INTRODUCTION

Since 1994, the Mississippi River Fisheries Team has routinely sampled juvenile and adult walleye and sauger in the tailwaters of Lock and Dams in fall using pulsed direct current night electrofishing. In contrast, most of Wisconsin Department of Natural Resources’ (WDNR) walleye sampling occurs in spring.

The earliest reports of locating walleye and sauger spawning areas in the Upper Mississippi River were conducted by Hubley in 1960 (Gebken and Wright, 1972). He collected 12 ripe males and 14 unripe female walleye in three feet of water over a sand bottom in flooded willows about 300 yards below Lock and Dam 7. In 1961, Hubley sampled for spawning fish using fyke nets and electrofishing; they found none. In 1969, Gebken and Wright (1972) collected a total of 68 (including 37 ripe males, 7 ripe females) walleye during two nights in riprap. They also recovered walleye eggs at these locations. During 1970, they found no spawning concentrations.


Outside of the Mississippi River, Priegel and Hickey (1970) documented spawning in flowing flooded marsh vegetation in the Wolf and Fox rivers of the Lake Winnebago system, Wisconsin. The Oshkosh Field Unit routinely electrofishes these marshes and adjacent backwaters. They catch large numbers during the daytime, sufficient to derive population information (R. Koenigs, Pers. Comm.). Ickes (1999) found walleye spawning principally in flooded backwater habitat. Spawning locations varied by water surface elevations; during a high-water spring, fish spawned in flooded backwaters, but during lower elevations, some spawning occurred in side channel borders.

During 2018 and 2019 we experimented with spring sampling in Navigation Pool 8. Our objectives included 1) to evaluate the possibility of comparing results with routine WDNR spring sampling, 2) to
compare Mississippi fall and spring sampling results using direct current electrofishing, 3) to determine if large numbers of walleye could be caught in the spring, and 4) to document potential spawning locations.

METHODS

During eight dates in 2018 and 2019, we used electrofishing to sample walleyes in a variety of microhabitats. During seven dates we sampled during daytime, while on May 2, 2019 we sampled at night. We did a total of 61 runs which had a mean depth of 1.7m (0.5 to 3.8m) and an average duration of 12.4 minutes (2.3 to 40.0 minutes). WDNR crews completed 41 runs in backwater or flooded terrestrial microhabitat, and 20 runs in main channel borders, secondary and tertiary channel locations (Figures 1 & 2; Table 1). We sexed fish based on gamete expression and measured them to the nearest 1 mm.

RESULTS

WDNR crews recorded similar water temperatures between years (Table 2) and flows were much higher in 2019 (77,173 vs. 158,095 cfs). We caught a total of 35 walleye and calculated a mean catch per hour (CPH) of 4.45 in 2019 and 0.73 in 2018 (Table 3). Correspondingly, the 2019 mean catch per mile (2.88) exceeded 2018 (0.73). During both years, crews caught 5.48 fish per hour in channels and 0.95 in backwaters or flooded terrestrial. ANOVA results suggest no significant difference (p= 0.1197).

TABLE 2. TEMPERATURES AND FLOWS (CUBIC FEET PER SECOND) DURING 2018 AND 2019 SPRING WALLEYE SAMPLING.

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TEMP °C</th>
<th>TEMP °C</th>
<th>TEMP °C</th>
<th>FLOW</th>
<th>FLOW</th>
<th>FLOW</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>9.8</td>
<td>4.5</td>
<td>15.3</td>
<td>77173</td>
<td>50400</td>
<td>87700</td>
<td>33</td>
</tr>
<tr>
<td>2019</td>
<td>9.4</td>
<td>4.8</td>
<td>12.6</td>
<td>158095</td>
<td>148362</td>
<td>166600</td>
<td>26</td>
</tr>
<tr>
<td>BOTH</td>
<td>9.6</td>
<td>4.5</td>
<td>15.3</td>
<td>112834</td>
<td>50400</td>
<td>166600</td>
<td>59</td>
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</table>

The highest CPH included stations 18 and 17 in the tailwater, followed by station 154 in I-90 bay, and stations 104, 1154 and 1156 located in the East Channel Bay. These stations all occurred in the far upper pool. Compared to routine fall tailwater electrofishing surveys (71.2 per hour, n=146), spring tailwater results were lower (12.2 per hour, n=9). Greater spring water depths may have influenced this difference. Night samples did not produce a significantly different (p=0.1184) catch rate (9.4 per hour, n = 6) than daytime (1.7 per hour, n=55).

Size of walleye varied between 6.0 and 23.7 inches (Figure 3). We identified a total of four ripe males. We classified all nine females as "green". We could not determine sex for 22 fish; and classified 9 as immature or spent (Table 1).
DISCUSSION

We found spring catch rates disappointedly low, especially compared to fall. Eight days of sampling produced only 35 walleye. During fall, this amount of sampling generally results in greater than 500 fish. High spring water levels, especially during 2019, limited available sampling locations. We’ve found electrofishing inefficient at depths greater than 2.5m. In the future tailwater night electrofishing may be more effective during lower flow conditions. Talbot (1982) experienced good catch rates during spring young-of-the-year sampling, but chose fall to avoid difficulties related to high water.
<table>
<thead>
<tr>
<th>DATE</th>
<th>STATION</th>
<th>WATERBDY</th>
<th>MILE UTMZ15N</th>
<th>LENGTH (M)</th>
<th>TIME HOURS</th>
<th>TEMP (°C)</th>
<th>DEPTH (FT)</th>
<th>SEX</th>
<th>REPRODUCTIVE CONDITION</th>
<th>ID</th>
<th>COMM_NAME</th>
</tr>
</thead>
<tbody>
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<td>05/02/2019</td>
<td>BACKWATERS OFF FRENCH SL., RMI 700.3</td>
<td>63981</td>
<td>481357</td>
<td>1651</td>
<td>22:10:30</td>
<td>0.3</td>
<td>11.0</td>
<td>39491</td>
<td>no fish captured</td>
<td>37738</td>
<td>WALLER</td>
</tr>
<tr>
<td>06/02/2019</td>
<td>BACKWATERS OFF FRENCH SL., RMI 700.3</td>
<td>63981</td>
<td>481357</td>
<td>1651</td>
<td>22:10:30</td>
<td>0.3</td>
<td>11.0</td>
<td>39491</td>
<td>no fish captured</td>
<td>37738</td>
<td>WALLER</td>
</tr>
<tr>
<td>08/02/2019</td>
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<td>63700</td>
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<td>11.0</td>
<td>39491</td>
<td>no fish captured</td>
<td>37738</td>
<td>WALLER</td>
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</table>

**TABLE 1. CHARACTERISTICS OF 61 SPRING WALLEYE ELECTROFISHING RUNS, POOL 8, 2018 AND 2019 (S = spent, R = ripe, I = immature, G = green/hard).**
FIGURE 1. LOCATIONS OF SPRING 2018 AND 2019 WALLEYE ELECTROFISHING STATIONS. UPPER POOL 8.
FIGURE 2. LOCATIONS OF SPRING 2018 AND 2019 WALLEYE ELECTROFISHING STATIONS. MIDDLE POOL 8.
It appears our sampling between 4.5 and 15.3° C was within documented Mississippi River walleye spawning temperature ranges. Ickes (1999) and Holzer and Von Ruden (1982) found peak spawning occurred at temperatures ranging from 7.2 to 10.3° C. Pitlo (1983) found peak egg drift at temperatures of 6.7 to 12.2° C. Von Ruden and Holzer (1984) recorded peak spawning at 6.7 to 10° C.

Other sampling gears, like fyke nets, hoop nets and trammel nets may prove more successful. Annually, the Genoa National Fish Hatchery uses fyke and hoop nets to gather enough numbers of pre-spawn walleye to meet their rearing quotas. Priegel and Hickey (1970) successfully used nets and A. C. electrofishing to catch an adequate number of fish to derive population level information and spawning characteristics.

Spring fyke and hoop netting on the Mississippi River is often difficult. Fast current and suspended and floating debris often compromise netting efficiency. Although fyke nets set in a protected location are likely to catch a small number of fish. It may be worth trying.

Biologists can sex walleye during spring. Sexing in the fall would require sacrificing fish. Therefore, spring sampling could provide more biologically relevant information, although sex ratios may not represent the population. During spring, males are more vulnerable to our sampling gears, since they remain in shallow water waiting to spawn. Females remain mostly inaccessible, because they only visit shallow water briefly to spawn and then immediately leave.

CONCLUSIONS

We captured inadequate numbers of walleye using spring electrofishing. Compared to our routine fall tailwater sampling, spring efficacy was poor. Our small catch prohibited comparisons with other WDNR spring sampling events throughout the state and identification of suspected spawning locations.
electrofishing appears more effective than spring. More effort and research may provide effective spring sampling methods for walleye and sauger on the Mississippi River.

REFERENCES USED


