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### The Shiner, and Its Use as a Source of Income in Worcester, and Southeastern Worcester County, Massachusetts

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THE SHINER, AND ITS USE AS A SOURCE OF INCOME  
IN  
WORCESTER, AND SOUTHEASTERN WORCESTER COUNTY,  
MASSACHUSETTS

By  
Robert William Spayne  
S.B., State Teachers College at Worcester, Massachusetts  
1953

A thesis submitted to the Faculty of Oberlin College  
in partial fulfillment of the requirements  
for the Degree of Master of Arts  
in the Department of Geography

1955

## CONTENTS

I. INTRODUCTION	
Location of Thesis Area	1
Purpose of Study	1
Methods of Study	1
Acknowledgments	2
II. GEOGRAPHY OF SOUTHERN WORCESTER COUNTY	
PHYSICAL GEOGRAPHY	
Topography	4
Stream Systems	8
Ponds	11
Artificial	11
Glacial	12
Ponds for Bait Fishing	14
Game Fishing Ponds	15
Climatic Characteristics	16
Weather	18
POPULATION	20
Size of Population	20
Distribution of Population	21
Industrialization	22
III. GEOGRAPHICAL BASIS FOR THE SHINER INDUSTRY	
Recreational Demands	26
Game Fish Resources	26
Number of Ponds	28
Number of Fishermen	29
Demand for Bait	30

IV. GENERAL NATURE OF THE BAIT INDUSTRY	31
Number of Bait Fishermen	31
Range in Size of Operations	32
Nature of Typical Operations	34
Personality of the Bait Fishermen	34
V. THE SHINER - ITS DESCRIPTION, HABITS AND CHARACTERISTICS	35
VI. STANDARD AND IMPROVISED EQUIPMENT USED IN THE INDUSTRY	41
Transportation	41
Keeping the Bait Alive	43
Foul Weather Gear	47
Types of Nets	48
SUCCESSFUL METHODS USED IN NETTING BAIT	52
Open Water Fishing	52
Ice Fishing	56
VII. ECONOMIC IMPORTANCE OF THE SHINER INDUSTRY	60
VIII. FUTURE OUTLOOK FOR THE SHINER INDUSTRY	62
IX. BIBLIOGRAPHY	69
X. APPENDIX	72

LIST OF ILLUSTRATIONS

		<u>Following Page</u>
Figure 1	Views of the Blackstone River and the Mumford River.	10
Figure 2	Views of glacial and artificial ponds in Southeastern Worcester County.	11
Figure 3	Mills that are located along the Blackstone and the Mumford Rivers.	22
Figure 4	The different sizes that native Shiners grow to in Worcester County.	35
Figure 5	A truck used for transporting live Shiners.	41
Figure 6	The type of seine that is used in Worcester County.	48
Figure 7	The Shiners' growth in relation to the length of the growing season	Appendix
Figure 8	Photographs explaining the walking method of seining as it is done in Worcester County.	Appendix
Figure 9	Views to ponds in which fishermen are trying to propagate Shiners.	Appendix

PLATES

PLATE I.	INDEX MAP OF MASSACHUSETTS SHOWING LOCATION OF THESIS AREA	3
PLATE II.	DETAILED MAP OF THESIS AREA SHOWING THE WATERSHEDS OF THE BLACKSTONE AND MUMFORD RIVERS	Appendix
PLATE III.	THE DISTRIBUTION OF PONDS RECOMMENDED FOR SPORT FISHING	Appendix
PLATE IV.	THE DISTRIBUTION OF BAIT DEALERS AND PROPAGATORS	Appendix
PLATE V.	THE DISTRIBUTION OF BAIT FISHERMEN	Appendix

## INTRODUCTION

The City of Worcester, and Worcester County, Massachusetts are quite heavily populated. This population needs recreational facilities, and a high percentage turn to fishing the many lakes and ponds in the area. As a result of this desire to go fishing, a need for Bait arises. The best all-around live bait for the game fish in this region is the shiner. Since the demand exceeds the supply, the game fishermen are quite willing to pay for their live bait. In this way a shiner fishing industry has developed, an industry which is local and peculiar to the region in which it is found.

This study is confined to the City of Worcester and Southeastern Worcester County. The stream systems studied are the Blackstone River from its source in Worcester to where it leaves Massachusetts, and the Mumford River, from where it reaches Lackey Dam to where it joins the Blackstone in the Township of Uxbridge.<sup>1</sup> The area covered east-west is approximately 20 miles, the same area being covered north-south, or a total of 400 square miles. The general altitude in the area ranges from 300 to 500 feet above sea level. The location of this thesis with respect to region described above is shown on Plate 1.

The purpose of this study is two fold:

1. To discuss and describe in its geographical setting the shiner fishing industry that is local and peculiar to this region.
2. To discuss the way in which the shiner fisherman earns his living from the natural resources that are present.

Experience in the industry for the past five summers, in the position of striker, store clerk, bait fisherman, and manager, plus personal interviews with bait fishermen and

1. In New England, the term township is seldom used. The principal town in the township gives its name to the township. If there is a village located in the township, its suffix is usually ville, for example, Farnumsville. The area normally referred to as a township elsewhere is referred to in New England by the town's name, for instance, Millbury, refers to both the town and township. In this study, if no designation is made, the area referred to is a township.



game fishermen both from the City of Worcester and Worcester County, and discussion with a fish hatchery supervisor, have formed the basis for much of the information presented in this paper.

In addition, personal correspondence with bait dealers, with the Division of Fisheries, Massachusetts Department of Conservation, with the City Clerk of Worcester, and with the license clerk for the Massachusetts Department of Conservation, has done much to supply information and statistics that otherwise might not be found.

In order to substantiate the information which was gained by experience, a questionnaire was drawn up. It consisted of thirty-five items which dealt with problems of the bait industry in Worcester County; for example, the salary earned through the sale of bait. They were sent out to all the bait dealers who held seining licenses as of June, 1954. A total of 42 questionnaires were mailed and of this number, 15 were returned, or 36% of the total. The questionnaire and a tabulation of the results appears in the Appendix to this paper.

#### ACKNOWLEDGMENTS

The author of this paper would like to offer his most sincere thanks for the capable guidance and constructive criticism given to him by Dr. Reuel B. Frost, Professor of

Geography. In addition to Dr. Frost, the author is indebted to Dr. Fred Foreman, Professor of Geology who read the manuscript, and to Mr. Lawrence L. De Mott, of the Geology Department, who also read the manuscript, and who, like Dr. Frost, gave much of his time to constructively criticizing this paper.

For assistance in obtaining original information from the Fisheries Department of Massachusetts, the author would like to acknowledge the assistance of Mr. Robert X. Tivnan, State Representative. The assistance of Mr. John Williams, a commercial bait dealer, in obtaining field experience and information is also acknowledged.

**Hammond's  
BUSINESS SURVEY MAP  
Massachusetts**

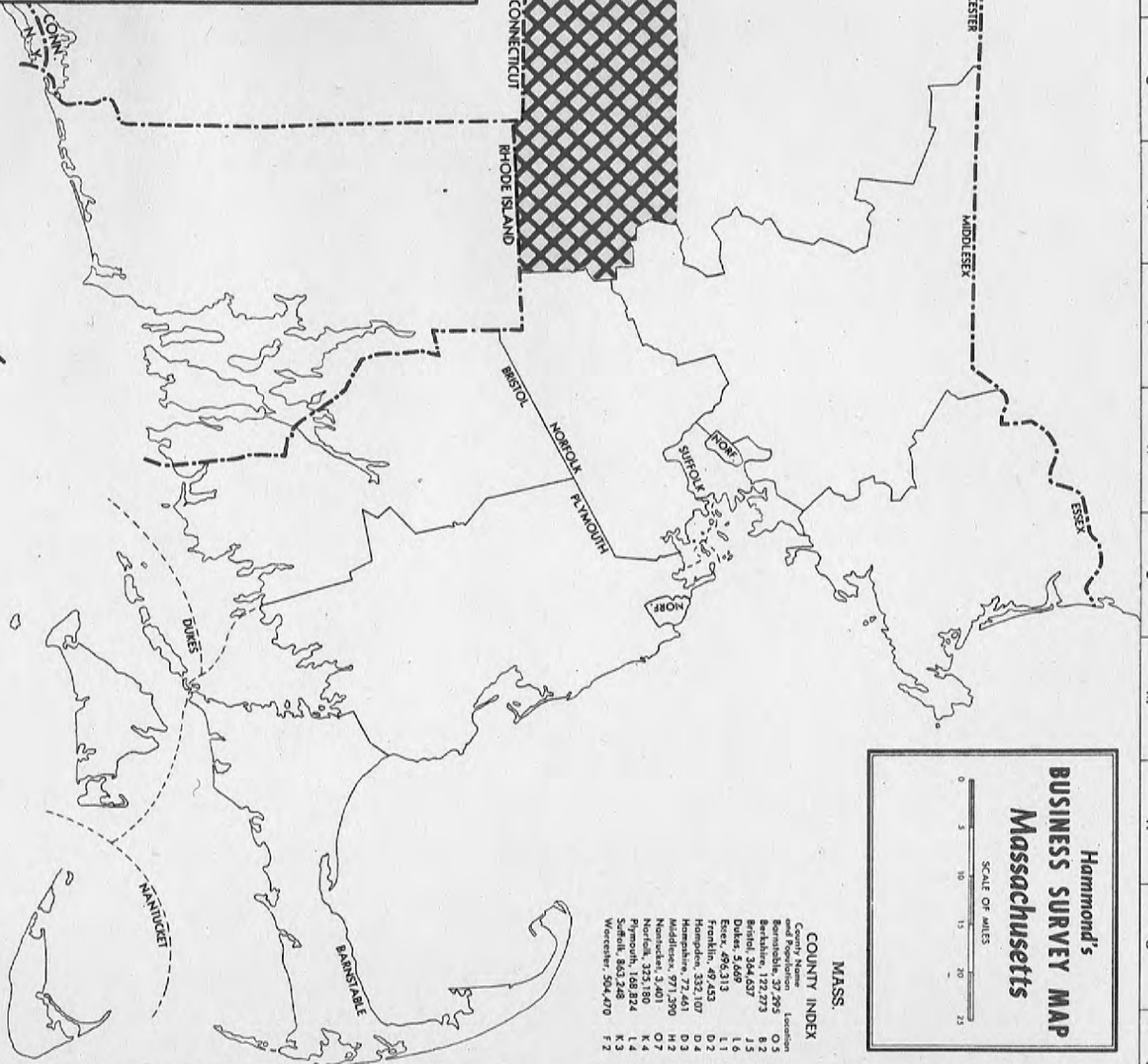
SCALE OF MILES

**MASS.  
COUNTY INDEX**

County Name	County Number	Location
Barnstable	01	1
Berkshire	02	2
Berkshire	03	3
Bristol	04	4
Dukes	05	5
Dukes	06	6
Essex	07	7
Framingham	08	8
Framingham	09	9
Hampden	10	10
Hampshire	11	11
Hampshire	12	12
Middlesex	13	13
Norfolk	14	14
Norfolk	15	15
Norfolk	16	16
Suffolk	17	17
Worcester	18	18

VICINAL LOCATION OF  
THESIS AREA

PLATE I



## II. GEOGRAPHY OF SOUTHEASTERN WORCESTER COUNTY

### PHYSICAL GEOGRAPHY

#### TOPOGRAPHY

The general topography before glaciers invaded Worcester County was one of a worn down mountain region, or what Davis<sup>2</sup> refers to as a peneplain, meaning that the area was reduced to a smooth lowland of moderate relief, close to the level of the sea. The streams on this peneplain were almost incapable of eroding and depositing, and merely meandered over the first surface.

Today, the area is a slanting upland gently rising from sea level to 1100 - 1200 feet above sea level. The surface is no longer even and continuous, but is now dissected by numerous valleys. By viewing the tops of the hills one can see an even skyline of the ancient peneplare surface. The known information infers that this area has been elevated from its former to its present altitude so as to gently slant to the south and southeast. The geological processes at work were broad warping and tilting, but not folding.<sup>3</sup> There is no known information as to why this area was uplifted at the beginning of the Tertiary.<sup>4</sup>

2. W. M. Davis, "The Physical Geography of Southern New England", National Geographic Society Monograph, (New York; 1896) p. 284
3. B. K. Emerson, "Geology of Massachusetts and Rhode Island", Bulletin 597, United States Geological Survey, (Washington; Gov't. Printing Office, 1917) p. 15
4. Davis, op. cit., p. 284

At the conclusion of the Cretaceous, the surface of central Massachusetts was a nearly continuous plain, with its rivers cut to base level.<sup>5</sup> With the tilting and warping of the Tertiary, the rivers were rejuvenated, and were able to cut deeper valleys than they could cut out previously, since they were once again seeking their base levels. The Blackstone River, with the exception of the stretch of river from Worcester to Farnumsville, and the Mumford River eroded their valleys in the early Tertiary, as soon as the uplift of the area occurred. The valley of the Blackstone from Worcester to the village of Farnumsville was eroded to base level in late Tertiary. The tributary streams of these rivers are still youthful. Singletary Brook, which flows into the Blackstone near the center of the Town of Millbury, is an example of a youthful tributary flowing into an older river. This brook drops 212 feet in 1.25 miles, or 170 feet per mile.<sup>6</sup>

The valleys of the main rivers are controlled by the variations in the rock structure. Where the rocks are hard, the valleys are narrow, and where the rocks are soft, the valleys are wide. The Blackstone Valley, on the whole, is a broad lowland excavated in weak rock. At Quinsigamond Village, in southern Worcester, an outcrop of hard rocks

5. Emerson, op. cit., p. 15

6. Preston James, "The Blackstone Valley"  
Annals of the Association of American Geographers  
XIX (June, 1929) p. 89

forms a water gap. Weaker rocks are again found south-east of Quinsigamond Village for a distance of 5 miles to the Town of Millbury, where a more resistant formation creates a set of rapids. Below the Village of Farnumsville, the river reaches its widest point, a distance of one-quarter of a mile. Finally, another resistant formation near the Blackstone, Massachusetts - Woonsocket, Rhode Island border occurs, and a waterfall is found.<sup>7</sup> It should be kept in mind that the major physical features of Worcester County were established before the glaciers.

The Pleistocene, or glacial epoch immediately followed the Tertiary period. The ice sheets which covered Worcester County moved in a south-south-easterly direction. As the glaciers crossed the county, they eroded the soil-covering from the prominent hills, leaving them denuded and barren; they steepened the South sides or lee sides of the hills; they wore down rock surfaces somewhat lower than they had been; and they broadened and deepened soft rock valleys. The ice did not have too much effect upon the hard rock hills.

In addition to eroding the land, the glaciers also deposited some of their load on the county. A thin veneer of glacial drift and glacial outwash was deposited irregularly over the surface. This distribution of debris obstructed many valleys, and thus formed numerous lakes and ponds. The streams were sometimes displaced from their

7. Ibid., p. 70

well graded channels of pre-glacial time, causing the formation of many swamps. Most of the streams today have succeeded in cutting through the glacial drift on which they flowed and have reached bed rock.

The glacier also filled the marshy hollows with rounded boulders; paved the lake bottoms and shorelines with rocks; filled the soil with heavy boulders; and left a thin covering of coarse sand or gravel the thickness of which varies from 1 - 20 feet; in some places, it barely covers the crystalline bed rocks.<sup>8</sup> A few oblong hills, known as drumlins, were deposited near Millbury and Sutton.

The Blackstone Valley served as an important line of glacial drainage for the outwash materials which left the glacier.<sup>9</sup> The melt water left an aggraded floor of sands and gravels, roughly stratified, which still remains as a broad terrace on either side of the river channel.<sup>10</sup> This terrace extended along the Blackstone River from Ironstone on the south, north to its junction with the Quinsigamond River at Farnumsville. The West River, a tributary of the Blackstone, which also runs approximately north-south has the same type of terraces along its course.<sup>11</sup>

8. Loc. cit.

9. W. C. Alden, "Physical Features of Central Massachusetts" Bulletin 760 - B, United States Geological Survey (Washington; Gov't. Printing Office, 1924) p. 56

10. James, op. cit., p. 70

11. Alden, op. cit., p. 57

No study of these terraces has been made along the Mumford River. South of Ironstone, or below Uxbridge, the Blackstone flows through a pitted, uneven surface of morainal deposits and kame terraces.<sup>12</sup>

#### STREAM SYSTEMS

##### BLACKSTONE RIVER

The Blackstone River is the largest river in Worcester County. From its source to where it leaves Massachusetts, it has traveled a distance of approximately 26 miles. The sources of the river are Stillwater Pond, and Coes Pond in the Township of Auburn and the City of Worcester respectively.

From Coes Pond the river widens out into "Middle River", as a result of the water gap at Quinsigamond Village. The river is divided in two here, but joins together in the Township of Millbury. It is joined in Millbury by waters from streams draining Dorothy Pond, and by streams having Lake Singletary as their source, the lower portion being known as Singletary Brook. In the northeastern corner of Sutton Township the Blackstone is fed by several ponds; the chief one is Stumpy Pond. Here, the river is again divided in two, since one part of it is the old Blackstone Canal, which parallels the river, and the other the original river. At Farnumsville, a village in southern Grafton, the Blackstone is joined by a string of ponds, consisting of Lake Quinsigamond and Lake Ripple, and commonly called

12. Loc. cit.



the Quinsigamond River.

At the confluence of Blackstone and Quinsigamond, a considerable sized pond is formed. As the river leaves Farnumsville, it again resumes its parallel course until it forms Northbridge Pond. Near the center of Northbridge Township the river after assuming the shape of a narrow river, broadens out into a swampy pond, to which no name has been given. It remains a narrow river after this pond through Northbridge. When it enters Uxbridge Township it widens from one eighth of a mile to one fourth of a mile, in the form of Rice City Pond. This pond is approximately two miles in length.

In northeastern and eastern Uxbridge Township, most of the stream systems of any consequence join the Blackstone. The Mumford River joins it just below Rice City Pond. The river continues for about one mile and the West River joins it. The West River starts in Miscoe Brook in eastern Grafton Township, is joined by the Warren Brook, and Centre Brook in Upton Township, flows into Pout Pond in Uxbridge, where it is joined by several smaller brooks, and finally enters into the Blackstone at a point just north of Uxbridge Center. In all, West River travels a distance of about 13 miles through four townships, Grafton, Upton, Northbridge, and Uxbridge, before it enters the Blackstone River.

After having been joined by the above rivers, the Blackstone flows due south, and is joined by Emerson Brook in Southern Uxbridge Township. About one mile north of

the Rhode Island boundary, in Uxbridge Township, the river swings to the east, then southeast in Millville and Blackstone Township. From where it swings east to southeast it widens to about one sixteenth to one eighth of a mile. In Blackstone Township, a resistant rock formation called the Milford granite of Devonian age causes a waterfall, and helps divert the river so that it first flows north, then south, to form a horseshoe bend. It leaves Massachusetts at this point. The river ultimately enters Narragansett Bay, near Providence. Through out its course, the Blackstone River has a dendritic drainage pattern.

#### MUMFORD RIVER

The Mumford River from Lackey Dam to the Blackstone, is the second river that is covered by this thesis. From its sources in Manchaug Pond in Sutton Township and Whitins Reservoir in Douglas Township to where it joins the Blackstone in Uxbridge Township it has flowed a distance of approximately 15 miles. At the junction of the streams that leave these ponds, the river flows southeast, where, in northeast Douglas it is joined by several tributary streams, causing it to widen at two points. The Mumford flows east into Uxbridge for about one half of a mile, and then abruptly flows north and widens into Lackey Dam Pond which is about one and one-half miles in length, and one-eighth to one-fourth of a mile in width. Lackey Dam Pond flows through the townships of northwestern Uxbridge,

A View of the Blackstone  
River at Rice City Where  
the River Narrows



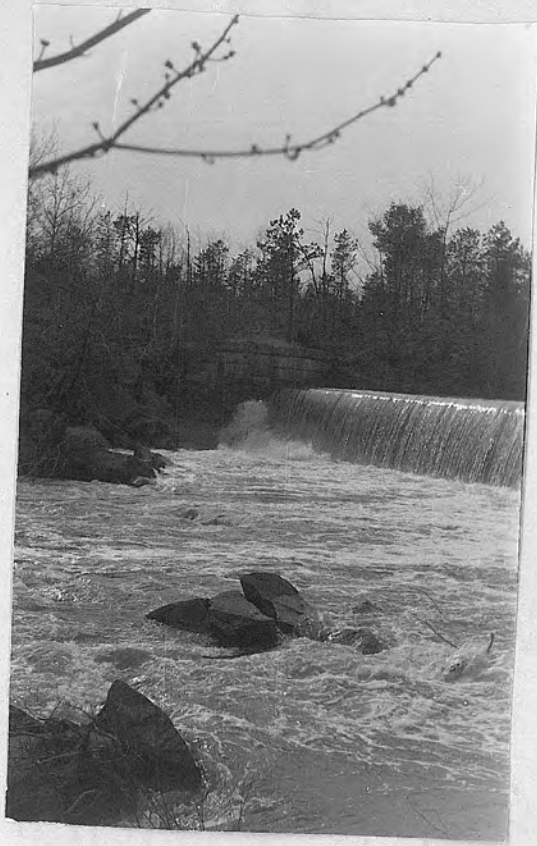
A View of the Blackstone  
at Blackstone, Mass..



Figure 1.

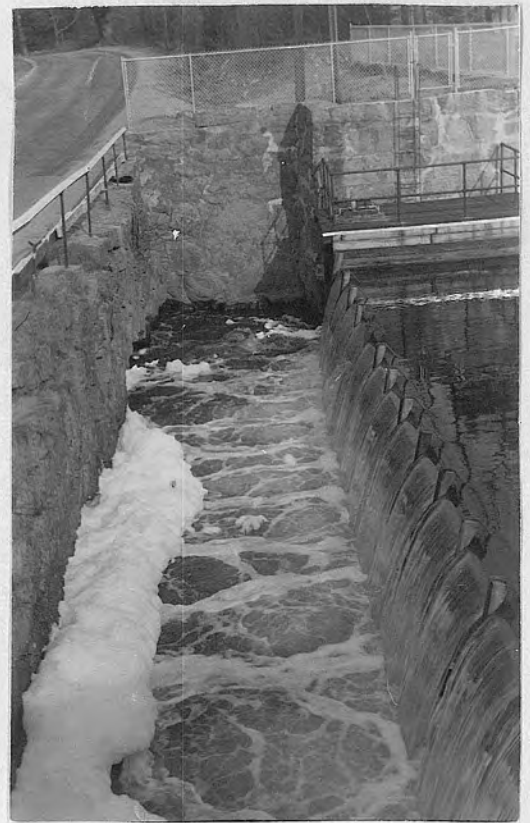
This Is the  
Dam at Lackey  
Dam Pond





A dam built on the Blackstone River at Blackstone, Mass.. Note the presence of the resistant rocks.

A lock on the Blackstone Canal at Rice City Pond in Uxbridge



A dam on the Mumford River at Lackey Dam Pond

southeastern Sutton, and southeastern Northbridge, at which point it connects with Meadows Pond. Meadows Pond is fed by short tributaries in Northbridge and Sutton, and by Swan Pond in Sutton. From the Meadows, the Mumford narrows and flows east, southeast until it reaches Linwood, and enters North Uxbridge, a village in Uxbridge Township, where it again widens, and forms a pond known to bait dealers as Domenics. Below this pond is a smaller pond, and from this place to where it joins the Blackstone, two miles downstream, the Mumford remains a narrow river. It joins the Blackstone in northeastern Uxbridge, about one mile above where the West River joins the Blackstone. The Mumford, like the Blackstone, has a dendritic stream drainage pattern.

## Ponds

### Artificial

In Worcester County, the numerous ponds and lakes were formed either artificially, or by the glacier. The names of the ponds and their locations can be found on Plate II. The artificial ponds, or man-made ponds, can be identified easily since they form a basin or reservoir for some mill or factory that is located on them. Along the Blackstone and the Mumford, portions of these rivers have been dammed to form catch basins for the river water, so as to maintain a continuous supply of water for the mills. These artificial ponds invariably have a dam, with a culvert.

Figure 2.

Rice City Pond, an  
Example of a Pond Which  
Was Built by Damming the  
Blackstone



Meadows Pond Is  
an Example of a Glacial  
Pond. Note the Rocky  
Shoreline.





These are views of artificial ponds located along the Mumford River. These ponds are fished by both game and bait fishermen.

The top pond is located in Sutton, and the other pond is Domenic's Pond in North Uxbridge.





Artificial ponds which are located along the Blackstone River. The top pond is Rice City Pond, and the one below is known as Northbridge Pond.







Two more views of artificial ponds, the top photo is a basin for the falls, formed by the pond below. The above pond is excellent for shiner fishing, while the bottom pond is a good pond for game fish.



A cross-section of one of these ponds would show, at its farthest end, a narrow, deep channel, surrounded by shallow water.

At the place where the channel joins the basin, the whole basin is of uniform depth, usually averaging fifteen to twenty feet in depth, right up to the very shore line. These ponds are quite dangerous to fish because of the deep water located next to the shore line.

In the river systems studied, the artificial ponds along the Blackstone River, beginning with Millbury, are as follows. The small ponds which have their source of water in Dorothy Pond, and which flow into the Blackstone in Millbury are artificial. Where the river joins the Quinsigamond River at Farnumsville, a large man-made pond is found. Northbridge Pond, and the swampy pond below it in Northbridge are also artificial. Rice City Pond in Uxbridge, part of the River at Millville, and again where the river assumes its horseshoe shape in Blackstone - all were made by man.

Along the Mumford River, in Douglas, where it widens into two nameless ponds; Lackey Dam in Douglas-Sutton-and Northbridge; Linwood; Domenic's and the small pond below Domenic's are the artificial ponds.

#### Glacial Ponds

Before the white man came to Worcester County, there were also many lakes and ponds. These were formed by the glacier. Some of them were the result of the glacial

debris deposited in preexisting valleys causing the normal drainage to be interrupted and partially blocked, causing them to flood into ponds. In some cases, large chunks of ice were broken from the main glacier, and buried under its debris.

As time went on, the ice melted, and kettle lakes were formed. These lakes are not very large, but are scattered throughout Worcester County. They can be identified by their Indian names, or by the extraordinary number of glacial boulders, or paved shorelines. They normally are deep ponds, with no especial system of shallows and deeps. The water is usually very clear, and they may be fed by underwater springs. In Worcester, Coes Pond, Stillwater Pond, and Middle River were either formed by the glacier or influenced by the ice sheet. In Auburn, Ramshorn Pond, or Lake; in Millbury, Dorothy Pond; in Sutton, Lake Quinsigamond; in Grafton, Lake Ripple; in Northbridge, the Meadows; in Douglas, Whitins' Pond or Reservoir. The Blackstone River, from southeastern Uxbridge to south-central Blackstone was widened by the glacier, and dammed with morainic materials. It still has its profile of late maturity. In addition to the above named ponds, there are many that do not have names, and that are also small ponds, in some cases too small to show on a map, but they are of glacial origin.

### Ponds Used for Bait Fishing

Massachusetts has a law which forbids seining in any great ponds or lakes, such as Lake Singletary, Lake Quinsigamond, and so on. These ponds actually are very poor places for bait fishing since they do not contain shiners in great enough numbers to make fishing them profitable.

The ponds that are fished in Southern Worcester County for bait are usually the dammed portions of the rivers, since the water flows more sluggishly. The bait fisherman will not normally interfere with the game fishermen, since the latter do not usually fish the artificial ponds. In Worcester, Stillwater Pond, and Middle River used to be fished continuously, but they have been unproductive for the past six or seven years. Farnumsville in South Grafton, at the confluence of the Quinsigamond and Blackstone is likewise unproductive, although it was once an excellent bait pond. In Northbridge, recent years have shown Northbridge Pond to be quite productive, and it is fished by at least six bait fishermen. Rice City Pond in Uxbridge is fished by three bait dealers. It was perhaps the best bait source for many years, but it became overfished, and unproductive. 1954 was the first year in many that any appreciable number of shiners were caught from this pond. The stretch of the Blackstone River, all through the town of Blackstone, widens considerably, and it is here that the best bait fishing has taken place in recent

years. There are only four bait fishermen who fish it, and knowledge of the area is guarded quite jealously.

Below the Massachusetts border, bait fishing is exceptionally profitable, but Rhode Island will not grant seiners' privileges to Massachusetts bait dealers, although Massachusetts allows out-of-state bait fishing.

Along the Mumford River, the first pond, (along its course) which is fished for bait, is Lackey Dam. This particular pond is excellent for spring, summer, and fall fishing, but as soon as the ice forms, the shiners seem to disappear. There are normally eight bait dealers who fish this pond. Parts of Meadow Pond are fished for bait, also. In Northbridge, besides Meadows, the two Linwood Ponds supply many shiners, especially in the spring. In North Uxbridge, Domenic's is the source of many small shiners, throughout the summer.

#### Game Fishing Ponds

Besides the bait fishing ponds, Worcester County has many excellent game fishing or sport fishing ponds. In Southern Worcester County, the following ponds are fished for food fish. Lake Quinsigamond, Shrewsbury; Lake Ripple, Grafton; Ramshorn, Auburn; Dorothy Pond, and Brierly Pond, Sutton; the Meadows, Linwood Pond, and Lackey Dam, Northbridge; Domenic's and Pout Pond, Uxbridge; are a few of the ponds bearing names. There are many, many ponds in this region which are nameless, but are favorite fishing holes. Plate III illustrates the ponds in the County that are

recommended for fishing by the Massachusetts Department of Conservation.

#### Climatic Characteristics

In order to present a fair description of the climate of Worcester County, three stations have been chosen. The first is the City of Worcester, which is located in the middle of the County, where the Blackstone River has its source, the second is Northbridge, which is located near the center of the area, between the City of Worcester and the Rhode Island border and the third is Pawtucket, Rhode Island, near the Massachusetts - Rhode Island boundary. In each case the information represents records that have been kept for the past forty years. In Worcester, the average January temperature is  $26^{\circ}$ , while the average July temperature is  $71^{\circ}$ . Pawtucket, approximately 30 miles away has a January average of  $30.2^{\circ}$ , and a July average of  $73^{\circ}$ . No data are available for Northbridge as regards temperatures. The average for the entire county is  $28^{\circ}$  in January, and  $72^{\circ}$  in June.<sup>13</sup> The range in temperatures is approximately  $45^{\circ}$  between the lowest and the highest average monthly temperatures.

Precipitation data show that all three stations have abundant rainfall distributed quite evenly throughout the year. The total precipitation for Worcester averages 39.74 inches, with the minimum amount of 2.6 inches falling in February. The maximum amount for any one month is 3.8

13. United States Department of Agriculture, 1941 Yearbook, Climate and Man, (Washington; Gov't Printing Office, 1941) p. 996

inches, and that falls in September. Northbridge has a total of 44.24 inches of rainfall, the average minimum amount recorded is 3.2 inches, falling in May and October, while the maximum is 4.1 inches in March. The final station which is representative of the area is Pawtucket, Rhode Island. Being closer to the ocean, it receives a total rainfall amounting to 45.34 inches. Its minimum rainfall, an average of 3.1 inches occurs in May and October, while its maximum rainfall takes place in March with a total amount of 4.3 inches. The monthly distribution of rainfall in the areas for these specific stations are:<sup>14</sup>

<u>Station</u>	J	F	M	A	M	J	J	A	S	O	N	D	Total
Worcester	3.1	2.6	3.6	3.3	3.0	3.5	3.5	3.6	3.8	2.8	3.0	3.2	39.74
Northbridge	3.7	3.3	4.1	3.8	3.2	3.7	3.8	3.9	3.9	3.2	3.6	3.7	44.24
Pawtucket	4.1	4.0	4.3	3.9	3.1	3.4	3.7	4.0	3.8	3.1	3.3	4.2	45.34

The precipitation in the county may be broken down by seasons, with the average total precipitation for the seasons distributed as follows:

Winter - 10.18 inches

Summer - 11.09

Spring - 10.31

Fall - 10.78 <sup>15</sup>

Approximately one out of every three days has precipitation in some form in the County.<sup>16</sup> Even with the

14. Ibid., p. 992-993

15. Ibid., p. 994

16. Ibid., p. 1,000

frequent precipitation, the sun manages to shine 50% to 58% of the time.<sup>17</sup>

The prevailing winds in the summer are west, southwest, and in the winter, northwest.

The growing season in Worcester County ranges between 160 days and 170 days. In Michigan, in 1936, Gerald P. Cooper made a study of the size of the shiner as related to the length of the growing seasons. The periods he chose were 110 to 140 days and 140 to 180 days. Worcester County would fit into the latter category. His study showed that in the first summer in the life of the shiner, in areas where the growing season was 140 days to 180 days, the shiners reached an average size of 2.2 inches. This means that they are nearly mature, or are mature at the end of their first summer in the Worcester County waters.<sup>18</sup>

#### Weather

Worcester County, located in the middle latitudes, comes within the influence of constant conflicts between cold, dry air masses flowing out of the great sub-polar region to the northwest, and the warmer, moisture bearing, tropical marine air masses from the Atlantic.<sup>19</sup> Most of

17. Loc. cit.

18. Gerald P. Cooper, "Age, Growth, and Suitability for Propagation of the Golden Shiner", Michigan Academy of Science, Arts, and Letters, XXI (1936), p. 588

19. U. S. Department of Agriculture, op. cit., p. 999



the general cyclonic disturbances, in an effort to skirt the polar front, move through this region. The results are a more or less regular succession of bi-weekly storms of snow in the winter, or rain in the warmer seasons, with intervening periods of from two to three days of fair weather, usually with warm west to southwesterly winds in summer, and cold northwesterly winds in winter.<sup>20</sup>

The topography presents varied influences within the moving air masses; for instance, in winter there is very little permanent snow cover along the lowlands near the southern coast of Rhode Island, whereas the snow increases in volume as one goes north from this point into the highlands.

Winter is usually more severe in the interior than it is along the coast. Summer heat also is more oppressive in the interior than along the coast. Since Worcester County is land locked and is approximately 40 miles from the coast, these apply particularly to it. Thunderstorms, accompanied by hail, are very common in the area, particularly in the summer.

Occasionally, deep low pressure areas pass over or near southern Worcester County, on the coast, and when this happens, severe coastal disturbances occur, the effects of which are felt in the interior of the state. Within the last 17 years, in early fall, severe storms of tropical

20. Ibid., p. 1,000

origin, usually hurricanes, have reached Massachusetts. In most cases they have been severe, since they passed over water, thereby maintaining their destructive forces. Once in a while the storms will travel over the land, and will be worn out by the time they reach this region. On September 21, 1938, the first major hurricane struck Massachusetts. Since that time, there have been several others, the most recent violent ones occurring in the fall of 1954.

Tornados, which normally occur in our south-central and western states were practically unknown in the area until the devastating tornado of June, 1953, which caused multi-million dollars in damage to personal property, and took 90 odd lives

The hurricanes and tornados as well as the day-to-day weather definitely influence the shiner industry.

## POPULATION

### Size of Population

The population of Massachusetts is 4,690,514. Of this number, one-eighth live in Worcester County, or approximately 546,401. Thirty-seven percent of this figure, or 203,486 people live in the City of Worcester,<sup>21</sup> and another 175,000 people live in the thesis area outside of the City of Worcester. Thus approximately 375,000 people live in the area covered by this study.

21. Hammond's Atlas, Ambassador World Atlas, New York, 1954 (C.S. Hammond, 1954) Appendix

The greatest concentration of people in Worcester County is located in the lowlands and the valleys. The Blackstone Valley serves as an excellent example. The following cities and towns and their populations are located in the Blackstone Valley:<sup>22</sup>

Millbury*	8,347
Wilkinsonville*	400
Saundersville**	380
Fisherville**	1,167
Farnumsville**	1,427
Northbridge*	10,476
Uxbridge*	7,007
Millville*	1,692
Blackstone*	<u>4,968</u>
Total	35,864

In the Mumford Valley, the town, villages, and their populations are:

Manchaug**	790
E. Douglas**	1,846
Whitinsville***	5,662
Linwood**	981
N. Uxbridge**	<u>2,100</u>
Total	11,379

\* - Township    \*\* - Village    \*\*\* - Town

The uplands have fewer towns, and they are usually very

22. Ibid., p. 132

small, since most of the area is given over to farms and orchards, or to pastures for the dairy herds.

### Industrialization

The water power around which so much New England capital has been invested, and about which the New England population gathers, is attributable to the glacier which covered all of the area. The glacier formed many large lakes which could be used as natural reservoirs for industry, since they would assure the plants of a continuous supply of water. The rapids and waterfalls, were due to glacial action, too, and they assured industries of a large enough fall of water to induce them to establish at these sites. Water wheels could be erected, which were turned by the falling water and which gave to the mill owner a source of power. The sites of many of the cities and towns, especially in the early history of the County were determined by the occurrence of waterfalls, not only in the small head-water streams, but also on the lower courses of the larger rivers.

Power supplied by the falling water was the mainstay of industry until the invention of the steam engine, and the Industrial Revolution. The factory towns and cities of Worcester County are peculiar in the fact that they all were located along some stream or river, at some point where there was a waterfall, and also the fact that they were inland, but not so far inland that the raw materials could

A textile mill  
located along the  
Blackstone River  
in Northbridge



Figure 3.



A small machine shop  
located on a tributary of  
the Mumford River in Sutton



A large machine shop on the Mumford River in Linwood

not be shipped in nor the manufactured goods out. As industry expanded, and more and more water power was needed, it was found that the glacial lakes were inadequate for the volume of water needed, and so the mill owner built dams along the rivers, forming large artificial lakes. These would assure him of a continuous supply of water all year long. In the Blackstone Valley there are mills located in the majority of river cities and towns. Most of them at one time depended upon the water for power. The number of mills found along the Blackstone in Worcester is four; Millbury, two; Grafton, three; Northbridge, three; Uxbridge, four; and Blackstone, four. Some of the types of the early mills located along the river were grist mills, textile mills, iron factories, paper mills, a linseed oil mill, saw mills, scythe and ax makers, makers of trip hammers, a hoe maker, several nail factories, and several potash factories.<sup>23</sup>

With the Industrial Revolution, the need for water power became nil. It now meant that a factory did not have to be located on a river or stream, but could be built elsewhere, and still have a source of power. Some types of mills, however, were forced to use water in their operations, and other mills gradually supplanted those mills mentioned above. The mills that are located along the river systems studied for this paper are primarily textile mills, where

23. James, op. cit., p. 79

the water is used in washing processes; iron and steel factories, where the water is used in cooling processes; machine tool mills, where the metals are cooled, and washed of their oil and grease; and carbo-electric plants where the water is used to create steam and for cooling the turbines for power purposes.

The City of Worcester is an excellent example of the Industrial Revolution's affects upon a town. It was originally settled for its proximity to Lake Quinsigamond, and to the waterfalls of the once beautiful Blackstone River. Worcester is today known as "the city of diversified industry", and rightly so, since it has a tremendous range of marketable industrial goods. According to the Chamber of Commerce about 10,000 different items are available for sale in Worcester. Most of them have been manufactured in Worcester. With this industrialization has come, hand in hand, an increase in problems of how to control pollution. Some of the factories that used their water rights for power have converted to better means of power, but still use their water rights to get rid of their garbage, oil slick, wool waste, or scrap, whatever the industry may be. It all goes into the river and in good time descends to their neighboring cities down river. Much of it never goes down to the next mill, but settles into the river. Several legal cases have come before the City of Worcester in the

last few years dealing with pollution. Pollution does not usually kill bait fish, but does kill game fish.<sup>24</sup> The methods used to combat pollution, once it has taken hold, are what kills off the bait fish.

About 1949, Worcester undertook a program of cleaning up the stench which had been caused by several mills in the Cherry Valley area of the city. These waters eventually flow into the Blackstone River. Before 1949, the Blackstone River area or Middle River, as it is known in that part of Worcester, and all along its course to where it flows out of Massachusetts, was one of the best bait fishing areas in Worcester County, if not in the state. Unwittingly, and perhaps innocently, the crew undertaking the removal of stench from the waters in Worcester used a poison concentration which was strong enough to poison the water for at least 6 to 8 miles of river. As far south as Millbury, the shiner was affected, and most likely in the rest of the whole river, for bait fishing became exceedingly poor from that time on. Almost any thing that swam or inhabited the waters was killed off. Nothing was ever done by the city or state to re-stock the area since the bait dealer is a relatively minor threat to political standing, while the mill owners probably exercise more control. Not only were shiners killed off, but crawfish as well. As an illustration,

24. Charles Haskins Townsend, "Our Heritage of the Fresh Waters", National Geographic Magazine, (August, 1923) p. 118



crawfish at one time were so plentiful in the Worcester area of the Blackstone that the dealers sold them for 1/2¢ each. They are now worth either 2¢ or 3¢, when they are available, which is not very often.

In the spring of 1954, about 2,000 mature shiners appeared at one of the "old fishing spots" in Middle River, to spawn. They seem to be gradually coming back into their own, not because the city stocked them, or because the state stocked them, but because an old bait dealer, who earned his living from the river, illegally stocked 5,000 pin-heads. The stocking was illegal, because the irate bait man did not seek permission from the state, but acted on his own, in the hope that one day fishing might return to the stage in which it was, prior to 1949. He was tired of having to travel 40 miles one way to catch less than he used to catch behind his own house. Pollution, can very definitely ruin the shiner fishing.

### III. GEOGRAPHICAL BASIS FOR THE SHINER INDUSTRY

#### Recreational Demands

In a County of one-half of a million people, and in a city of 203,000 people, with the total land area of the County only 1632 square miles, recreational facilities are needed. The approximate density of population is 334 per square mile in the area covered by this thesis.

Worcester County is particularly fortunate in having many different ponds which will support many varieties of

fish. Fish hatcheries are in operation throughout many of the important districts of the state for the purpose of raising fish which will be used to stock Massachusetts ponds. These hatcheries raise trout primarily, although some of them are now raising game fish other than trout. In addition to the state hatcheries, there are several private hatcheries which raise fish, chiefly trout. Nearly all of these are located on Cape Cod.

Most of the fish that are found in Worcester County are native to the region, with the exception of the brown trout, the rainbow trout, and the German carp. These fish were introduced to the area from Europe. The fish that are indigenous to the region are the brook trout, the pickerel, the small mouthed bass, the large mouthed bass, the calico bass, or crappie, the yellow perch, the white perch, the horned pout or bull head, the blue gill, and the sun fish. Several other fish, such as the sucker, the eel, the carp, and the shiner are not considered food fish, and as a result, very few anglers fish for them.

Most of the ponds in Southern Worcester County abound in yellow perch, bull heads, calico bass, suckers, blue gills, and sun fish. These fish usually form the catch of the average fisherman, who is out to enjoy himself, and to catch a few fish. The brown trout, and the rainbow trout are limited to deep ponds with clear, cold water. The only ponds in the area covered by this thesis that holds

these trout are Lake Quinsigamond, and Lake Singletary. Brook trout are found in nearly every stream in the area, but do not usually inhabit the rivers, such as the Blackstone and the Mumford, since the pollution caused by the mills make the water inhospitable. Pickerel, small mouthed bass, and large mouthed bass are found in nearly all the ponds although some ponds have more of one species than other ponds. A good example of this is Lake Ripple, and Lake Manchaug. Lake Ripple has many large, large-mouthed bass, while Lake Manchaug is widely known as a small-mouthed bass pond. It is a safe assumption that all ponds in the region have some type of fish in them, but normally the ponds that were created by the glaciers are more productive for game fishermen than those ponds that were created by man for industrial purposes, and that are still in use today. A few of the artificial ponds have been turned into good fishing waters, for instance, Lackey Dam.

There is a total number of 92 ponds in Worcester County that are recommended for fishing by Massachusetts Department of Conservation. In Southern Worcester County, there are 42 ponds recommended, and in Southeastern Worcester County, there are 20 ponds.<sup>25</sup> There are many more ponds than these in the County, for nearly every town has at least one fishing pond or stream. The ponds recommended on the

25. Massachusetts Department of Conservation, "Where to Fish in Massachusetts Ponds", Division of Fisheries and Game (Boston; 1954) pamphlet

basis that, since the state has done some stocking, they are good for fishing. This is not necessarily the case. The largest, and most popular fishing ponds in the area are: Lake Quinsigamond, Lake Ripple, Lake Singletary, Lake Manchaug, Swan Pond, Lackey Dam, Meadows, Dorothy Pond, and Domenic's Pond.

#### Number of Fishermen

This paper has mentioned the large population of the area, and their need for recreation. In the year of 1953, in Worcester County, 27,445 fishing licenses were sold. In addition to these licenses, the City of Worcester issued 12,616 sporting licenses, which are combination hunting and fishing licenses, and 7,265 licenses for fishing, or a grand total of 19,881 licenses.<sup>26</sup> In the County and the City, counting combined licenses, the total equals 40,061.<sup>27</sup> This figure represents 7.3% of the total population of the County. Since a person must be 15 years of age before he must buy a fishing license, the 7.3% represents that percentage of fishermen over 15 years. There are very many youngsters that fish also without licenses.

26. Personal letter  
Robert O'Keefe, City Clerk  
Worcester, Mass.  
March 10, 1955
27. Personal letter  
E. C. Bresnahan, License Clerk  
Boston, Mass.  
March, 1955

### Demand for Bait

The number of ponds, plus the number of fishermen in such a limited area creates a great demand for bait. There are, however, certain elements which influence the bait business, and the most important of these elements are geographical. For instance, the weather elements that influence climate are sunshine, rainfall, wind, temperature, and fog. Business in the bait industry is tremendous, provided the sun is shining, the temperature ranges between 55° and 75°, and there is a light west or southwest wind blowing. If, on the other hand, the sky is overcast, or it is raining, or the temperatures are below 40° or above 85°, or there is a fog, or a north-easter, or high winds, or winds from the northwest or north, the bait dealer experiences a definite slump in sales.

These weather elements also affect the fish. On very bright, sunny days, with very high temperatures, the fish seek the deep holes in the lakes and ponds and will not be lured by the fishermen's bait. Times of heavy rains will flood the ponds, and make fishing impossible. The rains also collect an abundance of food into the waters, upon which the fish gorge themselves, and then they will not strike the fishermen's bait. High winds also prevent the fish from feeding, and make it practically impossible for the fisherman to have any luck.

Factories affect the bait dealer also. Modern labor

regulations limit a man's working day to eight hours, creating quite a bit of leisure time. Interestingly enough, neither inflation nor depression affect the bait business. During inflation, the game fisherman has time on his hands, and lots of money to spend, so he turns to fishing. During depression times, the game fisherman has all kinds of leisure time, and while he may not have much money, the money he does have will serve a dual purpose, 1- he will be able to relax a little by fishing, and 2- he will also be able to supply food for his family. Either way, the bait fisherman gains. The geographical elements control the catch of the bait dealer also, for without a good catch, all the leisure time and money of the game fishermen mean nothing, since the bait dealer has nothing to offer for sale. As long distance travel to good fishing areas becomes necessary, the bait dealer will undoubtedly be in business for a long time to come provided a source of bait can be found.

#### IV. GENERAL NATURE OF THE BAIT INDUSTRY

##### Number of Bait Fishermen

In Worcester County, for the year 1954, the total number of shiner bait licenses issued was 43.<sup>28</sup> Since each license allows a striker, or helper, this figure,

28. Personal letter

Robert H. Johnson, Director of Fisheries (Massachusetts)  
July 27, 1954

Discusses the names of the bait dealers in Worcester County.

theoretically, would be doubled to 86 persons. Plate IV represents the distribution in the County of the commercial bait fishermen. Superimposed upon the map is the river system with which this paper deals. It shows the relationship of the river systems to locations of business of the bait dealers.

The second type of license issued is the propagator's. The total number of these licenses that were issued for 1954, was 34.<sup>29</sup> Plate II shows the distribution, in Worcester County, of both types of fishermen. The number of shiner licenses issued was 43, and the propagators' licenses issued was 34, that is a total of 77 potential bait dealers, along with a possible potential of 120 employed as fishermen. (77 combined, plus the possible 43 strikers) The number of sport-fishing licenses issued in the County was 40,061. The number of dealers 77. This means that there is only one bait dealer for every 520 fishermen in the County. The ratio is probably even higher, because not all the propagators are interested in raising bait fish. Any person licensed to fish may take shiners for bait, but not for the purpose of sale under these regulations - 1. By means of a single fish trap with openings not exceeding one inch, 2. By a single hoop, or circular net not exceeding 6 feet in diameter, 3. A rectangular net not exceeding 36 square feet of net surface. Since most of the fishermen

29. Ibid., Class 3 Propagators

do not have time to catch their own bait, or to find places where bait may be caught, they invariably buy their bait from the dealers.

The bait dealer may take shiners, provided the dealer is a licensed fisherman, and holds a special shiner license, the cost of which is \$5.00. The law limits the commercial dealer to 10 traps, openings of which are not to exceed one inch, or to a circular or hoop net, not exceeding 6 feet in diameter, or to a net containing not more than 200 square feet of net surface. These are the rules governing the taking of shiners by commercial shiner fishermen.<sup>30</sup>

Actually, there are two types of special licenses issued. The first is the type mentioned above; the second type, called a propagator's license, allows the fishermen the right to stock their own ponds with shiners. Some of the bait dealers fish full time, and depend upon the shiner for their livelihood. Most of them, however, have some type of job which they can fall back upon when bait fish becomes scarce. Some of them catch bait as a hobby, but usually they are in the business to make a profit. The largest operators in the area are those who fish full time, since they know where the schools of bait are concentrated, and since the value of the bait means much more to them than to the part time fisherman. The range in the sizes of the businesses are from individual dealers who do all their own

30. Massachusetts Department of Conservation  
"Massachusetts Fish and Game Laws"  
Division of Fisheries and Game  
(Boston; \_\_\_\_\_, 1955) 10 pages



fishing, up to the large scale operator who employs up to seven people to help him. The largest dealer in the area is located in the city of Worcester, and employs seven.

#### Nature of Typical Operations

The shiners are caught alive, and in order to be of any value, they must be kept alive. For the period in between which the dealer is holding them for sale, and until the time that they are sold to his customers, they must be kept alive. As a result, every bait establishment has some sort of holding tanks, where the bait is kept, and where the customer may see what he is buying.

When the customer has decided how many shiners he is going to purchase, he presents his shiner bucket to the dealer. It is filled with water, generally from the tank, since the bait is acclimated to the water temperatures in the tank. The shiners usually run small, medium, or large. The small ones may be called "pinheads", the medium sized shiners, merely mediums, and the large size shiners, "horses". The prices range from two cents for pinheads, to five cents for medium and large. The average price in the County is three and four-tenths cents per shiner.

The bait dealer is usually uneducated, the highest level of education attained being on the high school level. He is hardworking, industrious, and most often ingenious. He works sporadically at his fishing trade since some days

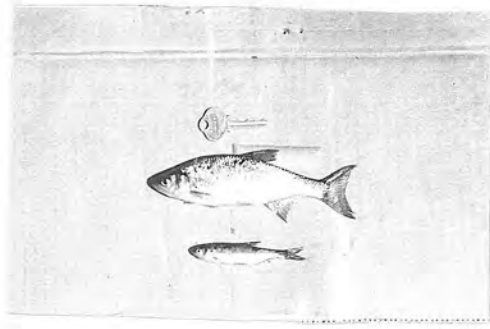
he will have enough bait to carry him over for a few days, when he can rest up, or take in some sport fishing of his own; other days he must work long hours to catch enough bait for the following day. Friday, Saturday, and Sunday, plus holidays, are his busiest days. He prepares for the weekend as early as Tuesday or Wednesday, so that he will have enough bait on hand to please even his fussiest customer. He invariably has a love of the great outdoors. He is very sincere in all he does and says, with the exception of any matter concerning his present source of bait. He will often leave early in the morning, so that no competitors will follow him. During his first winter in business, he learns that the winter with a good ice covering on the ponds is his best season for making money, but he also learns, the next summer, that with intelligent handling of the bait, the summer will be almost as profitable as the winter.<sup>31</sup>

## V. THE SHINER

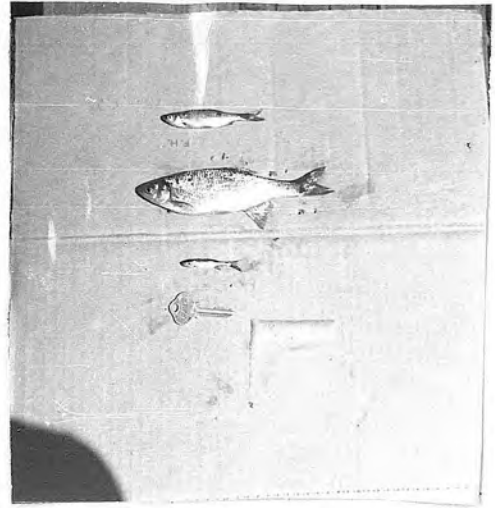
### ITS DESCRIPTION, HABITS, AND CHARACTERISTICS

The shiner is a small bait fish, usually ranging in size from one inch to six inches in length, often attaining a maximum length of twelve inches. It is a very soft-fleshed fish, giving a silver-streaker appearance in the water, and is very desirable both to the fishermen as bait

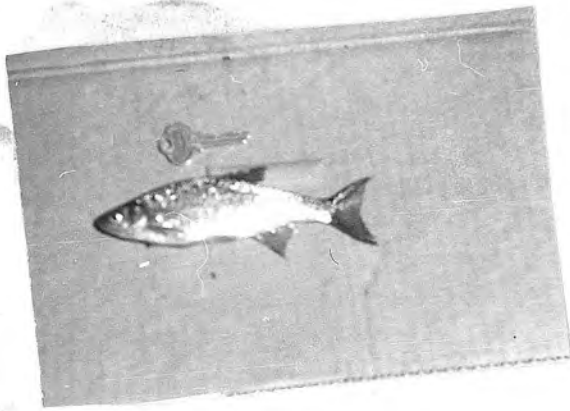
31. Two letters from bait dealers appear in the appendix to this paper. They are mentioned here, since they shed some light on the dealers' character, and personality.



A.



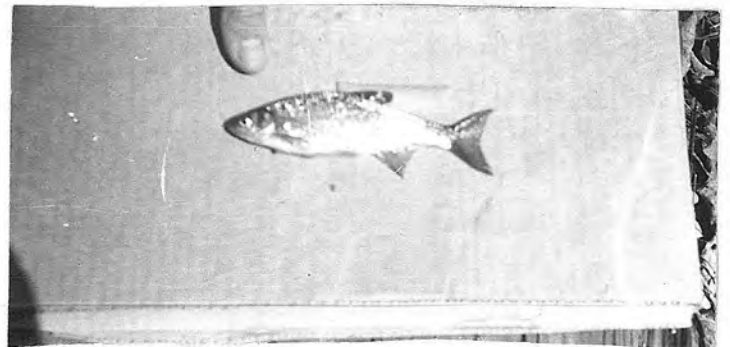
B.



C.

Figure 4.

These illustrations show the different sizes of the shiner as compared with a Yale key. B. shows the 3 common sizes, at the top of the photo, a 3 inch shiner, in the center, a 6 inch shiner, and at the bottom, a 2 inch shiner. Photos A., C., and D. show other sizes.



D.

and to the game fish as food. The body is thin and flat from side to side, and deep from dorsal to ventral. The adult is often golden in color, the majority of the golden-colored shiners being male. The scales are loose, especially in summer, or in warm-winter waters. The scales are plainly visible. Its mouth is small and upturned, having no barbels. The base of the anal fin is long, containing more than the customary 7 to 8 rays. The dorsal fin is located far behind the pelvic fins, both dorsal and anal fins being sharply pointed. There is usually a sharp ridge or keel on the belly between the pelvic and anal fins. A lateral line curves downward and follows the ventral body contour.

The golden shiner is widely distributed throughout the eastern United States and westward to the Dakotas and south to Texas. The western form Notemigonus crysoleucas auratus is most common west of the Allegheny Mountains and north of Arkansas. This species prefers lakes but is also common in the quiet sections of some of the larger rivers, frequenting well-vegetated bays and shoals. The species which this thesis will treat is Notemigonus crysoleucas crysoleucas, an eastern species of the Western golden shiner. Colloquially, the shiners are often referred to as flats, minnows, horses (in the case of large shiners) or pin-heads for those about one inch in size.

The golden shiner has a long spawning season which usually extends from May to August, each individual spawning either twice or three times in that season. The eggs are

adhesive, and usually stick to plants, although they are commonly scattered over filamentous algae, and less frequently over roots of aquatic plants. Under proper conditions, the shiner will reach saleable size in the Autumn of its first year. The species may mature in warm areas in 1 year at a length of 2-1/2 inches, but will usually reach maturity in its second year. Members of this species have been known to live 8 years. In Michigan and Iowa this species has been produced at a rate of more than 200,000 per acre in fertilized ponds. In the state fish hatcheries at Palmer, Massachusetts, 500,000 have been produced in a one acre fertilized pool. These fish were not raised for sale purposes, but as a source of food for the game fishes which are propagated there.<sup>32</sup>

The golden shiners, are omnivorous. Its young feed on algae and entomostracans. The adults have been known to eat young fishes, insects, plankton, crustaceans, protozoans, algae diatoms, and mollusks. In an inter-state survey of shiners' stomachs, some stomachs contained nothing but plankton; others 95% algae; a few had more than 75% amphipods.<sup>33</sup> A more detailed study showed the following food percentages;

32. Edward Griffin, Superintendent of Palmer Fish Hatchery  
Personal interview  
April 14, 1954

33. J. R. Dobie, O. L. Meehean, and G. N. Washburn,  
Propagation of Minnows and Other Bait Species  
(Washington, D.C.; U.S. Government Printing Office, 1948)  
p. 99

insects	35.0%	mollusks	1.9%	
plankton	28.5%	arachnids	1.4%	
algae	13.8%	bryozoans	1.4%	
plants	5.3%	rotifers and		
amphipods	0.4%	protozoans	0.2%	
		crustaceans	12.0%	34

During the spawning season, the shiners seek out the shallow, weedy areas, where food is abundant, and where the eggs can be laid in warm water, as well as the areas having the greatest amount of vegetation. After spawning, the shiners take to the running water which has more oxygen content, is cooler, and will have more food both on the surface and in the water.

In the winter time, the shiner seeks out the well protected coves. Usually it will not stay in the swift waters, since the calm waters in the winter time will have just as much oxygen content as the main river. Many times they can be located just at the edge of the running waters, in the coves, for food is most abundant there.

The shiner has very many natural enemies, the major one being the game fish. Under this heading would be the following fish in Worcester County which make the shiner part of its diet. The brown trout, the rainbow trout, the brook trout, the pickerel, the small mouth bass, the large mouth bass, the calico bass, and the yellow perch are all considered game fish by the average fisherman. The horned pout, or bull head, while not considered a game fish by many, will feed on shiners. Many times, especially in early

spring, when a mixed catch of pout and shiners is made, the pout can be seen gorging themselves on shiners in the net. The kingfisher heads the list of birds which are the most injurious to the shiner. They can be seen diving along the shorelines of rivers and ponds where shiners are present. The crane and the blue heron also feed upon shiners, although not to the same extent as the kingfisher. Besides taking their share of shiners from the ponds, the kingfishers and herons are parasite bearers. The kingfisher distributes the black grub, while the heron distributes the yellow grub. Some species of ducks as well as gulls will also feed on shiners.

Perhaps the worst enemy to the shiner is the snapping turtle, which, as an old wives' tale puts it, "is obliged to eat its own weight in fish, every day, in order to survive". The turtle is vicious, and will lie camouflaged on the river floor, suddenly striking out at a shiner as it swims along the river bottom in search of food. Fishermen have found halves of shiners floating about on the surface which have been severed as cleanly as if cut with a cleaver. Occasionally shiners minus tails are found floundering about on the surface. In the water the turtle swims swiftly, but on land, where it must go in order to lay its eggs, it is slow, clumsy, and awkward.

Snakes are another predator which can diminish the shiner population of any pond or river. A large percentage of the food of the common water snake and some garter snakes

consists of fishes.

Within the last year, another enemy to the shiner has appeared in the Blackstone River Area; otters. The otter is a sleek looking animal which thrives on fish. Within the last year, 5 different otters have been seen in the Blackstone area of the Blackstone River. Since their main diet is fish, they have been continuously raising havoc among the shiner schools of that area, and as a result, keeping the fish in the deeper waters, where the shiner has more room to escape. The bait fisherman cannot legally use equipment which would allow him to catch suitable quantities in water such as this, which runs an average of 16 feet in depth.

Floods are another menace to the shiner stock. In the 1938 hurricane, which hit Worcester County severely, every pond became a lake, and every river a torrent of flood water. Many of the shiners, especially the smaller ones, seem to have been carried from the county, and deposited in Rhode Island. While there is no definite proof of this actually happening, the fact that the bait dealers, after the waters had subsided to normal, could not catch bait in the places where previous to the hurricane the bait was caught, seems to be evidence enough. Fishermen in Rhode Island, on the other hand, experienced better fishing.

The most recent hurricanes of September, 1954, made the waters in this area abnormally high. Since fishing in



these high waters would mean endangering the bait fishermen's lives, most of them suspended their operations until the waters resided to more normal conditions. The game fishermen experienced excellent fishing, and the demand for bait forced some of the more courageous bait fishermen to seek the shiner schools. The shiner schools were difficult to locate, since they had so much freedom of water. The bait dealers who were fortunate in catching bait, found a ready market.

The bait dealers have one goal, and that is catching the shiners. How they catch them, and how they treat them will greatly affect the future potential of the region.

## VI. THE STANDARD AND IMPROVISED EQUIPMENT USED IN THE INDUSTRY

### Transportation

The equipment which is used in the shiner industry is quite specialized. The first equipment to be discussed will be that which deals with the method of transporting the live shiners. This includes transportation from the time the shiner is caught, until it is unloaded into the tanks. Usually the larger bait dealers are the ones who own the trucks. In the study conducted for this thesis, 20% of the dealers who answered the questionnaire, owned and operated tank trucks. One had the use of a tank truck, one used a tank trailer, one used a beach wagon with a tank, and six used their cars. Personal observation, however,

Figure 5.



A truck used for transporting live shiners.



An inverted steel tank used for hauling shiners.

would contradict this finding, since at least three other fishermen own and operate tank trucks, and at least three owned tank trailers. The purpose of the tank truck is to hold shiners or keep them alive in transit, from the time they are caught, until they can be placed in the holding tanks in the dealer's establishment.

A gravity-flow pump is often used on the tank by the dealer, since it will continually supply running water, and as the water passes through the air become areated, supplying oxygen to the shiners. These pumps cut down the mortality rate, in the summer, by as much as 97%.

Most bait dealers have boats, and of those who returned their questionnaires, approximately 70% own boats. The type of boat which is usually used is the row boat, although some bait dealers do use canoes. The row boat is much more common, since it is less dangerous. In order to assure lively bait, the dealer usually has some sort of cage made. A cage is a box which sets down either part way in the water, or is completely submerged, and is usually made just from lumber and screen. It allows the passage of the river water through it, and in this way, after the shiners have been netted, they are placed in the cage, where they have the identical water in which they were raised. This eliminates the necessity of running back and forth to the truck tank after each pull of the seine. At the end of the day, they are placed in the truck tank. There are two types of cages used, depending upon whether the dealer is

going to use the cage for a few hours, or for a few days. The immediate use cages are small, while the cages used for future storage are quite large. While the immediate use cages are successful, the future use cages are unsuccessful.

#### Problems in Keeping the Bait Alive in Holding Tanks

Perhaps the next greatest problem after catching the shiners is the problem of holding them in the store where they are to be sold. This involves holding tanks, a continuous supply of water, proper netting of shiners from the tank, the stocking of the tank, the regulation of the tank temperature, and finally the cleansing of the tank.

These holding tanks are generally made of concrete or galvanized iron or steel. Occasionally, a dealer will use a wooden tank. The shiners need a continual supply of oxygen, and fresh water while they are held in these tanks. The dealer who lives on a lake or pond has the advantage of having a natural source of water for his bait, and normally has a screen tank which utilizes the pond water. For those dealers who do not have this advantage, their best plan is to have well water flowing in their holding tanks, since the chlorination of the city water often proves fatal to the shiners.

In the wintertime, when the water contains more oxygen, it is possible to hold a great number of shiners in the holding tanks. There is no set gauge as to what would be an advisable number for a tank of such and such

proportions. Probably the only way a dealer can know if he overstocked his tank is to notice the increased number of fatalities. When a tank is overcrowded, nearly all the bait will try to rise to the top to take the oxygen from the air. Since they cannot receive enough oxygen in this manner, they will roll over on their backs, and in their struggle will flip violently about in the tank. When this happens, the dealer must increase his incoming water until he can relieve his tank of some of its contents.

A few dealers recently have attempted to supply the summer demand. Up to five years ago, very few bait dealers sold shiners in the summertime, principally because the bait would not stay alive, and dead bait is valueless. Unfortunately there are many more fishermen who fish with live-bait during the summertime, and the dealers who did manage to keep some survivors found a ready market. They could sell as many as they could catch. But of the 5,000 a day that they caught, 500 would live to be sold. Out of that 500, doubtless many died in the fishermen's buckets. On cool days, if the dealer made a good catch, many more would survive. Most of the dealers who only caught bait during the wintertime, decided that they could not afford to lose their winter business to the dealers who were mercenary enough to sell bait during the summertime. Many of the summertime customers would stay with the same dealer on through the winter. The fact that shiners caught many

more big fish in the summer helped to increase the summer dealers' business.

The problem confronting the conscientious dealers who began to fish bait during the summer months, was how would fishing in the summertime affect the following winter's catch? A second major problem was how could they improve their fishing methods or equipment to prevent such losses? Some of the answers to these questions applied directly to the holding tanks, for only in these tanks did the fishermen see the bait, and if the bait was not lively, they would refuse to purchase it.

The summer bait dealer found that the majority of the catch would consist invariably of "pin heads", or that particular summer's hatch, and "horses", or bred stock, and were usually females filled with spawn. The medium-sized shiner, which is the average sportsman's choice, was seldom found in any large numbers during the summer months. The bait dealers, for the 200 or 300 medium-sized shiners, would often take the whole net full. Even though there was not a great demand for small and large shiners, they would be sold eventually, if they did not die first.

Some of the dealers found that the bait, having acclimated itself to the warm waters, and, in turn, become soft-fleshed, and had to be "babied". It had to be placed very gently in the truck tanks, had to be netted very gently from the truck tanks to the store tanks, and from the store

tanks into the fishermen's buckets. Rough handling would account for a high fatality. The golden shiner is the most difficult shiner to handle at any time of the year.

In the actual seining of the bait, the dealer, after having made his catch, had to take the net out into the deeper water, where the temperature of the water would be lower, and where the shiners would have more room to move around. Many times, the seiner found that his net mesh was just a little too small to keep all the shiners in, for the tiny pin-heads would gill themselves, and consequently die.

With better handling methods all around, the number which died decreased, but the problem of the optimum number is still unsolved. A tank, that the winter before, comfortably accommodated 10,000 shiners will in the summertime hold only 1,000 or 2,000 at the most. Some days the dealer may sell 2,000, other days 3,000, some days only 500. Very often a fisherman will ask the dealer if he fed the shiners in his tank. This has been suggested as one way in which shiners could be kept alive for longer periods of time in the holding tanks.<sup>35</sup> In similar cases, bait has lived as long without food, as it has with food.

35. In Circular 12, of the United States Fish and Wildlife Service, Propagation of Minnows, the author says: "Minnows that are held for a few days must be fed.... minnows will eat a variety of foods, but the most practical are those that are easy to handle, and convenient to store. The food should appeal to the fish so that it is consumed fast enough to prevent undue contamination of the tank water. Oatmeal and cottonseed meal are satisfactory foods."

Once a tank becomes cloudy, or appears to be dirty, it should be drained, and thoroughly scrubbed with a mixture of three to five quarts of bleach water to every 250 gallons of water. After being well rinsed, the tank can then again be filled. All the dead bait must be picked out before it is scrubbed.

#### Foul Weather Gear

Since the fisherman must fish in all kinds of weather, in order to make a living, he must have some kind of protection from the elements. In the warm days of summer all he needs is his waders. But when a thunder storm or north-easter appears, he must have protection. About the best type of protection is what is known as a "hood". The "hood" is made of water-proof canvas, and is a large jacket, with a draw-string at the center. It is worn over the waders, so that the chest waders come up inside the jacket, overlapping each other. To the jacket is attached a hood which, like the waist of the jacket has a draw string, enabling the fisherman to draw the hood close about his head. A zipper, or clips usually extend about six inches from the throat down toward the base of the jacket to allow some "give" to the shoulders. The sleeves are longer than usual, and are so constructed, that they have snaps which can be interlocked, thus preventing rain, or cold air from crawling up the sleeve. Unfortunately, these "hoods" or



"parkas" can become awfully warm on the inside, and the wearer is apt to perspire profusely. In the wintertime, they serve as excellent wind breakers, and are quite warm. They are a wise investment for bait fishermen who must fish in inclement weather.

#### Types of Nets Used in the Industry

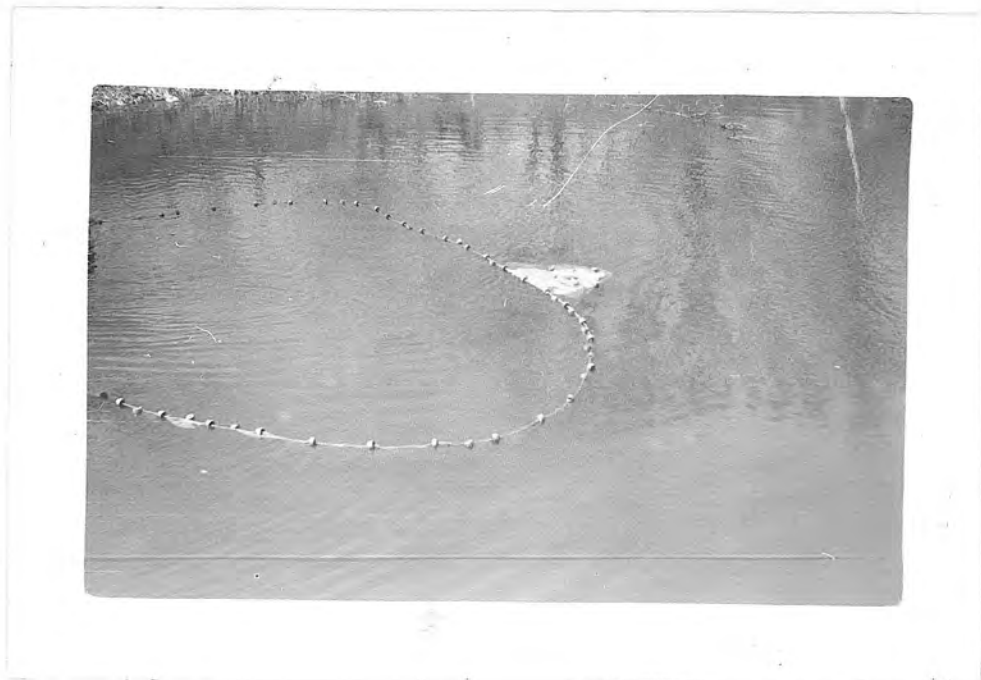
The four major types of nets which are used in this industry are the seine, the drop net, the square net, and the trap. The seine is the one which will be discussed first, since it accounts for the most shiners caught. A seine is comparable to a fence. It is rigged so that it is actually a water fence. Heavy floats at the top keep it level with the water surface, and heavy sinkers at the base tend to hold it down along the bottom of the pond. The central portion of the seine is known as the "bag", and stretches out beyond and behind the two forward pieces, which are called wings. The "bag" is completely surrounded by netting, while the wings are perpendicular to the pond or river bottom. The fisherman tries to "herd" the shiners from the wings into the bag, where they are captured.

The material which goes into the making of the seine is usually linen, although some cheaper ones are made of cotton thread. Some fishermen make their own seines, and when they do this they usually have a superior net which will last several years. It also takes a long time to make it. The modern fisherman buys his nets ready made. The



Figure 6.

The top photo shows a seine being carried from the pond at the end of a day of fishing. The photo below illustrates a seine in use, showing the type of seine which is used in this area.



material is woven, but knotted, and is quite strong. In Massachusetts, the law limits a seiner to 200 sq. feet, so when ordering his net, he must give the proper dimensions. The area of the bag is not included in the 200 feet, but the top of the bag is. For instance, a dealer could have a net made with wings 48 feet long and 2 feet thick. Thus the total length of the wings would be 96 feet x 2 feet, or 192 square feet. The top of the bag could be 4 feet giving the legal 200 square feet, but the area of the bag itself would be 100 square feet or 25 feet trailing behind, as long as the 4 feet were not violated.

The mesh sizes for the seines are usually  $1/10$  of an inch,  $1/8$  of an inch,  $1/4$  of an inch, and  $1/2$  of an inch. The  $1/8$  inch and the  $1/4$  inch meshes are usually the most popular. No matter what size of mesh is used, however, the dealer always runs into schools of bait that are a little too small for the size of the hole, but just a little too large to escape entirely. This is especially true in the summertime. As a result a great many pin-heads are killed through no fault of the fisherman.

The color of the seine is quite important. Also the treatment given to the net both before the purchase and at the end of the fisherman's day. Some net makers are inclined to supply the net material or the finished net, untreated, and a bright glowing white. White nets just do not catch the shiners. The net company at Gloucester,

Massachusetts, will barktreat the net, thus promising it a longer life and also dyeing it a dark brown. These dark brown nets, when placed in the water, are quite inconspicuous. The white nets are worthless unless the fisherman has dyed them himself.

The drop net is the type of net which is usually used during the ice-fishing season. It is a round net, consisting of very fine mesh, and a heavy wire hoop forming its circumference. To it is attached a rope on both sides. It is then lowered through a hole in the ice. It is baited with small pieces of bread dough, and then the ropes are pulled outward, and the net is hoisted to the surface. Two men must be used, since the net must come to the surface horizontally. If it is tipped or tilted at all, the shiners will be pushed out of the net and released. Although the law allows the bait dealer 200 square feet for his seine, he can only use a drop net with a six foot diameter. A net of this type will never be too large, since the larger the net is, the more awkward and difficult to manage it becomes. A net with a 6 foot diameter is about the largest size that is used. These nets are not manufactured, therefore, the dealer must make his own. He can buy the netting all right, but he must construct his own hoop, and he must sew the strips of netting together. After he has done this, he must attach them to the hoop, leaving a central pocket for the shiners to slide into, after he has raised the net to the surface.

A third type of net, and one which is used extensively, is the square net. This type of net is composed of strips of netting sewed into a square. The square may be 8, 10, 12, or 14 feet. The most common size that is used is the 10 footer. After the strips of netting have been sewed into the square, the netting must be tacked on to a stronger rope which serves as the perimeter of the square. To the four points of the square are sewn metal rings. The net is now complete, but in the case of square nets there are also other important parts that must be considered. This net is more complex than the other two types of nets mentioned.

Other parts of the square net which are essential are the bars, the cross piece, the pulling rope, and the pole. The bars are steel, and are about  $\frac{3}{16}$  th's to  $\frac{1}{4}$  of an inch in diameter, and 4 to 5 feet in length. They have spring clips fastened to them, and as such, serve as connections between the bar and the net. The other end of the bar is fitted into the cross-piece, which consists of 4 hollow tubes, welded together, in the form of a cross, with a ring placed in the center. The bars are placed in these tubes, and are held in place by friction. The cross-piece is attached to the pole by means of a piece of heavy hemp. The pole can be either metal or wooden. It is used to project the net out from where the fisherman is to the desired place in the water.

There are on the market today several types of traps for the catching of bait. The most common type is the wire

mesh trap. The shiner trap is cylindrical in shape. It is about 3 feet in length, with a diameter of 12 to 26 inches. The size of the opening into the trap is regulated by the state of Massachusetts. The openings may not exceed 1 inch in diameter. The trap is so devised that once the shiner swims into it in search of the food which is located in the trap, it can not find the opening which leads to freedom. These traps have to be checked every 2 or 3 days, since the fish will often die from lack of oxygen and swimming area if allowed to stay in the traps too long. Approximately 15% of the dealers who answered the questionnaire used traps. They are not very popular.

## SUCCESSFUL METHODS IN NETTING BAIT

### Open Water Fishing

This paper has already mentioned the many types of materials and items necessary for the bait-fishing industry, but all these materials are useless if the dealer does not know how to use them to the best advantage. The major geographical factor that influences the methods used is the climatic, since it affects water conditions to the point where the equipment and methods are peculiar to the season. The dealer must use specialized equipment and methods for open water fishing and also for ice fishing. In the case of seining, there are some methods which are fine sometimes and in some ponds, when other methods may fail. Some methods may fail in some ponds, but may be

successful in other ponds. The methods which catch the greatest amount of bait fall into 3 general types.

1. the walking method
2. the quick pull method
3. the baiting method.

Only one method, the walking method will be described in detail.

The walking method is dependent upon two major factors - the fisherman must find a dead-end cove, and the water depth must not exceed the depth of the net. There are, of course, other minor factors, such as the presence of stumps on the bottom of the cove, since some of the artificial ponds were once forests, whether it is sandy or muddy, the presence of junk which will rip the net, and finally, the length of the cove. Two men are necessary, and a boat can or can not be used, depending upon the size and depth of the cove. The first time the cove is fished the boat should be used, but after that time, the fisherman should know enough about the cove and its depth to be able to decide whether a boat is necessary or not. In most cases it might prove advantageous to have the boat along. The width of the cove, when possible, should not exceed the length of the net, for very often the shiners will escape through a very narrow opening left behind one of the fishermen.

The net is placed on the back of the boat, in such a way that it can easily fall off the back, with the bag flowing out behind the wings and forming a place into which

the frightened shiners can swim. The striker walks out into the water whenever the boatsman does not think he has enough net to cover the cove. Ropes may be tied to the poles on the seines, if the water proves too deep for wading. They should be retrieved as soon as possible, and the end of the net procured by the fisherman. He should endeavor to hold the seine-pole tilted to an angle of about 60° with the bottom of the cove. The two men then proceed to walk toward the shore end of the cove. The bait is pushed into a position from which it can not escape. After the seine has been drawn into a rough circle, the fishermen begin to pull the net in, so that the shiners will leave the wings of the seine, and swim into the bag. When the fisherman reaches the sinkers, which are used to mark the bottom of the bag, he pulls this part up quickly, and the shiners are trapped in the bag. This has to be done rapidly, but also smoothly, so that the shiners will not be injured. If the water appears to be too shallow for the contents of the bag, the fisherman must walk the bag out into deeper water, where the bait is free to swim about. The water usually has more oxygen and a lower temperature farther out, than at the far end of the cove.

This wading method is most efficient in the early spring, in the early fall, and in the winter. It is during these periods that the shiners gather in large schools, and seek the safety of the coves. In the early spring the



shiner schools seek the coves to spawn in the fall, along with the summer hatch, they swim into the coves in search of food for the new shiners. In the winter, the shiners seek the quiet, calm waters of the coves in preference to the turbulent, turbid icy waters of the river systems to which they belong. During the summer months, however, as soon as they spawn they leave the coves and swim out into the rivers, where the waters are cooler, and cleaner. For this reason, the fisherman must adapt his seining methods to the time of the year. Oddly enough, a great number of bait fishermen are ignorant of the many basic factors underlying bait fishing.

The second method used in fishing for shiners employs the use of the square net. The square net is an importation from Europe, where it was used for catching food fish rather than bait fish. There are more bait fishermen in Worcester County who use this method of bait fishing, since only the fisherman is needed. He does not have to have a striker to assist him with the net. This reason, and also the fact that the fisherman may not be able to pay a striker, account for its popularity. The materials that are used in these nets have already been mentioned in Chapter VI, "Standard and Improvised Equipment Used in the Industry".

Traps are usually set out in deep water. They are heavily baited on the inside with bread, and as the shiners see the bread, they go inside the trap after it. Traps are not very successful, and usually are not used by commercial

fishermen, the reasons being that they are too clumsy to handle, too much bother for the number of shiners that they collect, and very undependable to keep the bait alive once it is caught. The currents in the river might push the shiners against the cage crushing or scaling them. Sometimes the trap might move into the mud, thus suffocating its inhabitants. They are not recommended for commercial fishing.

### Ice Fishing

The methods of fishing shiners in the winter do not differ as much as one would expect, with the exception of the seine. The seine and standard methods of fishing with the seine, can be used if the winter is mild, or if the water in a particular pond is warm enough to withstand ice. Once the ice freezes on the ponds and rivers, the fisherman must use new methods.

In using a seine under the ice, the fisherman must first chop "peep" holes in the ice in some quiet, nearly enclosed cove. Through these holes, he drops small pieces of bread dough. If the shiners are present in the cove, they will catch the bread, stopping it in motion, and begin to run around with it. Once he has ascertained that the shiners are present, he must chop out of the ice a semi-circle at the point where he is going to start the seine. Long, narrow, white boards, 10 - 12 feet, by 2 - 3 inches are tied to the ropes which are attached to each pole on the

seine. One board is started toward the right bank of the cove, the other board started toward the left bank of the cove. These boards are pushed under the ice. The fishermen follow the white boards under the ice, and chop a hole at the end of the board. After they catch the rope which is attached to the seine, they pull the rope, and the seine begins to straighten out under the ice. This process is followed until the seine is spread out across the cove.

Once the cove has been enclosed by the seine, the fisherman goes to the end of the cove where he will pull in his net, and chops another semi-circle, large enough for two men to stand in, and in water deep enough to allow the bait swimming area. The closer to the shore the second semi-circle is the better, since the shiners will try to escape the net. The process of pushing the white board, and then chopping the hole, pulling up on the ropes, pushing the board ahead, always underwater, is continued until the second semi-circle is reached. The white boards are always under the ice until they reach the second semi-circle, at which time they are thrust onto the ice. Once the second semi-circle has been reached, both fishermen jump into the hold, and pull in the seine, just as they would have had it been open water. When the bag has been reached, the sinkers may be lifted and deposited on the ice, and the bag then forming a pool for the shiners.

The bait should be treated carefully, but need not be

handled as gently as in the summer. The scoop net, plus the pot, plus the cage must be used. Two or three times as many shiners may be carried in a bucket as compared to the summertime. The truck will also be capable of carrying more shiners, and the holding tanks will be able to support greater amounts of shiners for longer periods of time.

Whenever possible, with this method, the fishermen should select a sheltered cove, one in which the depth of the water is not greater than the depth of his net, and one in which the bottom is clear of stumps. If the water is too deep in the cove he selects, his work will be useless, since the shiners will swim under the seine, and escape. If the shiners are present, and if the conditions for seining are met, the fishermen will find this method very successful.

The drop net is the favorite net for winter fishing. The net is round, and is dropped through a hole in the ice. A rope is attached to either side of the net so that it can be pulled up quickly. The net is baited until the shiners are drawn over the net, and then it is raised as rapidly as possible. This type of net corresponds to the square net. The only time the square net would be used would be in open water. The drop net is used through the ice. The catches made in this way are small, but assured. One man can fish with a net like this, although 2 men usually will team up, and set out 2 nets, each helping the other

pull up his net. The shiners should be scooped out, and handled as carefully as possible. Approximately 60% of the fishermen in Worcester County use the drop net for ice fishing for shiners.<sup>36</sup>

Traps might be used, although they are not used very often. The fisherman would have to mark where he puts his traps, and run the risk of having some other fisherman steal the shiners from his traps. The amount of energy used in chopping and re-chopping the holes for the traps would not be worth the few shiners which would be lured into the traps.

Ice fishing is a very popular sport in Worcester and Worcester County, and the years in which ice comes early and leaves late are very profitable years for the bait dealer. Massachusetts law allows the fisherman five tilts, or tip-ups, or four tilts and one jigger stick.<sup>37</sup> The fisherman

36. In the Appendix, question #7 of the questionnaire gives proof of the fact.

37. Tilts are simply crossed pieces of wood with a reel which extends below the water line. A flag is attached to a spring, and when the game fish takes out line from the reel, the flag is released, and the fisherman knows he has a "bite".

The jigger stick is the only artificial device for fishing through the ice without shiners. The jigger stick is a small, bright, highly polished piece of brass, or copper, in the shape of a small fish. To this is attached a hook, and to the hook a fish eye. It is usually quite successful for yellow perch.

can use five hooks if he likes, needing five shiners each time he sets his hooks. In open water fishing, he is only allowed two hooks; so during the winter season he theoretically used nearly three times as much more bait than he does in the summer. Every thing else being equal, he will have to buy more bait in winter, even though the shiners will live better. In the questionnaire, nearly all the bait dealers agreed that their winter season was more profitable than their summer season. One other major factor that enters in, is that during the winters, the shiner is the only available bait. In the summer, the fisherman can use either artificial lures, or worms, crawfish, hellgrammites, or shrimp. He has no choice but to use shiners for winter fishing.

## VII. ECONOMIC IMPORTANCE

The physiography of Worcester County is such that it can be used profitably for recreational purposes. Interspersed among its many hills are ponds and lakes, which are the sources of revenue for both the local governments and the state government. A glimpse of the value of the shiners to the bait dealers in the area can be seen by comparing the number of licenses and their value issued in the county, with the average bait sales and the resulting potential bait sales.

In Worcester County the fishermen number 40,061.<sup>38</sup> The average cost of a resident fishing license in Massachusetts, for adults is \$3.25. Sporting licenses are sold at \$5.50, or \$2.75 for fishing. The \$3.25 added to \$2.75, divided by 2, would average out to approximately \$3.00 per license. Worcester County's gross income from the sales of licenses would be approximately \$120,183.00; while the City of Worcester would receive approximately \$59,643. This latter figure represents nearly 50% of the licenses sold in Worcester County. If the value of the licenses to the County is \$120,183.00, and if there are approximately 40,061 licensed fishermen in the County, the bait dealers are sure of a ready market for their catch.

The number of shiner licenses issued was 43, and the propagator's licenses issued was 34, making a total of 77 potential bait dealers. The number of sports fishing licenses issued in the county was 40,061. This means that there is only one bait dealer for every 520 fishermen in the county. The ratio is probably even higher, because not all the propagators are interested in raising bait.

The average bait sale is approximately \$1.00. Ideally, the bait dealer can earn \$520 per week, if his 520 fishermen went fishing that week. He may earn that much in a week, but it is unlikely. Some weeks he may earn \$3-400.00, other weeks \$1-200. In the questionnaire conducted for this

38. Personal Letter

E. C. Bresnahan, License Clerk, Boston, Mass.

paper, 80% of the dealers would not answer the question which dealt with earnings. The other 20% gave minimizing answers. There are no figures available on the exact earnings of the bait dealers. Many of them report a tremendous loss at the end of the year, since they report the many dead shiners in their tanks as representing losses to their business. Along with water bills, and improvements to their business, the yearly report of earnings is not impressive. However, with the tremendous demand for shiners, there is no reason that the bait dealer should not earn at least \$10,000 per year, provided he is intelligent enough to find either a constant source of bait from the surrounding waters, or to raise his own.<sup>39</sup>

#### VIII. FUTURE OUTLOOK

This study has attempted to describe the shiner industry, and discuss this industry in its geographical setting. The industry itself is controlled by various geographical factors, such as weather and climate, topography, the condition of the stream systems, the creation and location of the numerous ponds and lakes, by the size of the population, by the distribution of the population, and finally by the effects of industrialization.

One geographic factor remains to be discussed, and that is the question of conservation. In Worcester County,

39. A letter which represents the small bait dealer is included in the appendix. He tells of the expenses involved in setting up a bait business.



the shiner catches have been decreasing every year.<sup>40</sup> The locations of shiners have been narrowing down every year, to the point where there are only two or three good sources of shiners left in the area, as compared with ten sources which existed seven years ago. Soon there will be no native shiners left in this area to support an industry. Yet, every year, the fishermen increase, and every year the potential of the shiner industry increases. The profits that should be made are not made, because the bait is disappearing. There are two alternatives that should be considered. One is conservation of the remaining natural shiner schools; the other, the construction of small ponds, where the bait dealer can raise his own shiners. If conservation measures are to be taken, they must be taken soon, or there will be nothing left to conserve. The following suggestions are made as to ways of conserving the native shiner in Worcester County. The first set of suggestions deal with the steps which the bait fishermen can take, while the second set of suggestions deal with revisions which are needed in the fishing regulations.

The bait fisherman can either contribute to increased shiner fishing or reduced shiner fishing. He is the one who has the nets which can catch the most shiners, provided they are in areas where they can be trapped. He is the person

40. Question #26 of the questionnaire, in the Appendix shows that 60% of the bait dealers believe that shiner catches are on the decline.

who must use intelligence in the catching of his bait. Over-fishing of any pond, poor or run-down equipment, poor holding tanks, unwise selection of shiners, over-handling, taking "all he can catch", taking all small shiners, taking all the breeders, removing the breeding stock from the ponds, leaving trash behind him which might close the pond to fishing - all these can directly influence the conservation of the shiner industry.

The boys who usually inhabit the rivers in their area, and usually know where the shiners can be located, often are engaged in a small business catching shiners, using exceptionally poor, make-shift equipment. When they catch the shiners, they usually do not have a ready market, and as a result the shiners die before they have served any useful purpose.

A third type of shiner fisherman who influences the number of shiners is the man who catches bait for himself. Usually, his catches serve his relatives and friends. As long as the bait is given to the friends and relatives, the fisherman is in no danger of breaking any laws, but should he sell the bait, without holding a special license, he is operating illegally.

In addition to the above conservation practices which could be followed by the bait fishermen, there are some fishing regulations which, if they exist now need to be changed, and if no legislation exists, regulations could be proposed.

The fisherman who uses shiners as bait, and who has a surplus of bait at the end of his fishing expeditions, by releasing them alive, is guilty of illegally stocking the pond, and can be punished by both a fine, and if necessary a sentence, even though he is helping to re-stock the pond, and is supplying added, natural, and much desired food to the pond. Even though shiner fishing decreases year after year, and the potential demand for shiners increases year after year, it is illegal for the fisherman to release his live shiners in the pond. If this were allowed, the fish would very definitely increase in size, owing to an added food supply. It would assure the catching of more shiners, it would mean more shiners would be available to the individual game fisherman, and all in all, everybody would benefit. Instead, at the end of the day, according to Massachusetts law, the fisherman must kill off his bait, rather than release it.

Unfortunately, the state of Massachusetts forbids the taking of game fish by nets in any waters, be they polluted, unfished, or otherwise. If the Massachusetts Fisheries Division, in cooperation with the seiners, allowed them to seine the game fish from the shiner waters, which are seldom fished by sport fishermen, the shiner population of the area would invariably increase. The seined game fish would be stocked in much-needed and over-fished ponds. In this way, an equilibrium would be established. As the situation exists today, the shiner fisherman is able to catch large-sized

game fish, but very few shiners. The game fisherman, on the other hand, can catch only small, undersized, inbred fish. By cooperating with the seiners, the state could very rapidly, inexpensively, and satisfactorily complete a much-needed fish conservation movement.

Massachusetts will license out-of-state fishermen, and allow them to catch bait in its waters. The states surrounding Massachusetts will not license the Bay States' shiner fishermen. Therefore, Massachusetts fishermen can only fish bait in their own state, but a Rhode Island fisherman can fish in his own state, plus in Massachusetts.

Rhode Island refuses to license Massachusetts fishermen. Since the Blackstone River flows through both Massachusetts and Rhode Island, there should be some reciprocal arrangement. If this is not feasible, then the Massachusetts Division of Fisheries should refuse to license out-of-state fishermen.

There are no rules or regulations limiting the size of the shiner, nor the number of shiners which can be taken at one time. The state might attempt to pass regulations governing the size and catch, but more harm would be done to the present shiner population than is done under the present conditions.

The only solutions which seem practical are those that deal with revisions in the existing regulations. The state could refuse to license bait fishermen from other states,

**BIBLIOGRAPHY**

or form a reciprocal arrangement with the surrounding states. It could also cooperate with the bait dealers in seining game fish, and re-stocking them, under state supervision. The final recommendation would be that the state allow the individual game fisherman the right to release his surplus shiners, and shiners only, at the end of the day's fishing.

The alternative to conservation of the native shiner is the setting up of artificial ponds for the propagation of shiners. Some of the ponds in which experimentation is taking place can be seen in figure #9 of the Appendix. These ponds are artificial but were not constructed at first for the raising of shiners. The dealer who wants to construct his own ponds would need capital to buy or lease land and the pond must be constructed so that the water level could be controlled at all times. He would then have to experiment with the golden shiner until he got a subspecies which would propagate freely under these controlled conditions. The golden shiner would have to be the species, since it is the only shiner the game fishermen in this area will purchase. The propagator, in order to be successful would have to start on a large scale, since his bait would grow at various rates, and reproduce at various rates.

There have been some bait fishermen who have tried to raise shiners in this area. In answer to the question on the questionnaire which dealt with raising shiners, 27% answered that they had tried raising shiners, and of this

figure, 73% were unsuccessful. Only 7% were successful. Never-the-less, 40% of the dealers owned or leased ponds, the sizes of which ranged from 350 square feet to six acres.

The present situation is such that the native shiners are rapidly decreasing. The fisherman who is able to propagate shiners in large enough quantities to harvest them at the times when the market is at its peak, will undoubtedly find a very lucrative business that could easily spread from Southern Worcester County, to Worcester County, and reach as far east as Boston, and as far west as Springfield.

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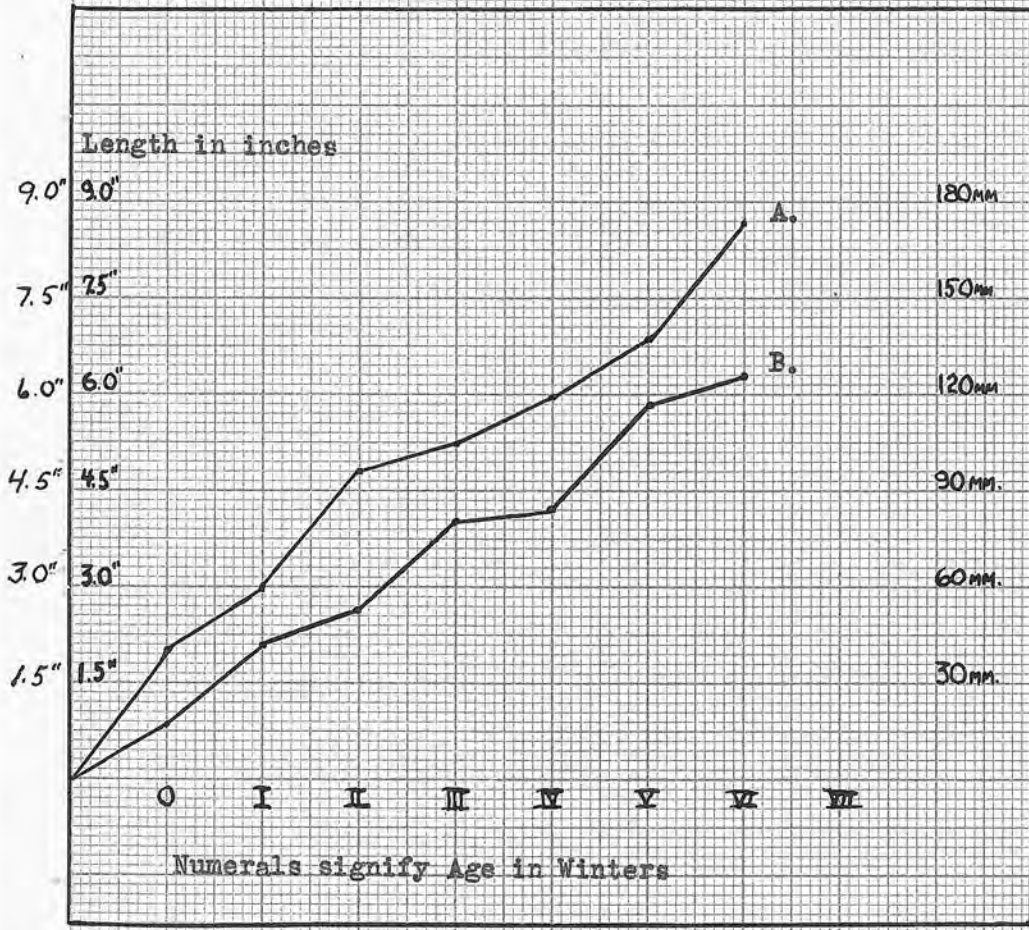
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APPENDIX

SHINERS' GROWTH IN RELATION TO  
THE LENGTH OF THE GROWING SEASON <sup>1</sup>.



- A. 140 - 180 day growing season
- B. 110 - 140 day growing season

October 3, 1954

Robert W. Spayne

IV

Dear Mr. Spayne

In answering your letter of Sept 27, regarding the Commercial Union Business in Worcester County, we are enclosing you after year, due to lack of the shares - as each year they are popular to find in the territory.

Although the demand for shares is great the - but shares can't decrease each year, as we cannot supply the customers, and expenses increase each year for equipment etc.

The reason I never pay license each year is that I use a spare not to provide myself with skins, and a license is required by law - unless you want me anything over a four foot net.

I have made a list of expenses for setting up a skin business as I did inquire from bait dealers & others, which does not include car expenses - travel and the man's labor in all kinds of weather.

Total Expenses for setting up  
Shiner Business

Shiner Business

1 Shiner Tank - or. 50 gal -	\$ 75.00
1-200 ft. sp. wire net	87.00
1-kg. net or. 120 ft. (on air ft. rope)	26.00
spring steel rods - 4	3.00
piping & line for sp. net	10.00
1 special made back -	65.00
2-50 gal drums	35.00
air pump for shiner tank -	36.00
50 ft. plastic piping & etc - for Shiner Tank	15.00
Water - for shiner or. 10 mos. -	62.00
Chickery - food & etc.	15.00
<u>Total -</u>	<u>\$ 397.00</u>

Having the name within the  
wire net is best as the shiners  
one in shallow water, and in  
water the shiners are in deep  
water and the spore net is  
formed.

Considering the expense and  
shiners in Shiner the profits  
are little or none at all.

As for raising shiners  
the bait dealers here have  
found it is not profitable  
in this part of the country.

A. Heikman

Maple St.  
Nov. 19, 1954

Dear Mr. Spayne

You inquired about the Shiner raising & business.

Pauls bait shop or Careys bait Shop in Worcester, Mass. may be able to give you much more information than I in that respect as they are both big dealers in the business.

Paul buys all of his bait.

Carey catches all or the majority of his bait.

This is my story for what it is worth.

This friend of mine and I like fishing very much. and we used to have to go to Worcester for our bait which is 12 miles.

In the fall of 1952 My brother had a pond which covered about 1 acre and had about 1 foot of water and three feet of mud with a brook running through we knew the pond had Shiners in it but couldn't get them with a drop net being too shallow.

So we bought a seine and put a box in the brook screened at both ends. just before ice we seined the pond and got app. 3500 shiners for our own use and for our friends we supplied an old washing Mach. in the cellar from the box.

We tried a few other ponds in town that we knew had shiners but only caught about another add. 500 we were told that Carey had worked the ponds all summer.

In the Spring of 1953 we decided to try catching them in the spring and hold till fall. 2 farmers whom have small ponds for watering thier cattle said "we could use

thier ponds as they were only interested in water for thier cattle".

In the spring we caught app. 2 or 3000 and put them into one of these ponds.

In July a friend told us of a small pond he saw in a pasture which was drying up and he saw fish which looked like shiners.

We asked the farmer and he told us to take them if they were any good to us.

We cleaned it out getting app. 6-7000 and put them into that private pond.

In Late August that pond was almost dry we figured that it would go dry in a week and took all our bait out that week end. sepuated the good from the pins and put the good ones at my brothers pond and the pins in the other farmers pond which we hadn't put any into yet as it was very close to Rt. 20. this pond that dried up had never dried up before but last year was a bad year around here.

The outcome was that we lost almost all our good shiners from fungus. the pins didn't suffer so much to our knowledge but the big one went like wild fire. We inquired from the Wild life div. and were informed that this is common when the fish are handled in the warm weather as they are soft at that time and injure easiley.

Last winter I don't think we had as many as we had the year before of large shiners.



Last fall The Marlboro Fish & Game Club drained their trout pond which had shiners in it Some fellow from Hudson got all the big ones and they told us we could have the pins that were trapped in a low spot as they were going to poison the pond before refilling it we seined it an got app. 5000 which we put into the pond with the other pins, this spring the state highway sprayed D.D.T. dust for Elm blight or something and covered the pond with the dust and killed all our pins. We didn't have it posted as fish raising so got nothing other wise they would have avoided it. sune fun huh, but we are learning the hard way I guess.

Last fall we put 175 real large shiners into the pond that went dry for breeders this summer we could see schools of small shiners all over the place so we may have better luck raising them but I dont know how long it takes for them to grow to 3 or 4 inches which is a good bait. shiner, some fellows say three years. on that basis we are figuring this way. we have 3 ponds besides the 2 at my brothers.



1. breeding pond
2. split for second year
3. finish ponds which are larger than #2.

I hope this works.

This year we have none to date we didn't get any this spring, we didn't try this summer and this fall since it got cold the water is so high you cann't do anything as those two Hurricanes raised the water over the banks.

The general opinoin of the bait dealers around Worcester County is that the time has come when a fellow has got to raise them or not have them.

I answered no to ques. # 32 on Conservation for Shiners as I don't think it is the fisherman who is doing the harm.

This Westboro Reservoir a few years ago was alive with beautiful Red fin shiners Millions of them, they stopped all netting and only allowed pole fishing there now but at the same time some one put white perch in there for good pole fishing white perch fishing was beautiful for a few years but now there are no more shiners and the white perch are stunted and that is no good. if you mean measures like that I agree.

Well Bob I don't know if I have given you any information that will help you but that is my experience and that is all I know. all I can say is I had a hell of a lot of fun doing it.

Yours truly.

Theodore Stone.

1. Do you catch shiners full or only part time? Part - 80% ; Full 20%
2. Do you have another job besides catching shiners? 80% yes; 20% no
3. Would you care to estimate your earnings? ( for one year) 80% no; 20% yes  
If yes... \$ Range \$25. - \$300.00

4. Do you sell shiners all year around, summer and winter? 40% yes; 60% no

5. How many other people do you employ or that assist you? Range 0 - 5

6. Do you use a seine? 53% yes Do you think this is the best method, or are you against seining? 7% If so, Why? (best method 33%)

7. Do you use a drop net? (square net) 60% yes

Do you use a method other than the above? 20% yes Name applied to it? \_\_\_\_\_  
13% traps; 7% push net

9. Do you sell shiners directly to the fisherman, or wholesale, or both?  
80% to fishermen; 0% wholesale; 20% both

10. Do you rent a store for the purpose of selling bait, or is it done in your own home? Cellar or garage, for example.  
20% in bldg.; 27% in cellar; 7% in garage; 20% home; 27% no answer

11. Do you have to go outside of Worcester County to buy bait? \_\_\_\_\_  
33% yes; 50% no; 18% no answer

12. Do you have to go outside of Massachusetts to buy bait? \_\_\_\_\_  
53% no; 27% yes; 20% no answer

13. Do you have to go outside of Worcester County to catch bait? \_\_\_\_\_  
60% no; 27% yes; 13% no answer

14. Do you have to go outside of Massachusetts to catch bait? \_\_\_\_\_  
80% no; 7% yes; 13% no answer

15. Do you sell only the "flat" or golden shiner? \_\_\_\_\_ Other kinds?  
53% yes; 20% this plus some other type; 27% no answer

16. Do you sell more shiners in the summer or winter? \_\_\_\_\_  
Winter- 53%; summer- 20%; 27% no answer

17. Do you raise any of your own shiners? Have you ever harvested any of the ones you raised yourself? 27% yes; 60% no; ... 73% unsuccessful; 7% sw

18. Do you have your own pond? (either leased or owned) 40% yes; 40% no  
 Size? Range: 50' X 70' to 6 Acres
19. How many shiners would you say you handle in the whole fishing season?  
Range: 200 to 200,000
20. Would you be willing to buy shiners if they were available at fair  
 wholesale prices? 60% yes; 20% What do you consider a fair wholesale  
 price? \$ \_\_\_\_\_ per 1,000.  
 Range: \$5.00 to \$25.00
21. Would you prefer to catch your own? 80% yes; 7% no; 13% no answer
22. Do you use chest waders or hip boots?  
 Waders: 33%; boots: 27%; both: 13%; none: 7%; no answer 20%
23. Do you own a boat?  
67% yes; 33% no,
24. Do you own a tank truck?  
67% no; 20% yes; 13% no answer
25. If not, how do you carry your shiners? Some answers: tank trailer,  
 borrow tank truck, beach wagon, car, oil tank, milk jugs
26. Was the spring and summer of 1954 as good a year for catching shiners  
 as the year 1953?  
60% no; 7% yes; 7% same; 26% no answer
27. Do you have any other names for shiners?  
80% no; 20% no answer
28. Have you ever tried raising shiners? \_\_\_\_\_ Successful or unsuccessful?  
40% no; 33% yes; 27% no answer Successful: 20%; unsuccessful 13%
29. Do you have a metal tank or a concrete tank in your establishment for  
 holding shiners for sale? \_\_\_\_\_ Is it efficient? \_\_\_\_\_  
67% yes; 20% no; 13% no answer (83% of 67% efficient; 7% no)
30. Have you ever used shiner traps with any success?  
67% no; 13% yes; 20% no answer
31. What do you charge per shiner?  
 Range: 2¢ to 5¢ Average price: 3.4¢
32. Do you think Mass. needs conservation methods in shiner fishing?  
 Yes- 47% ; No- 33%; no answer; 20%
33. Do you have any suggestions? Ranged from raising trout for bait to  
 changing the shiner laws
34. Do you think Mass. needs new shiner laws? \_\_\_\_\_ Can you suggest any?

34. Number of years in business:

Range- 6 months to 21 years

35. Is the shiner business increasing or decreasing?

increasing: 27%  
decreasing: 53%  
no answer: 20%