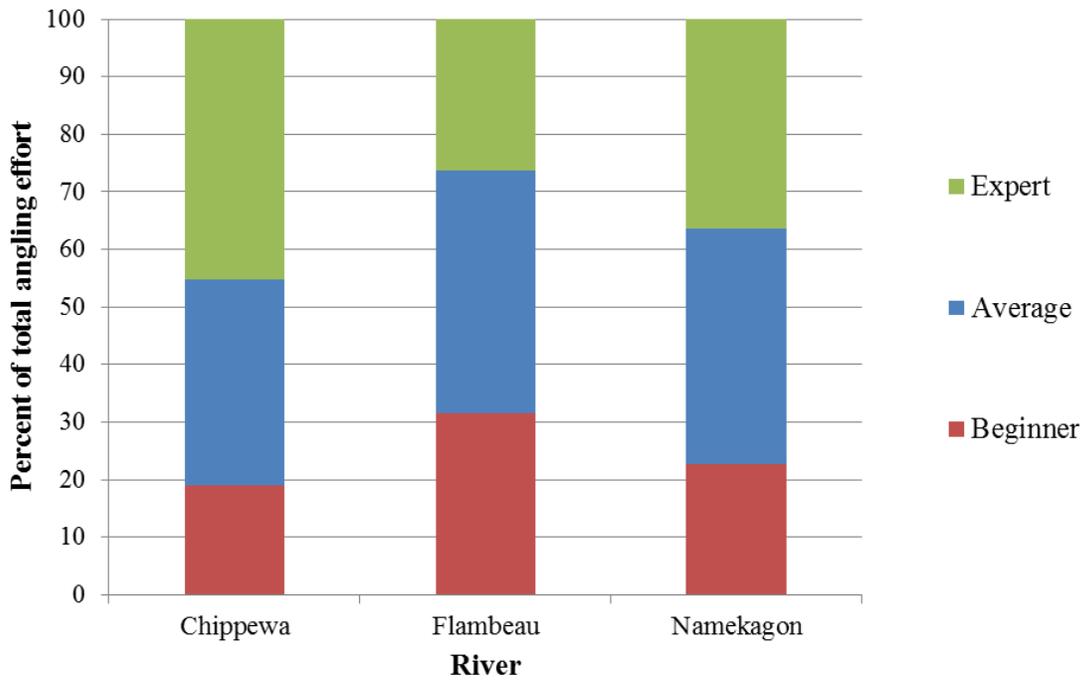


Figure 1. Guide-rated angler skill level, by river, in 2012.

Effect of Angler Skill and Factors Mitigating Catch Rates



Angler skill level had a significant effect on catch rates of smallmouth bass (all sizes). As expected, the average catch rate of experts was significantly higher than that of inexperienced beginners ($P < 0.01$, Figure 2). Average anglers also had a significantly higher catch rates than inexperienced beginners ($P = 0.02$) but were not different than expert anglers ($P = 0.44$).

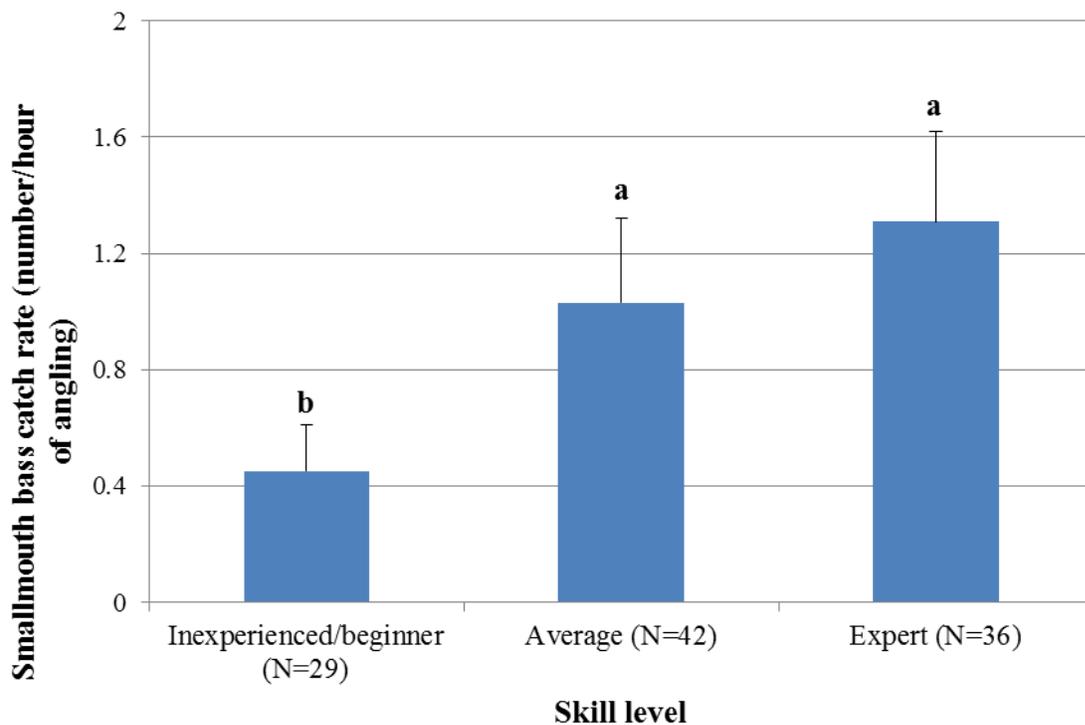


Figure 2. Catch rates of smallmouth bass targeted by guided anglers of different skill levels in three northwestern Wisconsin rivers in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N) is shown in parenthesis. Significantly different groupings ($P < 0.05$) are denoted with different letters.

Angler skill level did not have an effect on catch rates of muskellunge (all sizes), but only data from average and expert anglers were available for this analysis ($P = 0.81$, Figure 3).

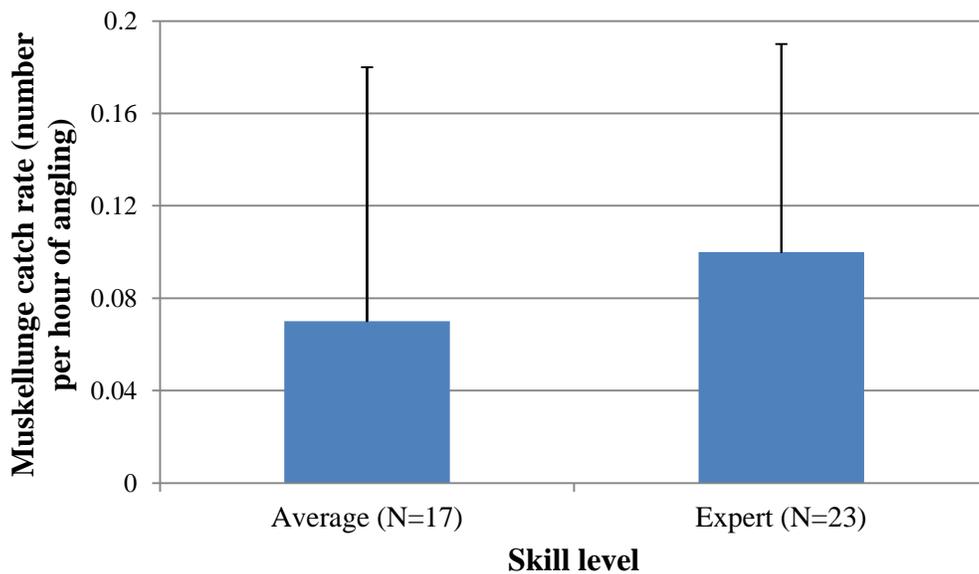


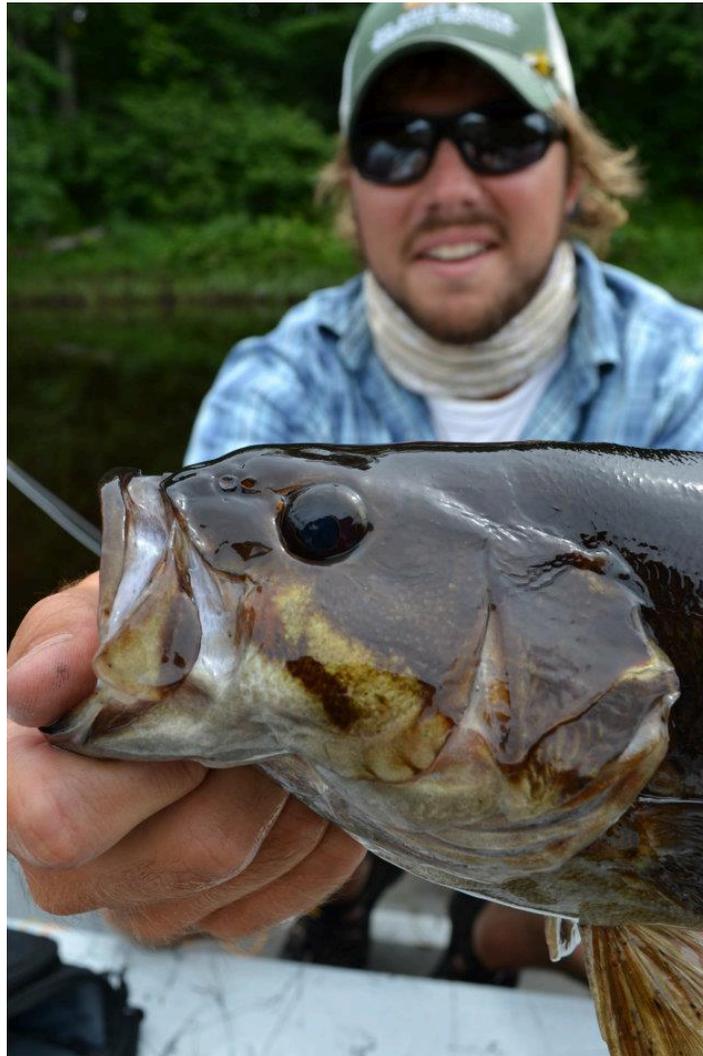
Figure 3. Catch rates of muskellunge targeted by guided anglers of different skill levels in three northwestern Wisconsin rivers in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N) is shown in parenthesis.

There does not appear to be a need to account for skill level of muskellunge anglers based on data collected in 2012, however there was inadequate data available for comparisons to inexperienced beginners. We will continue to monitor differences related to angler skill as more data become available.

Differential catch rates among smallmouth bass anglers with different skill levels could justify application of some type of ‘correction factor’ to the data in the future. But for purposes of this pilot study report, we will assume that the skill level of anglers is random through time and across rivers (Figure 1) and reaches, effectively washing-out differences among individual anglers when examining mean catch rates.

Only 14% (32 of 235) of all trips occurred during conditions that were considered mitigating to angling success by participating guides. Catch rates for smallmouth bass and muskellunge during these trips were somewhat lower than at other times, but statistically significant relationships were not identified ($P = 0.73$ for muskellunge and 0.15 for smallmouth bass catch rates). Regardless, we have excluded trips with mitigating conditions from most analyses.

Relative Abundance, Size Structure, and Distribution of Smallmouth Bass



Smallmouth bass were the most abundant gamefish in most reaches fished by volunteer guides during this project. We observed significant differences in both abundance and size distribution among the Flambeau, Chippewa, and Namekagon rivers. Average catch rate for smallmouth bass was significantly higher in the Flambeau River compared to the Chippewa and Namekagon rivers ($P < 0.01$, Table 1). This difference was largely the result of a particularly high catch rate of 7- to 11-inch fish in the Flambeau. In general, catch rate for smallmouth bass was close to one fish per hour of angling, which compares favorably with catch rates for unguided anglers who were specifically targeting smallmouth bass when interviewed by WDNR creel clerks on area lakes in recent years (1 fish per 3.3 hours of directed angling effort in the Chippewa Flowage in 2011; and 1 fish per 1.25 hours of directed effort in Grindstone Lake in 2012).

Table 1. Catch rates (fish per hour) of smallmouth bass targeted by guided anglers, by size class, on three northwestern Wisconsin rivers in 2012. Significantly different groupings ($P < 0.05$) are denoted with different letters.

Smallmouth bass size class	River			P Value
	Chippewa	Flambeau	Namekagon	
7-11 inches	0.30 (± 0.13) ^b	1.24 (± 0.55) ^a	0.17 (± 0.05) ^b	<0.01
11-14 inches	0.26 (± 0.08)	0.22 (± 0.11)	0.23 (± 0.07)	0.80
14-17 inches	0.28 (± 0.13)	0.18 (± 0.14)	0.30 (± 0.10)	0.63
17+ inches	0.06 (± 0.05)	0.00 (± 0)	0.09 (± 0.04)	0.17
All sizes	0.91 (± 0.30)^b	1.64 (± 0.69)^a	0.79 (± 0.17)^b	<0.01

Size structure of angler-caught smallmouth bass was poor in the Flambeau River; only 26% of all smallmouth bass caught were of quality size (≥ 11 inches), and no memorable-size fish (≥ 17 inches) were caught throughout the sampling period (Figure 4). By comparison, in the Chippewa and Namekagon Rivers, respectively, 67 and 79% of all angler-caught smallmouths exceeded 11 inches, and 7 and 12% exceeded 17 inches. Potential reasons for observed differences include: 1) more variable recruitment (perhaps a particularly strong year-class in the 7- to 11-inch range) in the Flambeau; 2) consistently higher density and correspondingly slower growth rate in the Flambeau; and 3) insufficient habitat diversity (large, deep holes) to hold significant numbers of larger fish during summer in the riverine reaches between mainstem flowages in the Flambeau. The actual reason for differences in size structure of angler-caught fish between the Flambeau and the other two rivers is worth further investigation and could have regulatory implications.

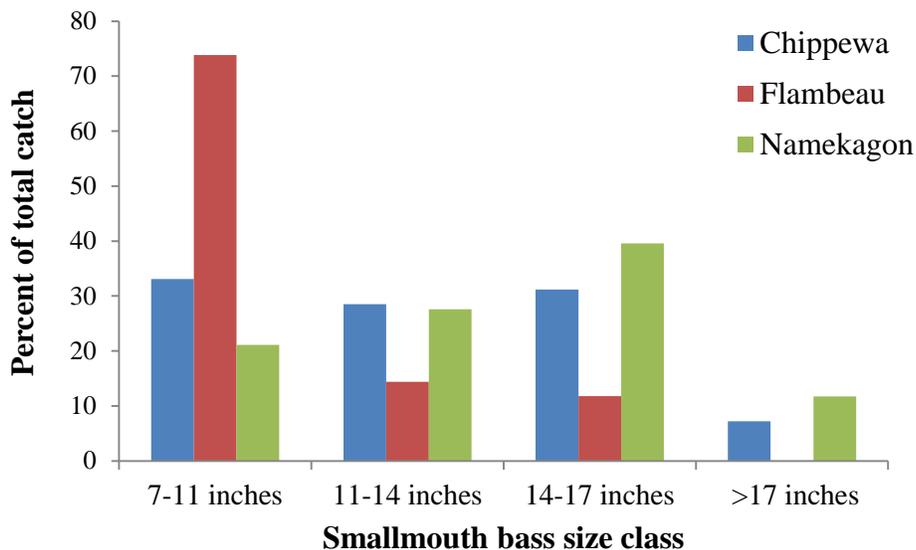


Figure 4. Relative size structure of smallmouth bass caught by guided anglers in three northwestern Wisconsin rivers in 2012.

We detected no obvious trends in angler catch rates of smallmouth bass along an upstream-downstream gradient in the three rivers (Figure 5). Therefore, this index of relative abundance does not appear to be linked to river width or discharge within the range of reaches fished, but is most likely influenced by other factors such as riffle-pool frequency, substrate type, current velocity, depth, abundance and distribution of holding cover (boulders and large woody debris), or prey abundance. Sample size was limiting in some reaches, so additional data, including habitat mensuration, will be necessary to fully describe and explain the relative abundance of smallmouth bass on a reach-specific basis.

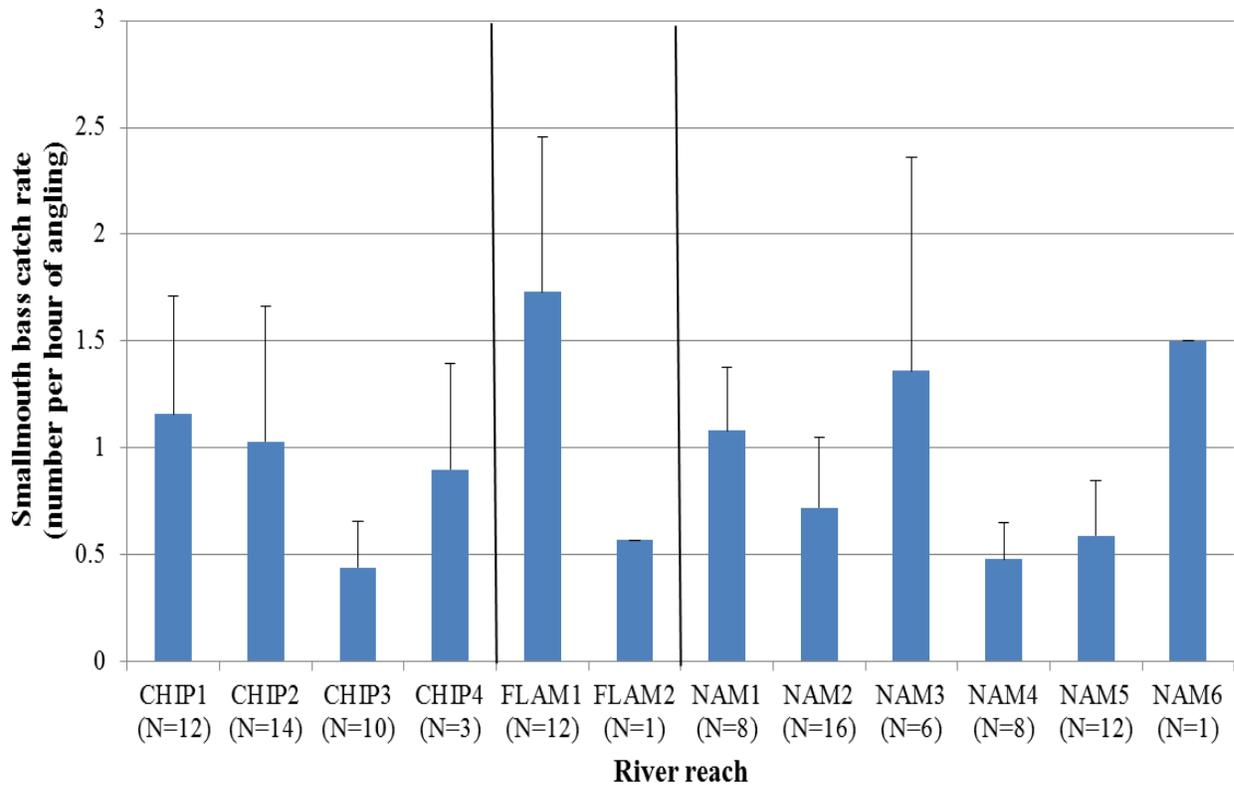


Figure 5. Catch rates of smallmouth bass targeted by guided anglers in different reaches of three northwestern Wisconsin rivers (CHIP = Chippewa, FLAM = Flambeau, NAM = Namekagon) in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N angler trips) is shown in parenthesis.

Relative Abundance, Size Structure, and Distribution of Muskellunge



Unlike smallmouth bass, there was no significant difference in guided-angler catch rate of muskellunge of any size among the three rivers ($P = 0.75$, Table 2), although this analysis was somewhat limited by low sample size. Overall, muskellunge catch rate averaged 1 fish per 10 hours of angling, which compares very favorably to the Wisconsin statewide average (1 musky per 34 hours of angling effort) and to many Sawyer County lakes (Chippewa Flowage = 54 hours, Teal Lake = 24 hours, Spider Lake Chain = 13 hours).

Table 2. Catch rates (fish per hour) of muskellunge targeted by guided anglers, by size class, on three northwestern Wisconsin rivers in 2012. A total of 70 muskellunge were caught by guided anglers in 2012.

Muskellunge Size class	River			P Value
	Chippewa	Flambeau	Namekagon	
20-30 inches	0.03 (± 0.02)	0.05 (± 0.03)	0.10 (± 0.10)	0.16
30-40 inches	0.05 (± 0.05)	0.05 (± 0.03)	0.04 (± 0.03)	0.94
40-50 inches	0.005 (± 0.009)	0.000 (± 0)	0.006 (± 0.018)	0.61
50+ inches	0.000 (± 0)	0.000 (± 0)	0.000 (± 0)	NA
All sizes	0.09 (± 0.05)	0.10 (± 0.04)	0.13 (± 0.08)	0.75

Muskellunge between 20 and 40 inches long dominated the catch; and there was no apparent difference in size distribution among the three rivers (Figure 6). No fish over 40 inches long were caught in the Flambeau, while two were caught in the Chippewa and one was caught in the Namekagon. Sampling in 2012 did not produce any 50-inch fish, but angler accounts and prior catch records suggest these rivers certainly have the potential to produce trophy-size fish.

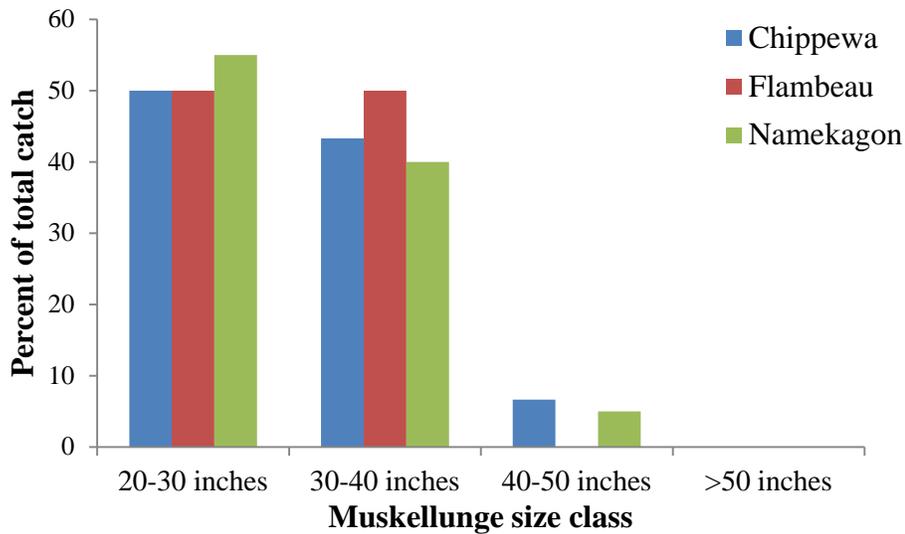


Figure 6. Relative size structure of muskellunge caught by guided anglers in three northwestern Wisconsin rivers in 2012.

We detected no obvious trends in angler catch rates of muskellunge along an upstream-downstream gradient in the three rivers (Figure 7). Variation in catch rates was very high in some reaches; additional years of data will be necessary to accurately assess relative abundance.

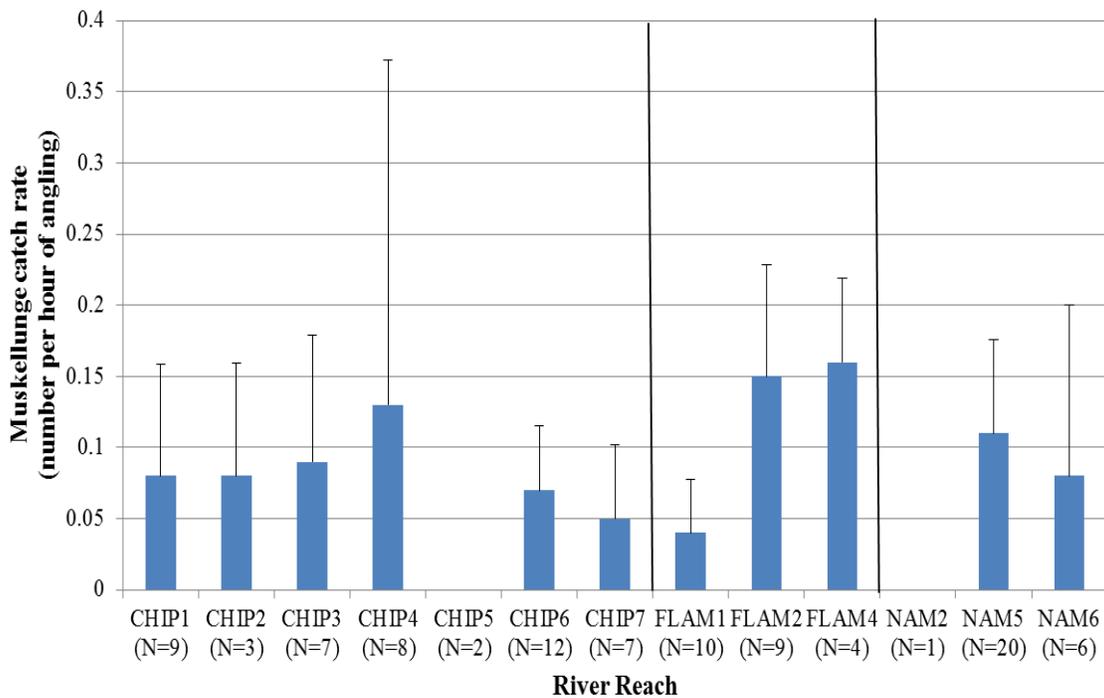


Figure 7. Catch rates of muskellunge targeted by guided anglers in different reaches of three northwestern Wisconsin rivers (CHIP = Chippewa, FLAM = Flambeau, NAM = Namekagon) in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N angler trips) is shown in parenthesis.

Muskellunge Encounters vs. Muskellunge Catch

Guides recorded encounters with muskellunge that did not result in fish being landed. “Encounters” were defined as follows, strikes, and fish hooked but lost before they could be fully subdued and intentionally released. Stratifying results by angler skill level allowed us to quantify an element of musky fishing quality and proficiency that typically goes undocumented. On average, three muskellunge were encountered for every fish caught (see “percent success” column in Table 3). Applying this ratio to the average catch rate of one fish every 10 hours, guided anglers who targeted muskellunge were encountering (and sometimes catching) a fish every 2.5 hours on these rivers – outstanding musky fishing action by any standard.

As one might expect, expert anglers had the highest ratio of fish caught to fish encountered (25.4%) – twice as high as average anglers (12.5%). There were too few data available for inexperienced anglers to make a legitimate comparison with more experienced clients. During the first year of this pilot project, guides did not always remember to assign a skill level to their clients. It will be important going forward for skill levels to be assigned to all anglers, because pilot project data suggest there may be significant differences in catch rates.

Table 3. Summary of muskellunge angling effort, catch, encounters, and success rate among anglers with different skill levels in three northwestern Wisconsin rivers in 2012. Percent success = fish caught / total encounters + fish caught.

Assigned skill level	Angling hours	Fish caught	Fish encountered but not caught	Total encounters + fish caught	Percent success
Inexperienced	22	2	7	9	22.22%
Average	100	4	28	32	12.50%
Expert	150	15	44	59	25.42%
Not assigned	437	49	124	173	28.32%
Total/Average	709	70	203	273	25.64%

Seasonality of Catch Rates

Average monthly catch rates of smallmouth bass were highest in July (1.4 fish per hour; Figure 8) despite a heat wave that resulted in many days with air and water temperatures that were considered high enough to mitigate fishing success. Catch rates dropped off significantly in August and September compared to July.

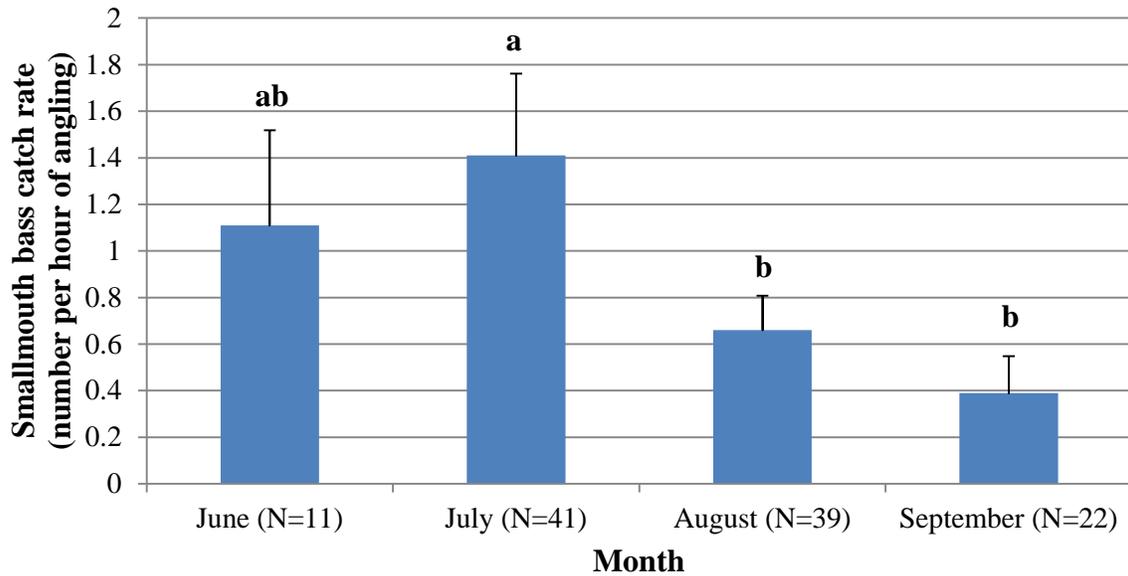


Figure 8. Catch rates of smallmouth bass targeted by guided anglers, by month, in three northwestern Wisconsin rivers in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N angler trips) is shown in parenthesis. Significantly different groupings ($P < 0.05$) are denoted with different letters.

Average monthly catch rates for muskellunge did not vary significantly, but low sample size (particularly in summer months when guides avoided targeting muskellunge during periods of high water temperature) and high variability limited our ability to test for seasonal differences (Figure 9). It was our expectation that muskellunge catch rates would be highest in the fall (September-November) when most of the targeted musky fishing effort occurred (88% of all trips). We will need more summertime musky fishing data in the future in order to determine if there are truly no significant seasonal differences in guided angler catch rates.

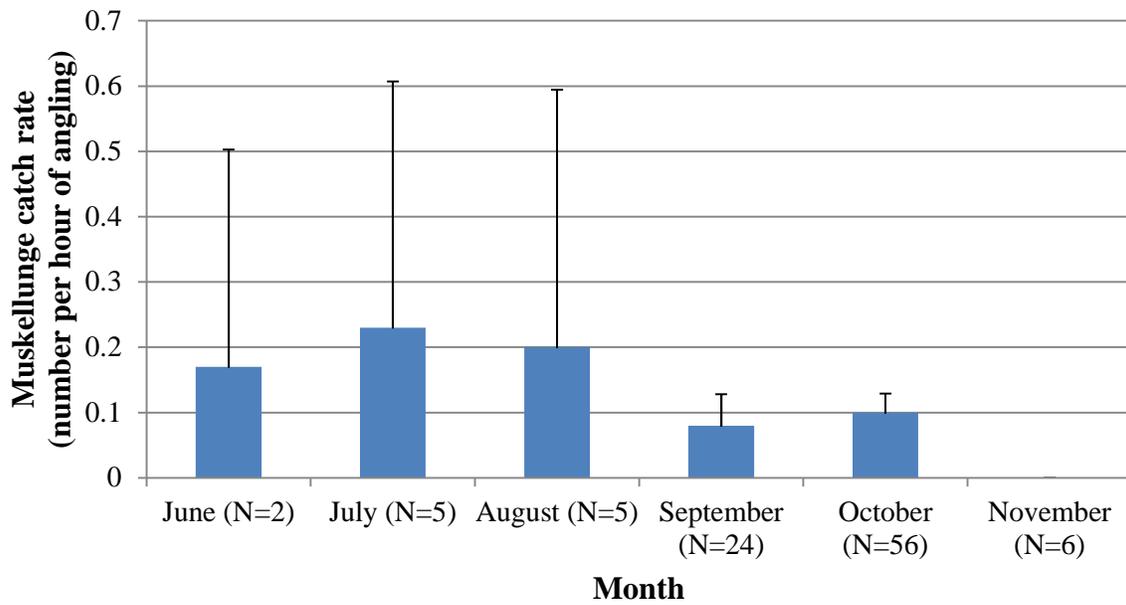


Figure 9. Catch rates of muskellunge targeted by guided anglers, by month, in three northwestern Wisconsin rivers in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N angler trips) is shown in parenthesis.

Relative Abundance and Distribution of Other Species



Northern pike were captured at a significantly higher rate in the Namekagon River than in the Chippewa or Flambeau rivers ($P < 0.01$, Figure 10). This difference was largely driven by high catch rates in Namekagon reaches 3 and 6 (Figure 11), which have an abundance of large-pool habitat and macrophytes compared with other reaches. In general, catch rates for northern pike were lower than for muskellunge. Given the niche similarity of these species and the high likelihood of competition, our tentative conclusion from these data is that muskellunge maintain a competitive advantage in most reaches sampled.

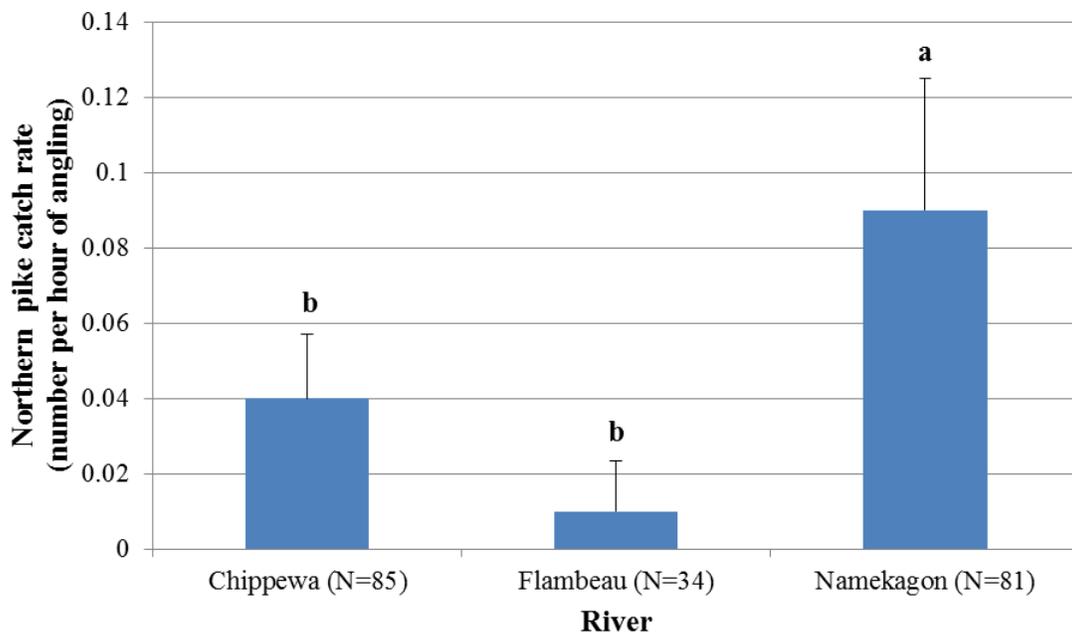


Figure 10. Incidental catch rate of northern pike by guided anglers in three northwestern Wisconsin rivers in 2012. Error bars represent 95% confidence intervals about the mean. Sample size (N angler trips) is shown in parenthesis. Significantly different groupings ($P < 0.05$) are denoted with different letters.

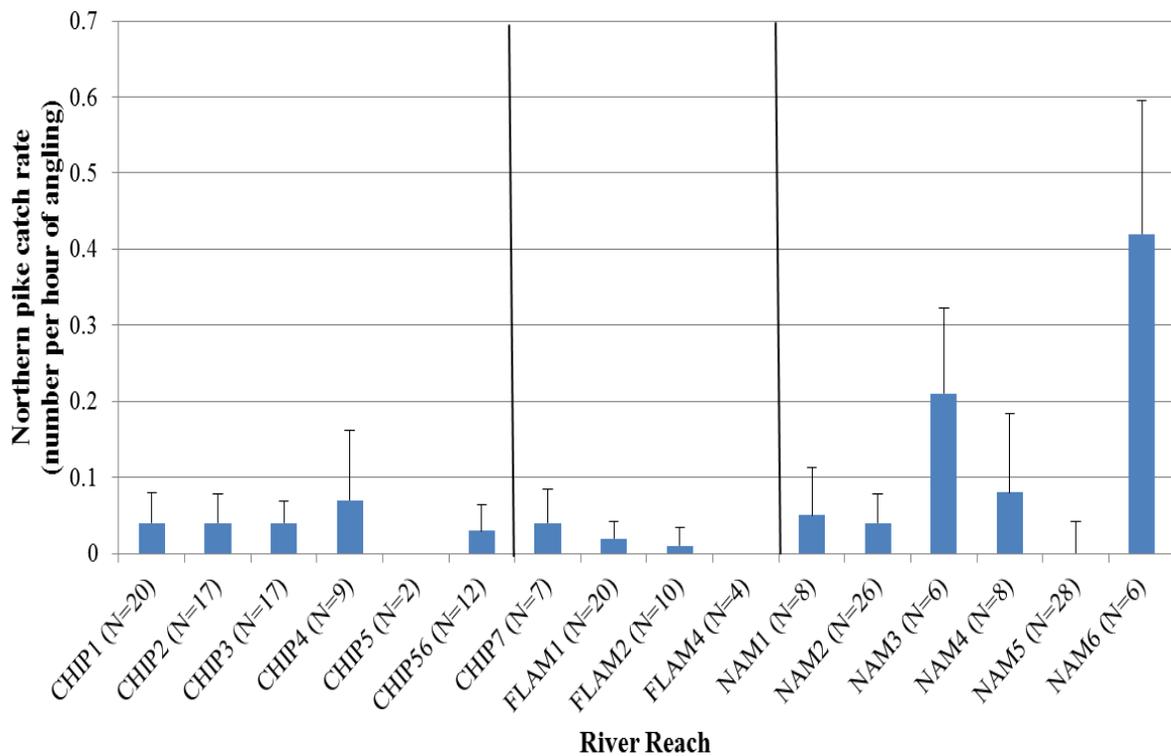


Figure 11. Incidental catch rate of northern pike by guided anglers in different reaches of three northwestern Wisconsin rivers (CHIP = Chippewa, FLAM = Flambeau, NAM = Namekagon). Error bars represent 95% confidence intervals about the mean. Sample size (N angler trips) is shown in parenthesis.

Only three walleyes and one largemouth bass were caught by guided anglers in our 2012 pilot study. This probably reflects relatively low abundance of these species during most of the fishing season, but it does not preclude the possibility of high seasonal use of these rivers by walleyes during their early-spring spawning migrations upstream from various flowages. Additional sampling will be needed to determine if assessments of the relative abundance and distribution of these species in rivers will even be possible using guided angler catch data.