Surface trawl surveys to determine the abundance of juvenile American shad (Alosa sapidissima) in the Pamunkey and Mattaponi rivers, 1952 -1956

William Henry Massmann
Virginia Institute of Marine Science

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SURFACE TRAWL SURVEYS TO DETERMINE THE ABUNDANCE OF
JUVENILE AMERICAN SHAD IN THE PAMUNKEY AND
MATTAPONI RIVERS, 1952-1956

W. H. Massmann

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SURFACE TRAWL SURVEYS TO DETERMINE THE ABUNDANCE OF JUVENILE AMERICAN SHAD (ALOSA SAPIDISSIMA) IN THE PAMUNKEY AND MATTAPONI RIVERS, 1952 - 1956

W. H. Massmann

Distribution of this report does not constitute final publication.

W. J. Hargis, Jr.  October 1963
Director
Surface trawl surveys were made to obtain estimates of the abundance of young shad in the Pamunkey and Mattaponi rivers in 1952 to 1956. These surveys were made during August or September, a period when juvenile shad were large enough to be caught by trawl, yet before the onset of fall migration seaward.

The surface trawl, described by Massmann et al. (1952, Trans. 17th N. Amer. Wildl. Conf.: 336-92) was 20 feet across the mouth and 7 feet deep while fishing. The net, towed at 2 knots for 15 minutes, sampled 1.4 acres of water. Generally, two successive hauls were made in each river section. Catches from successive tows were usually quite consistent.

The rivers were divided into 5-mile sections, the first section extending from previously established station 30 (30 nautical miles upriver from the York River mouth) to station 35. The remaining sections were located in a similar manner. The area of each section, measured by planimeter, is listed in Table 1. To estimate the number of shad in each section, the number of shad captured per acre was multiplied by the number of acres of water in the river section sampled. Estimates of abundance of young shad for 5-year period are listed in Tables 2-6.

The best method of measuring abundance of young shad in Virginia rivers was by sampling with a surface trawl. Use of this gear did not result in estimates of absolute abundance, however, for young shad were present in waters deeper than those sampled by trawl. Tests with a "double-decker", a surface trawl with a second net rigged to fish just
beneath it, have shown the abundance of shad in water from 7 to 14 feet was roughly comparable to their abundance near the surface. Shad were not uniformly distributed all the way to the bottom, for conventional otter trawl tows resulted in few specimens.

Shoal areas near shore could not be sampled by a surface trawl. Seining in these areas indicated that shad were present, but were not as abundant as in deeper waters. For estimates of abundance, the presence of shad in water deeper than those sampled by surface trawl is, to an extent, compensated by their scarcity in shallow waters. Rotenone sampling in tidal tributaries of the rivers indicated that few shad were present in these creeks. Most of those captured were found at the creek mouths.
Table 1. Areas of different sections of the Pamunkey and Mattaponi rivers as measured by planimeter

<table>
<thead>
<tr>
<th>River section</th>
<th>Pamunkey</th>
<th>Mattaponi</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>985</td>
<td>805</td>
</tr>
<tr>
<td>35</td>
<td>890</td>
<td>595</td>
</tr>
<tr>
<td>40</td>
<td>865</td>
<td>780</td>
</tr>
<tr>
<td>45</td>
<td>955</td>
<td>760</td>
</tr>
<tr>
<td>50</td>
<td>1,475</td>
<td>735</td>
</tr>
<tr>
<td>55</td>
<td>945</td>
<td>195</td>
</tr>
<tr>
<td>60</td>
<td>305</td>
<td>-</td>
</tr>
<tr>
<td>65</td>
<td>185</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>115</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>6,720</td>
<td>3,870</td>
</tr>
</tbody>
</table>
Table 2. Estimated numbers of shad in the Pamunkey and Mattaponi rivers, August 15-27, 1952

<table>
<thead>
<tr>
<th>River section</th>
<th>Pamunkey No./acre</th>
<th>Estimated total</th>
<th>Mattaponi No./acre</th>
<th>Estimated total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>0.7</td>
<td>1,000</td>
<td>2.1</td>
<td>1,000</td>
</tr>
<tr>
<td>40</td>
<td>9.3</td>
<td>8,000</td>
<td>41.4</td>
<td>32,000</td>
</tr>
<tr>
<td>45</td>
<td>4.3</td>
<td>4,000</td>
<td>121.4</td>
<td>92,000</td>
</tr>
<tr>
<td>50</td>
<td>11.4</td>
<td>17,000</td>
<td>(38.9) /l</td>
<td>29,000</td>
</tr>
<tr>
<td>55</td>
<td>24.3</td>
<td>23,000</td>
<td>9.3</td>
<td>2,000</td>
</tr>
<tr>
<td>60</td>
<td>(53.8) /l</td>
<td>16,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>65</td>
<td>134.8</td>
<td>25,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>18.9</td>
<td>2,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>96,000</td>
<td>156,000</td>
<td></td>
</tr>
</tbody>
</table>

/l Mattaponi River station 50 and Pamunkey River stations 60 to 70 were not sampled on this cruise. Numbers in parentheses are estimates based on the percentages of young shad taken at these stations on cruises made in succeeding years.
Table 3. Estimated numbers of shad in the Pamunkey and Mattaponi rivers.
August 10 - September 17, 1953

<table>
<thead>
<tr>
<th>River Section</th>
<th>Pamunkey No./acre</th>
<th>Estimated total</th>
<th>Mattaponi No./acre</th>
<th>Estimated total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>0.0</td>
<td>0</td>
<td>2.5</td>
<td>1,000</td>
</tr>
<tr>
<td>40</td>
<td>0.0</td>
<td>0</td>
<td>40.7</td>
<td>32,000</td>
</tr>
<tr>
<td>45</td>
<td>31.4</td>
<td>30,000</td>
<td>601.0</td>
<td>457,000</td>
</tr>
<tr>
<td>50</td>
<td>7.8</td>
<td>12,000</td>
<td>197.5</td>
<td>145,000</td>
</tr>
<tr>
<td>55</td>
<td>24.3</td>
<td>23,000</td>
<td>67.9</td>
<td>13,000</td>
</tr>
<tr>
<td>60</td>
<td>68.3</td>
<td>21,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>65</td>
<td>171.2</td>
<td>32,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>24.0</td>
<td>3,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>121,000</td>
<td></td>
<td>648,000</td>
</tr>
</tbody>
</table>
Table 4. Estimated numbers of shad in the Pamunkey and Mattaponi rivers
August 23 - September 17, 1954

<table>
<thead>
<tr>
<th>River Section</th>
<th>Pamunkey No./acre</th>
<th>Estimated total</th>
<th>Mattaponi No./acre</th>
<th>Estimated total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>0.7</td>
<td>1,000</td>
<td>1.1</td>
<td>1,000</td>
</tr>
<tr>
<td>40</td>
<td>0.4</td>
<td>&lt;1,000</td>
<td>25.4</td>
<td>20,000</td>
</tr>
<tr>
<td>45</td>
<td>45.7</td>
<td>44,000</td>
<td>172.9</td>
<td>131,000</td>
</tr>
<tr>
<td>50</td>
<td>68.9</td>
<td>102,000</td>
<td>131.8</td>
<td>97,000</td>
</tr>
<tr>
<td>55</td>
<td>35.7</td>
<td>34,000</td>
<td>(28.5) /1</td>
<td>6,000</td>
</tr>
<tr>
<td>60</td>
<td>111.8</td>
<td>34,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>65</td>
<td>53.6</td>
<td>10,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>432.0</td>
<td>50,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>275,000</td>
<td></td>
<td>255,000</td>
<td></td>
</tr>
</tbody>
</table>

/1 Mattaponi River station 55 not sampled. Numbers in parentheses are estimates based on the percentages of young shad taken at this station on the 1953 cruise.
Table 5. Estimated numbers of shad in the Pamunkey and Mattaponi rivers, September 8 - 10, 1955

<table>
<thead>
<tr>
<th>River section</th>
<th>Pamunkey No./acre</th>
<th>Estimated Total</th>
<th>Mattaponi No./acre</th>
<th>Estimated Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1.4</td>
<td>1,000</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>0.0</td>
<td>0</td>
<td>2.9</td>
<td>2,000</td>
</tr>
<tr>
<td>40</td>
<td>1.4</td>
<td>1,000</td>
<td>4.3</td>
<td>3,000</td>
</tr>
<tr>
<td>45</td>
<td>3.9</td>
<td>37,000</td>
<td>0.7</td>
<td>&lt; 1,000</td>
</tr>
<tr>
<td>50</td>
<td>0.4</td>
<td>&lt; 1,000</td>
<td>72.9</td>
<td>54,000</td>
</tr>
<tr>
<td>55</td>
<td>15.7</td>
<td>15,000</td>
<td>(6.1) /1</td>
<td>1,000</td>
</tr>
<tr>
<td>60</td>
<td>14.6</td>
<td>4,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>65</td>
<td>57.9</td>
<td>11,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>2.9</td>
<td>&lt; 1,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>69,000</strong></td>
<td><strong>60,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

/1 Mattaponi River station 55 not sampled. Numbers in parentheses are based on the percentages of young shad taken at this station on the 1953 cruise.
Table 6. Estimated numbers of shad in the Pamunkey and Mattaponi rivers, September 24-25 and October 9, 1956

<table>
<thead>
<tr>
<th>River section</th>
<th>Pamunkey No./acre</th>
<th>Estimated total</th>
<th>Mattaponi No./acre</th>
<th>Estimated total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>0.7</td>
<td>1,000</td>
<td>2.1</td>
<td>2,000</td>
</tr>
<tr>
<td>35</td>
<td>0.0</td>
<td>0</td>
<td>8.6</td>
<td>5,000</td>
</tr>
<tr>
<td>40</td>
<td>24.3</td>
<td>21,000</td>
<td>4.3</td>
<td>3,000</td>
</tr>
<tr>
<td>45</td>
<td>65.0</td>
<td>62,000</td>
<td>22.9</td>
<td>17,000</td>
</tr>
<tr>
<td>50</td>
<td>146.4</td>
<td>216,000</td>
<td>55.7</td>
<td>41,000</td>
</tr>
<tr>
<td>55</td>
<td>31.4</td>
<td>30,000</td>
<td>(6.9) /1</td>
<td>1,000</td>
</tr>
<tr>
<td>60</td>
<td>10.0</td>
<td>3,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>65</td>
<td>7.9</td>
<td>1,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>70</td>
<td>34.3</td>
<td>4,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>337,000</td>
<td></td>
<td>69,000</td>
<td></td>
</tr>
</tbody>
</table>

/1 Mattaponi River station 55 not sampled. Numbers in parentheses are based on percentages of young shad taken at this station on the 1953 cruise.