1988-1999 Lake of the Woods Muskie Angler Diary Surveys

by

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Introduction

Angler diaries have been used in the past by fisheries management agencies with much success (Anderson and Thompson 1991, Sztramko et al. 1991, Younk 1992, MacLennan 1996, Armstrong 1999). This method of collecting information on a fishery has both advantages and disadvantages. It is inexpensive to run; initial costs include printing and mailing out diaries, contacting resort owners, and providing incentives for participation. Being a voluntary program, anglers are less pressured to answer questions on the spot, as with roving and access creel surveys. They can answer the questions in the diary after each fishing trip is completed. One disadvantage is angler bias. Anglers may not report unsuccessful fishing trips, smaller fish caught, or may exaggerate the number and the size of fish reported. In addition, if the anglers do not have measuring devices with them, estimates of length may be incorrect. Overall, the angler diary program has great potential as a source of biological information regarding a fishery if implemented properly and the data analyzed correctly.

The Lake of the Woods Muskie Angler Diary Survey has been run in conjunction with resort owners and fishing guides on Lake of the Woods in 1988, 1995, 1996, and 1999. It has provided information to allow evaluation of the effects of regulation changes and other factors on the muskellunge (Esox masquinongy) fishery. Owing to the variable nature of this activity, muskie angling catch data are often missed or underestimated during regular creel survey interviews. Diaries have proven to be an important source of this information.

Changes to muskie size limit regulations have occurred during the muskie angler diary program. Minimum size limits were increased from 711 mm (28 inches) to 1,020 mm (40 inches) in 1987, along with a reduction in the daily bag limit from two fish per day to one fish per day and two in possession. In 1992 the minimum size limit was raised to 1,220 mm (48 inches) and again in 2001 to 1,372 mm (54 inches) for all trophy waters, including Lake of the Woods.

Methods

Muskie angler diaries were distributed to resorts and guides on Lake of the Woods before the season opened in 1988, 1995, 1996, and 1999. Resort managers were encouraged to have their guests who were muskie anglers complete a diary after each fishing trip. Survey information included: the number and origin of anglers; date and duration of trip; whether a trip was guided or not; general location fished; number, length and weight of muskie and northern pike (Esox lucius) caught; and number and estimated length of muskie and northern pike seen but not caught. A cover letter was also sent with the diaries outlining the purpose and the importance of the information to be collected. The diaries were returned to the Lake of the Woods Fisheries Assessment Unit (LWFAU) for analysis at the end of each muskie angling season. Entries missing key information were excluded from certain analyses. Resort owners and guides who participated were sent a summary of the survey results and a muskie angler diary T-shirt as a token of Ministry of Natural Resources’ (MNR) appreciation.
Results and Discussion

Data from 1995 and 1996 were combined for the purpose of analysis due to a small number of participants in 1995. The percentage of diaries completed and returned has increased, indicating a greater acceptance of this program. Data were returned from eight resorts in 1988, 16 resorts in 1995/96, and 20 resorts in 1999. The number of muskies reported caught, increased from 273 in 1988 to 442 in 1995/96, and 932 in 1999. Angler origin has remained relatively constant. Over 95 percent of all participating anglers are non-residents from the United States with the remainder from Ontario. The number of guided trips has also increased, from 17.2 percent in 1988 to 18.6 percent in 1995/96 and 22.2 percent in 1999.

Muskies

Open season for muskie on Lake of the Woods runs from the third Saturday in June until November 30. In each of the survey years, most muskies were caught during July when most of the pressure occurred (Figures 1 and 2). Catch rates or catch-per-unit effort (CUEs; Figure 3) appeared to improve monthly through the season. Highest CUEs were observed during the late fall when fewer but more experienced anglers remained. Mean length at capture of muskies varied significantly by month in 1988 (ANOVA, F=2.90, a=0.05), but not in 1995/96 or 1999 (Figure 4).

Following a regulation change in 1987, the percent of muskies harvested decreased dramatically (Table 1) from about 36 percent in 1986 to less than one percent in 1995/96. No muskies were reportedly harvested in 1999. This trend can be attributed to a combination of increasing minimum size limits and a greater adoption of catch and release angling for muskies popularized by groups such as Muskies Inc. and Muskies Canada.

Catch-per-unit-effort, expressed as the number of fish caught per angler hour, averaged 0.043 in 1999, compared to 0.038 fish/angler-hour in 1995/96. Both values are lower than the CUE of 0.057 from the 1988 diary survey. Rather than indicating a decline in the fishery, it more likely reflects the fact that a greater number of inexperienced anglers have participated in recent surveys, drawing down the success rate.

Figure 1. Total angling hours by month from angler diary surveys, Lake of the Woods, Ontario, 1988-1999.

Figure 2. Number of muskies caught by month from angler diary surveys, Lake of the Woods, Ontario, 1988-1999.
A comparison of length at capture throughout the diary program has indicated that an increasing percentage of smaller muskies are being caught (Figure 5). Muskies smaller than 1,000 mm (39 inches) comprised 44 percent of the 1988 catch and 56 percent of the catch in 1999. Muskies in the angler diary program averaged 1,013 mm long in 1988, 970 mm in 1995/96, and 969 mm in 1999. The difference in mean length between 1988 and the other two years is significant (ANOVA, F=6.68, α=0.05). Although greater numbers of large fish have yet to be caught, it would appear that increased numbers of fish are being recruited into the fishery.

A measure of resource equality was used to further test for improvement in the fishery. Smith (1990) proposed the use of Lorenz curves and a Gini coefficient to measure resource equality, in this case how evenly distributed the reported muskie catch was amongst anglers. The Gini coefficient is calculated by taking the ratio of the total area between the actual distribution (the cumulative percent of fishing trips versus the cumulative percent of muskie caught) and a 45° line, divided by the total area under the 45° line. The more that the catch departs from the 45° line (perfect equality), the higher the Gini coefficient will be. Lorenz curves and Gini coefficients were calculated for the four years of the muskie angler diary program (Figure 6).

Table 1. Comparison of estimated muskie angling effort, catches, harvest rates, and CUE (number of fish/angler-hr) from Lake of the Woods, Ont. Estimates for 1988, 1995/1996, and 1999 based on angler diary surveys are noted by an asterisk.
Figure 5. Percent representation of total length (mm) size classes in the reported muskie angling catch during angler diary surveys in 1988, 1995/96 and 1999, Lake of the Woods, Ont.


Both the numbers of fish caught as well as fish seen were used in the analysis. The Gini coefficient has steadily declined as the reported catch has become more equally distributed among anglers. More anglers are seeing and/or catching muskies than ever before. Anglers were not asked to record fish seen in the 1988 survey, but most of the respondents provided this information anyway.

**Northern Pike**

Northern pike are the main species taken incidentally by anglers who target for muskies. Muskie angler diaries have also supplied valuable information on these fish. Changes to northern pike size limit regulations have also occurred during this program. A daily bag limit of six northern pike with only one over 700 mm (27.5 inches) was implemented in 1989. A slot size protecting fish from 700 to 900 mm (27.5 to 35.4 inches), with only one fish in possession over 900 mm, was introduced in 1999, along with a reduction in the daily bag limit from six to four fish.

The percent of northern pike harvested by muskie anglers (Table 2) has declined from a high of 84.2 percent prior to the initial regulation change to 8.8 percent in 1999. CUEs for northern pike caught by muskie anglers on Lake of the Woods have steadily increased over the course of the angler diary survey from 0.021 in 1988 to 0.057 in 1999. This may be due to a greater number of diary participants who recorded pike caught during their fishing trips and not necessarily to an improvement in the fishery. CUEs for northern pike caught by muskie anglers based on lake wide creels and muskie angler diaries declined until 1993 when they began to recover. CUEs for northern pike caught by northern pike fishermen have also gradually increased over the same period (LWFAU unpublished data).

More smaller fish are now being caught (Figure 7), when lengths at capture are compared throughout the angler diary program. There has been a steady increase in the percentage of fish smaller than 700 mm, indicating increased recruitment into the fishery. Northern pike larger than 1,000 mm were rarely
<table>
<thead>
<tr>
<th>Year</th>
<th>Effort (angler-hrs)</th>
<th>Catch (# fish)</th>
<th>Harvest (# fish)</th>
<th>% Kept</th>
<th>CUE (# fish/hr)</th>
</tr>
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<td>1983</td>
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<td>1999</td>
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<td>1,245</td>
<td>109</td>
<td>8.8</td>
<td>0.057</td>
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Table 2. Comparison of estimated northern pike catch, harvest rates and CUE (number of fish caught/angler-hr) by muskie anglers from Lake of the Woods, Ontario. Estimates for 1988, 1995/96 and 1999 based on angler diary surveys are noted by an asterisk.

Figure 7. Percent representation of total length (mm) size classes of northern pike in the reported muskie angling catch during angler diary surveys in 1988, 1995/96 and 1999, Lake of the Woods, Ontario.

Caught, while those in the 800 to 1,000 mm size range comprise less than 50 percent of the catch in each year.

Lorenz curves and Gini coefficients were calculated for northern pike both caught and seen by muskie anglers who participated in the muskie angler diary programs (Figure 8). These results suggest that pike catches are more equally distributed among muskie anglers than muskie. Although the Gini coefficient decreased from 1988 to 1995/96, it has since returned to 1988 levels.

Conclusions

Fishing pressure for muskies has been increasing on Lake of the Woods (Mosindy 1996), as has the number of muskies being caught and released. An increase in the CUE for muskies, as well as increasing equality in the fishery indicate that the muskie population in Lake of the Woods is on the rise. Although increased numbers of trophy sized fish have yet to appear in the fishery, more fish are being recruited each year. The incidental catch of northern pike by muskie anglers also is increasing, with greater numbers of fish being recruited into the fishery.

The muskie angler diary program has provided a cost effective method of gathering a large amount of information on a fishery that has proven difficult to monitor using standard assessment methods. Care should be taken when interpreting the results obtained. Due to the nature of the fishery, information is collected on only the larger fish in the population, which may bias population size structure estimates. Angler diary data, combined with information from other assessment programs (index netting, creel surveys, spawning ground and nursery habitat assessments, etc.) should be used in the management of muskie populations.

The use of Lorenz curves and Gini coefficients as population status indicators hold great promise. In a fishery that requires special skills and equipment for success, the more equally distributed the catch is among anglers of all skill levels, the better the fish population is doing as a whole. The use of this analysis, together with traditional fisheries management tools, can provide a good indication of the state of a muskie fishery.
Figure 8. Lorenz curves and Gini coefficients for northern pike from angler diary surveys, Lake of the Woods, Ontario, 1988-1999.

References


This publication should be cited as:


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51469
(01 03 29)
ISSN 1492-9996 (electronic edition)