Several marking techniques have been used by Fisheries Biologist to identify ‘lots’ of fish during future sampling events. Fin clipping is one of the easiest and the most commonly used methods because it is relatively easy compared to other techniques, very cost effective and it is easy to recognize in the field by biologists and anglers. Therefore, we used a left ventral fin clip on yellow perch to evaluate how effective it is on young-of-the-year yellow perch.

Following are some of the objectives of the study (Binkowski and Eggold, personal communication):

1. Determine if yellow perch can be effectively fin-clipped at a relatively young age.
2. Determine if fin clipping affects growth and survival.
3. Determine the regeneration percentage during the study.
4. Determine if fin regeneration has stopped during the study.

Method:

Yellow perch were raised in the Binkowski lab (UWM SFS). On 2/8/2016 two hundred 90-day old fingerlings of approximately 100 mm were selected for the experiment. One hundred of them were given a left ventral clip all the way to the base of the fin. For consistency sake, the same person from WDNR clipped all the fish. Each fish was measured (total length in mm) and weighed (g). The control group fish (100 non-fin clipped perch) were also measured and weighed in the same way, except for fin clip, and placed in a separate tank. Photographs of fin clipped perch were taken for the records. Both groups of fish were raised identically for the next 90 days. The fish were observed daily for any mortality. Data on fin clip regeneration, length and weight of perch were collected once a month on 3/7/2016, 4/11/2016 and finally on 5/6/2016.

At the conclusion of the experiment (5/6/2016) we rated each fin clipped perch for the degree of regeneration of clipped fin. We developed a rating system to place the fish into different bins based on the degree of regeneration in comparison to the unclipped paired fin. The number of perch that fell into each category was tallied. The categories included, 0 % (i.e., no regeneration was observed), 1-10% regeneration, 11-25%, 26-50% and greater than 50% (i.e., greater than the midline of the unclipped paired fin). Two people looked at each fish at the same time and arrived at a mutually agreeable category.

Results:

Finclipping results
We used young-of-the-year yellow perch approximately 100 mm in total length. At this stage they were easy to handle for processing holding with one hand and clipping the left ventral with a pair of scissors using the other hand. All the fish recovered quickly in the tank, and we did not notice any obvious impairment due to the clip. The clipping part was easy, quick and went well.

**Growth and Survival Rate**

Two hundred 90-day old yellow perch were divided into two treatment groups of 100 fish each and used in the experiment. The control group fish were measured and weighed similar to the fin clipped fish. The average length of fin clipped perch at the beginning of the experiment was 103.72mm and that of non-fin clipped perch was 105.15mm. Similarly, the average weight of fin clipped perch and non-fin clipped perch was 12.84g and 13.45g, respectively (Table 1. A). There was no statistically significant difference in the median total length (P=0.136) as well as median weight (P=0.125; Mann-Whitney U test) between the two study groups (treatments). However, the non-fin clipped perch were slightly larger than the fin clipped perch at the beginning of the study, and they maintained the difference throughout the study period which is evident in the month to month data (Table 1. B-D). In 90-day study period the fin clipped perch gained 36.28mm in total length and 16.16g in weight; and the non-fin clipped perch gained 38.85mm in total length and 19.15g in weight. At the end of the study period, the median total length of non-fin clipped perch was significantly greater than the fin clipped perch (P=0.001) and the median weight of non-fin clipped perch was significantly greater than the fin clipped perch (P<0.001; Mann-Whitney U test).

The staff in the SFS rearing facility observed both the tanks daily for any sick or dead fish. There was no mortality in either of the treatments. Thus the survival rate during the experiment was 100%.

**Fin regeneration**

Observation of fin clipped perch after one month of study showed that some fish already started to regenerate their left ventral fin that was removed completely at the beginning of the study. After 60 days of clipping the fin (4/11/2016), some perch showed significant growth of the clipped fin at various levels of regeneration. At the conclusion of the experiment on 5/6/2016 which is about 90 days post fin clipping, 85% of the finclipped yellow perch had regenerated their clipped fin to a varying degree (Table 2; Figures 1-5). About 10% of the perch had grown the clipped fin to more than 50% of the original size and nearly 50% of the perch had regenerated their left ventral fin from 11 to 50% of the original size. Only 15% of perch had no fin regeneration (Figure 6).

**Conclusion:**

The experiment was conducted on 90-day old yellow perch which were in their active growing phase. The average total length of young perch at the beginning of the experiment was 103mm. It was relatively easy to handle perch at this size. All perch
received a very good left ventral clip up to the base of the fin by an experience WDNR fisheries technician and it was clearly visible. There was no mortality of experimental perch in either of the treatments. All perch fed well in the raring tanks and grew well. The study showed that the growth rate of fin clipped perch was significantly greater than the non-fin clipped perch. In a study Coble (1967) reported no effect of fin-clipping - left, right or both ventral – on mortality and growth of yellow perch.

Within thirty days after the fin was clipped the regeneration of fin was quite apparent. The fins that started regenerating continued to grow as the fish grew. At the end of 90-day test period 40% of perch had grown more than 25% of fin size compared to the original size. It is quite possible in due time as the fish grow the fin also may continue to grow and eventually attain the original size making it difficult to identify as a clipped fin. This was evident from the observation after 130 days (as fish were being disposed) when nearly 36% of fin clipped perch had grown clipped fin more than 50% of the original size as opposed to only 10% of perch at the end of 90 days of rearing. Only 15% of treatment fish had no fin regeneration during the study. It is quite possible that the perch were clipped too early in their age and/or size.

Overall, the experiment revealed that young yellow perch can be effectively fin clipped at 100 mm size without causing any mortality or hindering growth. However, the rate and proportion of perch regenerating the clipped fin may preclude this approach from applying for future identification of stocked perch in the harbor or the lake.

Acknowledgements:

This project was conducted in collaboration with the Binkowski lab, UWM SFS. We are thankful for their cooperation and assistance throughout the study.

Literature cited:


Table 1. Following tables summarize data on 100 fin clipped perch and 100 non-fin clipped perch from each sampling event.

A.

<table>
<thead>
<tr>
<th>Date</th>
<th>L/W</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/8/2016</td>
<td>Length (mm)</td>
<td>103.72</td>
<td>6.17</td>
<td>92-122 (30)</td>
</tr>
<tr>
<td></td>
<td>Weight (g)</td>
<td>12.84</td>
<td>2.77</td>
<td>8.2-24.8 (16.6)</td>
</tr>
<tr>
<td>Fin clipped</td>
<td>Length (mm)</td>
<td>105.15</td>
<td>6.68</td>
<td>93-124 (31)</td>
</tr>
<tr>
<td></td>
<td>Weight (g)</td>
<td>13.45</td>
<td>2.96</td>
<td>8.6-22.5 (13.9)</td>
</tr>
</tbody>
</table>
Table 2. Following table summarizes the amount of regeneration of clipped left ventral fin of young yellow perch in 90 days.

<table>
<thead>
<tr>
<th>% regeneration of left ventral fin</th>
<th># perch out of 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (no regeneration)</td>
<td>15</td>
</tr>
<tr>
<td>1-10</td>
<td>24</td>
</tr>
<tr>
<td>11-25</td>
<td>20</td>
</tr>
<tr>
<td>26-50</td>
<td>31</td>
</tr>
<tr>
<td>Greater than 50</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 1. Yellow perch fin regeneration study: 0% regeneration in 90 days.

Figure 2. Yellow perch fin regeneration study: 1-10% regeneration in 90 days.
Figure 3. Yellow perch fin regeneration study: 11-25% regeneration in 90 days.

Figure 4. Yellow perch fin regeneration study: 26-50% regeneration in 90 days.
Figure 5. Yellow perch fin regeneration study: >50% regeneration in 90 days.

Figure 6. Degree of left ventral fin regeneration in young yellow perch in 90 days post finclipping.
APPENDIX – 2

**t-test – DAY 1**  
Thursday, September 22, 2016, 8:17:50 AM

**Data source:** Data 1 in Notebook1  

**Normality Test (Shapiro-Wilk)**  
Failed  
(P < 0.050)

Test execution ended by user request, Rank Sum Test begun  

**Mann-Whitney Rank Sum Test**  
Thursday, September 22, 2016, 8:17:50 AM

**Data source:** Data 1 in Notebook1

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Missing</th>
<th>Median</th>
<th>25%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TL (mm) - Clip</td>
<td>100</td>
<td>0</td>
<td>103.000</td>
<td>100.000</td>
<td>108.000</td>
</tr>
<tr>
<td>TL (mm)</td>
<td>100</td>
<td>0</td>
<td>105.500</td>
<td>101.000</td>
<td>109.000</td>
</tr>
</tbody>
</table>

Mann-Whitney U Statistic= 4390.500  

T = 9440.500  n(small)= 100  n(big)= 100  (P = 0.136)  

The difference in the median values between the two groups is not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference  
(P = 0.136)

**t-test**  
Thursday, September 22, 2016, 8:18:29 AM

**Data source:** Data 1 in Notebook1

**Normality Test (Shapiro-Wilk)**  
Failed  
(P < 0.050)

Test execution ended by user request, Rank Sum Test begun  

**Mann-Whitney Rank Sum Test**  
Thursday, September 22, 2016, 8:18:29 AM

**Data source:** Data 1 in Notebook1

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Missing</th>
<th>Median</th>
<th>25%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT (g) - Clip</td>
<td>100</td>
<td>0</td>
<td>12.550</td>
<td>11.225</td>
<td>14.375</td>
</tr>
<tr>
<td>WT (g)</td>
<td>100</td>
<td>0</td>
<td>13.150</td>
<td>11.325</td>
<td>15.175</td>
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</table>

Mann-Whitney U Statistic= 4372.500  

T = 9422.500  n(small)= 100  n(big)= 100  (P = 0.125)  

The difference in the median values between the two groups is not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference  
(P = 0.125)
t-test – DAY 90

**Data source:** Data 1 in Notebook1

**Normality Test (Shapiro-Wilk)**  Failed  (P < 0.050)

Test execution ended by user request, Rank Sum Test begun

**Mann-Whitney Rank Sum Test**

**Data source:** Data 1 in Notebook1

<table>
<thead>
<tr>
<th>Group</th>
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<th>Missing</th>
<th>Median</th>
<th>25%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TL (mm) - Clip</td>
<td>100</td>
<td>0</td>
<td>140.000</td>
<td>135.000</td>
<td>145.000</td>
</tr>
<tr>
<td>TL (mm)</td>
<td>100</td>
<td>0</td>
<td>143.000</td>
<td>138.000</td>
<td>148.000</td>
</tr>
</tbody>
</table>

Mann-Whitney U Statistic= 3668.500

T = 8718.500  n(small)= 100  n(big)= 100  (P = 0.001)

The difference in the median values between the two groups is greater than would be expected by chance; there is a statistically significant difference  (P = 0.001)

**t-test**

**Data source:** Data 1 in Notebook1

**Normality Test (Shapiro-Wilk)**  Failed  (P < 0.050)

Test execution ended by user request, Rank Sum Test begun

**Mann-Whitney Rank Sum Test**

**Data source:** Data 1 in Notebook1

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Missing</th>
<th>Median</th>
<th>25%</th>
<th>75%</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT (g) - Clip</td>
<td>100</td>
<td>0</td>
<td>28.100</td>
<td>25.500</td>
<td>32.375</td>
</tr>
<tr>
<td>WT (g)</td>
<td>100</td>
<td>0</td>
<td>31.900</td>
<td>27.400</td>
<td>35.575</td>
</tr>
</tbody>
</table>

Mann-Whitney U Statistic= 3518.000

T = 8568.000  n(small)= 100  n(big)= 100  (P = <0.001)

The difference in the median values between the two groups is greater than would be expected by chance; there is a statistically significant difference  (P = <0.001)