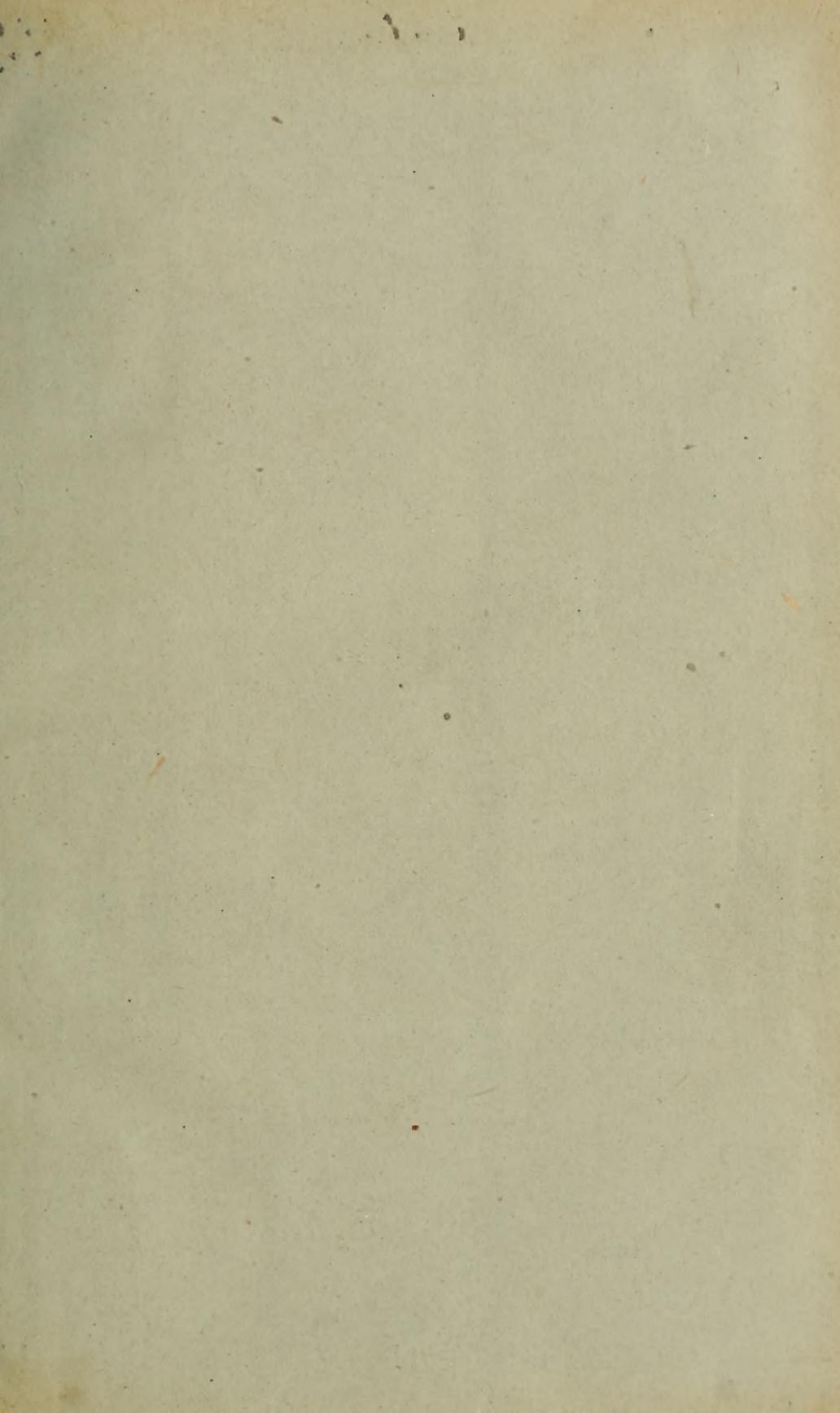
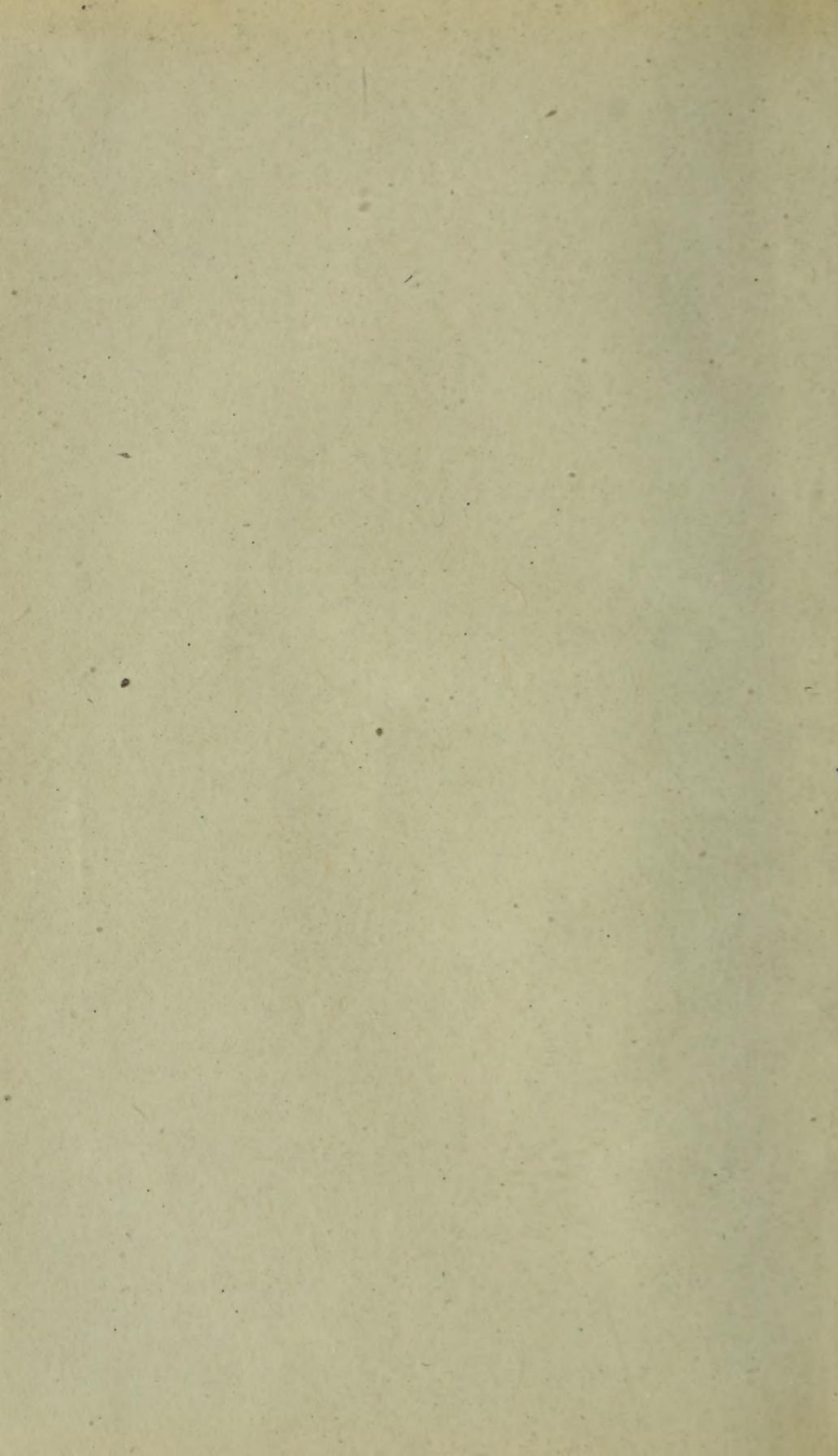


Tl. Cat.

597.0  
(773)  
+  
1888

**LIBRARY OF**  
**Illinois State**  
**LABORATORY OF NATURAL HISTORY,**  
**URBANA, ILLINOIS.**









REPORT OF BOARD

Natural History

IL 6  
1888  
cop 4

OF

# ILLINOIS STATE FISH COMMISSIONERS,

TO THE

GOVERNOR OF ILLINOIS.

---

SEPTEMBER 30, 1888.

---

SPRINGFIELD, ILL.:  
SPRINGFIELD PRINTING CO., STATE PRINTERS.  
1889.





Digitized by the Internet Archive  
in 2010 with funding from  
University of Illinois Urbana-Champaign

Pickered Are Rising Again.

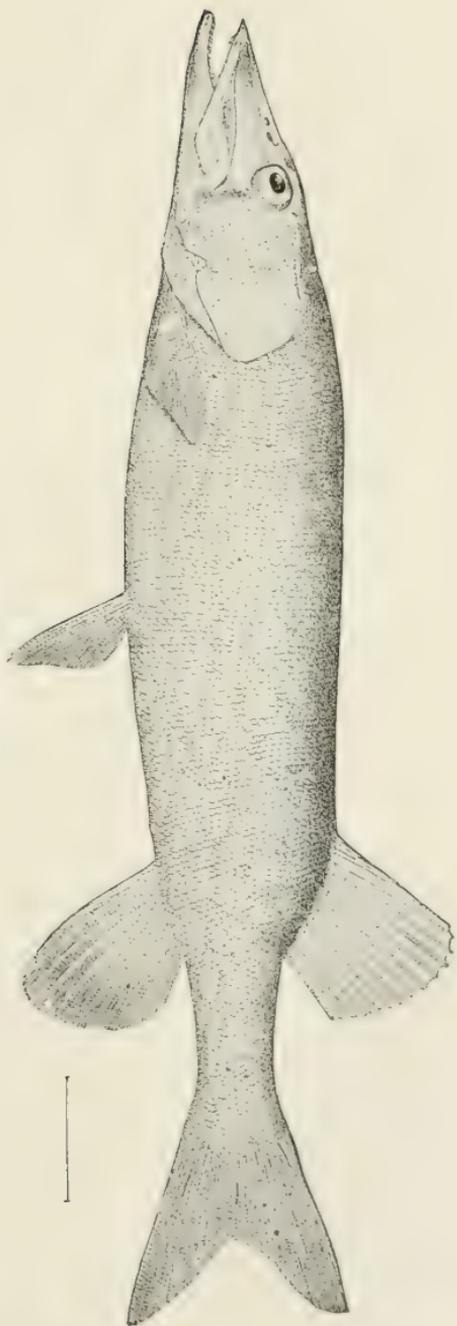
Splash!

The setting sun throws violet colored darts  
Through leafless branches, where the forest parts  
Shofts which fall richly through it and beyond,  
Upon the darkening surface of the pond  
See, how the violet mingles with the black,  
As sudden ripples make a cobweb track  
How opals slip in thousands to the shore,  
To touch the margin and appear no more.  
How from one spot concentric circles glide,  
Each with its gem-load to the water's side-

Splash!

Almost there is an echo from the hill,  
But the soft sound falls short. Now all is still  
A pickered rose just then!

Stanley Waterloo



**THE PICKEREEL.**

*Esoc reticulatus* Le Sueur.



## REPORT OF THE COMMISSIONERS.

---

*To His Excellency, GOVERNOR RICHARD J. OGLESBY:*

We beg leave to submit herewith our report as Board of State Fish Commissioners, from October 1, 1886, to September 30, 1888:

Since our last report we have encountered adverse, as well as favorable seasons, for our work. The high water early in 1887, and continued high water in 1888, has afforded opportunity for demonstrating the flexibility of our methods, as well as the fact that nature has provided ample means for re-stocking our streams with fishes indigenous to them, without recourse to artificial means of re-production. In spring of 1887, the water was out of river banks early, and as it quickly receded, left only the spawn to hatch. As a consequence the pools, lakes, etc., were filled with young fry only, when our work of taking them for distribution commenced. But few mature fishes were found in the shallow waters. The spring of 1888 opened with plenty of rain, and unusually high water, not only in the rivers, but in all the streams throughout the State. The water in the Mississippi river going over its banks early in the spring, and reaching the highest point. but one, known in forty years. An immense area of land was, of course, submerged, and, as a consequence, every slough and hole along its banks were filled, and the fishes, seeking spawning grounds, filled them to repletion.

With this immense quantity of the product of the overflowed ponds available, we desired to utilize as nearly as possible the supply, having had some correspondence with the United States Commissioner on the subject of native fish distribution, and knowing him to be greatly interested in the work, we applied to him for assistance. He responded by placing at our disposal the use of two of the United States Fish Commission cars, with their respective crews, for the purpose of making our distribution. But, owing to the continued high stage of water, which on July 15 was still ten feet above low water, we found that the bass, croppies and other native fish, instead of depositing their spawn and going back at once, as is the case where water recedes quickly, had taken advantage of the situation and remained until their young were of

sufficient size and age to be taken back with them into deeper water. As a consequence, when the water commenced to fall, they returned to the river proper, or nearest deep water.

However, our work was only delayed by this circumstance, as the river, after falling about four feet, again began to rise, and with the rise these holes and sloughs were again filled with fish, larger than those we had saved in previous seasons, and when water was low enough for us to proceed with our work, we had for the greater proportion of our supply, breeders, or mature fish, to distribute. And while, from their size, it was impossible to carry anything like the usual number, yet, in point of fact, the interest of the waters was thus better subserved, in that, the smaller streams having been practically depleted, they would be the more speedily repopulated by planting with fish which would, by the next season become reproductive, than would have been possible by planting the usual number possible to transport, of small fish. Having secured the use of the cars, it was found impracticable to continue our former methods of gathering our supply, viz.: by means of small boats and crews; and some method which would insure greater quantities in less time, was a necessity. So, with the consent of the authorities, we procured a small steamboat, one we had used in former seasons,—the "Hannibal Eagle." The cost of the boat was about \$400, and up to date, she has not only done our work, but has placed to the credit of our fund over one-half her cost,—which will be found properly credited in our financial statement—and we think that before the season is ended, she will nearly have paid for herself. We built a barge, or live box, so constructed that, by use of gates, covered by a wire gauze, the barge could be, at any time, filled, and a current of water put through it, or when being towed, could be made water-tight, and towed up the river to point where fish were to be taken. The barge was twenty-five feet long, eight feet wide, and four feet deep, and when filled would contain as many fish as could be carried in a car, with safety.

The cars of the United States Commission, placed at our disposal, were built for the purpose of transporting trout, white fish, shad and carp, by the United States Fish Commission, and are used as well, for hatching white fish and shad, in their seasons, consequently had to be re-arranged so as to admit of tanks being placed in them for the purposes of the native fish distribution. Twenty tanks, calculated to contain about 80 to 100 gallons of water, were fitted into the larger tanks in the car, and with a crew of five men in each car, to care for them, the fish were taken to the various streams in the State. A car load contained from 4,500 to 6,500 fish, according to their size and condition, and the state of weather.

These cars were at our disposal from July 15 to October 5. The crews and men were maintained by the United States Fish Commission.



**THE PIKE.**  
*Esox lucius.*



The transportation of these cars throughout the State was the next question to consider, as it would have been simply impossible to pay for it from our appropriation and perform the other work devolving on us, of taking and caring for the fish, etc. The Board ordered a circular letter prepared and sent to the various railroad managements, setting forth our necessities and asking their aid. A number of the roads promptly responded, and we were thus placed in a position to prosecute our work, without which assistance we could have reached but a small portion of the territory which their liberality has enabled us to cover. And in justice to the railroad managements, we wish to say now, that to their liberality we are indebted for the success of our work. More than this, the assistance given us has been cheerfully rendered, and it would be impossible to have had any better facilities, any kinder attention, or greater assistance from managements or employes had we been paying full rates for every mile we traveled, instead of being transported, as we were, free of expense. We have never asked a favor that was not granted; never desired a particular train that we were not given it, and water when needed, with every attention possible cheerfully accorded us.

To the Chicago, Burlington and Quincy, and Wabash railroad managements, however, are we especially indebted, as from the location of our headquarters (Quincy, Ill.), we have been compelled to get out over one or the other of these lines, and have required a great deal of shifting of cars, etc. Not one word of complaint has ever reached us.

We feel warranted in saying that the State is certainly indebted largely to the United States Fish Commission and our railroad managements, for the success of our work, and we think that our people should understand it.

We publish herewith the list of railroads granting us transportation for the cars and many favors:

Chicago, Burlington and Quincy R. R. Co.

Wabash Railway Co.

Chicago, Milwaukee and St. Paul R. R. Co.

Illinois Central R. R. Co.

Chicago and Northwestern R. R. Co.

Central Iowa R. R. Co.

Chicago, Burlington and Northern R. R. Co.

Chicago and Eastern Illinois R. R. Co.

Chicago and Iowa R. R. Co.

St. Louis and Chicago R. R. Co.

Terre Haute and Peoria Ry. Co.

Louisville, Evansville and St. Louis R. R. Co.

Toledo, Peoria and Western R. R. Co.

Rock Island and Peoria R. R. Co.  
 Ohio and Mississippi Ry. Co.  
 Jacksonville Southeastern R. R. Co.  
 Lake Erie and Western R. R. Co.  
 Indianapolis and St. Louis R. R. Co.  
 Louisville and Nashville R. R. Co.  
 Indiana, Illinois and Iowa R. R. Co.  
 Cairo, Vincennes and Chicago R. R. Co.  
 Chicago and St. Louis R. R. Co.  
 \*St. Louis, Keokuk and Northwestern Ry.  
 St. Louis Bridge Co.

#### INCREASE OF NATIVE FISH.

The practical results obtained by our mode of saving and distributing native fish are evident in almost every portion of the State.

At several points in the Mississippi river, above and below Quincy, have been taken, in large numbers, fine specimens of the wall-eyed pike, the product of our planting four, five and six years ago. The spawn was obtained at Green Lake, Wis., and after it was hatched, the fry was distributed at various points throughout the State and in the Mississippi river at a number of points.

During the seasons of 1887 and 1888, wall-eyed pike were taken from the river at Quincy in greater numbers than ever known before, and of a variety not common to the river, being unquestionably the product of the plants of 1880, 1881 and 1882. Some specimens taken weighed  $5\frac{1}{2}$  pounds, and two were taken which weighed  $6\frac{1}{4}$  and  $6\frac{3}{4}$  pounds, respectively. In taking the young fish from the drying pools, thousands of young pike, one and two years old, were gathered, and with the rest of the products of such ponds, distributed through the State.

At Rockford, on Rock river, the catch of this fish has been remarkable this season (1888.) These were two and three years old, and are undoubtedly the product of the plant by the commission in that river, and give evidence of a very great increase since they were put in the river.

From Charleston, on the Embarras river, Mr. Weiss, Secretary of the Charleston Protective Fish Association, writes that there has been a great increase in the game fish in that stream, and that the catch of black bass, croppie, etc., has been remarkable. In Fox river, we are assured by those interested, that the increase of the finer qualities of fish, is noticeable. This is also true of

---

\*Although out of the State, they generously tendered the use of their trains when the car was sent to points south of East St. Louis, thus avoiding lay overs and saving time.

the Kankakee river. So, from all parts of the State, an increase in all varieties of native fish, the product of our planting, has been reported. In the absence of statistics, it is very difficult, of course, to determine just what ratio of increase has been attained, as adverse seasons, the taking of fish by unlawful means, and the renewed interest which seems to have been taken in rod and line fishing, during the last few years, have all conspired to decrease the annual supply.

Some idea of the effect the use of rod and line may have upon the general supply through the State, may be gained from facts which have come under our personal observation and knowledge. At Quincy, Illinois, in the bay back of the C., B. & Q. stock yards, the water is quite deep, and lying there all season have been a number of sunken flat boats and barges. In ten days time, there were taken from that one point, over ten thousand fish. It has been no unusual thing to see strings of 35 to 50 white bass and wall-eyed pike, to one angler, the fish being, too, of good size. This state of things is, however, new to that locality.

It has been estimated that, in early spring, five hundred fishermen could have been counted in one day, upon the river and bay front, at, above and below Quincy, and, as a general thing, all successful in their catches. We have been able to gain some idea of the growth and increase in native fish, by observation of the results in the inland ponds stocked by the commission.

Taking the results of their culture in ponds, we may form some estimate of what the increase would be in streams, where all the natural conditions would seem even more favorable, as there would be the natural supply of food, and the proper conditions present, for the deposit of the spawn, and the feeding and caring for the fry. We will cite a few instances of the results in ponds planted by the commission:

At Lanésville, eighteen miles east of Springfield, upon a farm owned by Mr. F. K. Whittemore, of Springfield, the Wabash R. R. Co. built a reservoir, by making an embankment across a natural ravine, which, by backing up the water about one-half mile, caused the formation of a lake of about eight acres area, being about six feet deep at deepest point, and running out to nothing at upper end and sides.

This, Mr. Whittemore, who reserved the fishing and boating privileges, provided at its outlet, which was through a culvert, with a wire screen, and obtained of our commission a few tanks of native fish, and some carp fry. This was in the fall of 1882 and spring of 1883. In the summer of 1887, which, as we have before noted, was an extraordinarily hot and dry one, the water became very low, partly from evaporation and partly from the use of it by railroad company, and fearing that fish would be lost, Mr. Whittemore decided to take them out. Sending over a gang of our men, with seine, we undertook to take them out, and transfer them. This we found impracticable, however, as the number

and size were so great that it would have been impossible to procure transportation for them, and so they were taken in quantities by people living about there. We took from the lake at that time, black bass weighing  $3\frac{3}{4}$  pounds, croppie weighing  $1\frac{1}{2}$  pounds and carp weighing 7 pounds. These were weighed and on exhibition at the Leland Hotel, Springfield. We were informed that afterward, the lake ultimately drying up, a great number of bass were taken out, which were much larger than those above mentioned. The size and quantity of fish taken from this lake show that in still water, fed by tile and surface drainage, native fish not only grow rapidly, but increase in numbers to such an extent as to seem almost incredible.

The following statement from Mr. Wilkinson, division superintendent Illinois Central R. R., regarding a plant of fish made in the Clinton reservoir of the Central R. R. at about the same time as the first-named instance, will serve to illustrate further the fabulous growth and increase attained in the inland waters:

ILLINOIS CENTRAL RAILROAD COMPANY,  
OFFICE OF DIVISION SUPERINTENDENT,  
SPRINGFIELD, December 9, 1888.

*S. P. Bartlett, Esq., Secretary Fish Commission, Quincy, Illinois:*

DEAR SIR—I take pleasure in advising you of the proximate results of the fish planting in this company's reservoir at Clinton.

During the summer of 1887, the water getting low in the reservoir, owing to the general drought, it was thought best to take the fish out. The result was simply astonishing. From my best recollection the fish that were planted there not to exceed three to three and half years previous, had individually attained a remarkable size, besides being in great quantity. I should estimate that we took out not less than two thousand pounds in drawing a seine through the pond, which is some eight hundred feet long and an average of say one hundred feet wide. The water seemed to be fairly alive with all varieties and sizes of fish, and I was much astonished to find a great quantity of black bass in excellent condition: they ran in weight from four and one-half pounds down to two pounds. The German carp, of which there was a large number, ran in weight from seven pounds to fourteen and one-half pounds. The other varieties of fish ran in about the same proportion, but I was impressed that the black bass had more than maintained their relative position in point of growth. Therefore it would appear that if such quantities of fish can be grown in an artificial water reservoir, it can be regarded as a splendid result and at once recommends itself to the thoughtful as an example of the solution of the problem of providing cheap food, and it seems to me that any farmer has it in his power to enjoy a fish diet without expense. The propagation of the German carp seems to be entirely successful. I distributed several of this fish, weighing from twelve to fifteen pounds, and the report of those who partook of them was favorable. Properly cooked, they are a very wholesome and nutritious article of diet. It gives me great pleasure to testify to the entire success of fish culture so far as it has come under my observation, and I consider it due to you, to advise you as above.

Respectfully,

WM. WILKINSON,  
Division Superintendent.

Also the following letter from Hon. John M. Pearson, of Godfrey, Ill., which is to the same effect:

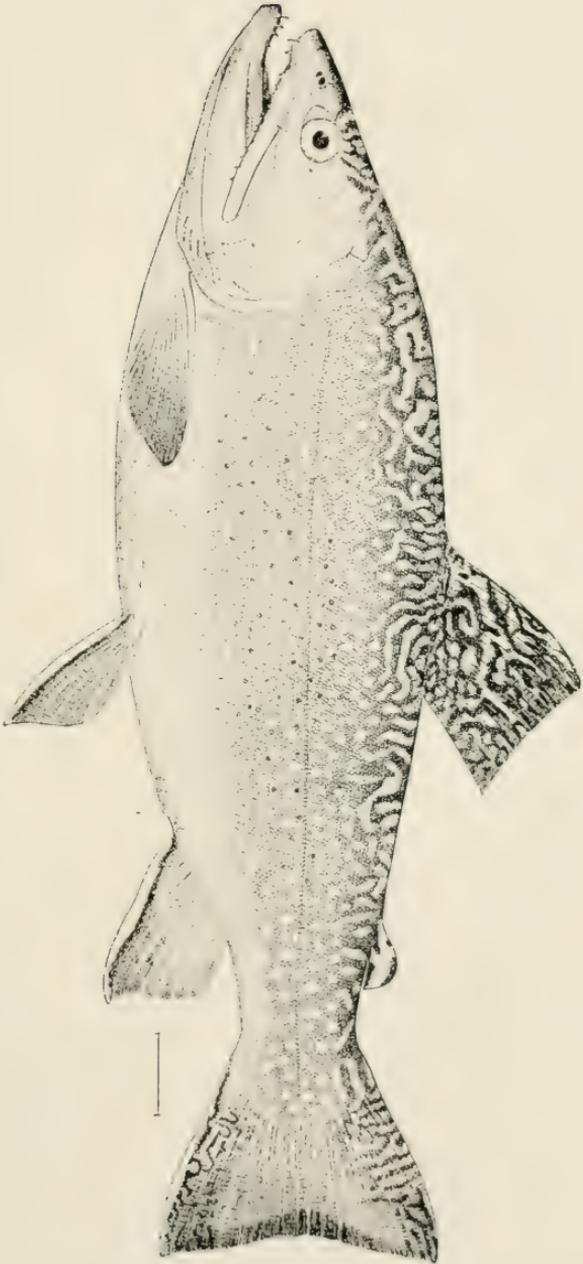
GODFREY, ILL., June 6, 1888.

DEAR SIR—I feel like writing you a fish letter. Last Friday I took fifty croppie out of my little pond, of about one pound weight each. About two weeks since, after the heavy rain, the railroad pond here (which you stocked), overflowed, and the boys found fish in the field below that weighed  $18\frac{1}{2}$ , 18,  $16\frac{1}{2}$  and 6 pounds. The weight of the big ones was increased by spawn, which, in one instance, weighed  $6\frac{1}{2}$  pounds.

[Signed.]

JOHN M. PEARSON.

With such facts as the foregoing before us, it is but fair to presume that the growth and increase of the fish, planted by us in the rivers and lakes, the natural homes and breeding places of the native fish, would be much greater than in the still waters of artificial ponds. And from the distribution this season of thous-



**THE SPECKLED TROUT.**

*Salvelinus fontinalis.*



ands of fish which will, at the opening of next season, be ready to begin their work of reproduction in the waters which are their natural homes, and under the conditions natural to their habits, we may hope for marked and encouraging results. It would seem to us, to be the most practical and economical method of propagation and distribution possible. And as the question is not now, nor has it been for years, one of experiment, but a fact demonstrated by an increase in the supply in every portion of the State, we fully believe that, with better facilities for our work, and proper protection for the fish, it can not be long before our State will be, as it was originally, one of the best in the Union for fish.

#### DISTRIBUTION OF NATIVE FISH.

The fish distributed in our inland streams and lakes, are such as are gathered from the sloughs and holes along the Mississippi River, left there by the receding waters, and if not so cared for, would perish in countless numbers each season. They are gathered by means of small-meshed seines. Such as are not used for distribution, are put into nearest deep water. When men are not occupied in gathering for distribution, their time is utilized in rescuing the fish from these drying holes, and putting them in the river. The fish gathered are, in the main, of the varieties named below, and are native to Illinois waters. The following are the varieties found:

Big mouthed Black Bass, Small mouthed Black Bass, Croppie, pale; Croppie, black; Wall-eyed Pike, Pickerel, Pike, Striped Bass, White Bass, Yellow Bass, Ringed Perch, Spotted Catfish, Channel Catfish, White Perch, Sun Fishes, Buffalo.

With these, however, there are more or less of the Hickory Shad and the Minnow family, which are as essential to a successful planting of fish, as the better varieties themselves, furnishing food for the latter, being prolific breeders, and adapting themselves to the waters of the State, equally as well as the others.

Of the varieties enumerated, the Pickerel, Wall-eyed Pike, and Ringed Perch, have been plenty only of late years, plants of them having been made throughout the State, and in the Mississippi river in 1881, 1882, 1883, and at various times since. The spawn of the Wall-eyed Pike was obtained at Green Lake, Wis., and hatched artificially. The Pickerel and Ringed Perch having been brought from Lake Michigan, Lake Geneva and Green Lake as spawners. Ringed Perch, in season of 1887 were very plentiful, being taken in very large numbers when seining the small ponds for fish, but this season have, so far, proved to be scarce. The Wall-eyed Pike and Silver Bass predominated early in the season, greater quantities of the young being taken, than in any previous season, which, as noted before, was true as regards the mature fish.

We used, in distribution, cars No. 1 and 2, of the United States Fish Commission. Car No. 1, in charge of Newton Simmons,

and car No. 2 in charge of W. A. Dunnington, and the whole work under the supervision of Geo. H. H. Moore, Superintendent Distribution United States Commission. The cars were those used by the United States Commission in their distribution of Shad and White fish. They are similar in size to a large passenger coach, and are fitted up with reservoir tanks, for carrying water, ice, etc., in main body of car, the tanks extending along each side. Into these were placed, for our distribution, boxes holding from 80 to 100 gallons of water, and these carried the fish for distribution. Each car had a crew of four men, and a cook. The cars were provided with air brakes, and were, in every respect, first-class.

The fish were gathered by gangs of men with seines, and put into a large flat boat, 25 feet long by eight feet wide and four feet deep, arranged so as to form a live box when necessary, or could be used as a flat-boat when in tow of steamer. A steamer of about five tons burthen, was used to shove the barge up or down stream, towing the small boats and crews and towing the barge or live box, back to port when filled with the fish. When boat was lauded at wharf, the gates were closed and box pumped out, and the fish transferred in carriers to the car. This was attached to a passenger train and taken to its point of destination. The crew of car by use of dippers, aerating the water constantly, until they were planted. Thus we have been enabled to place in every stream, crossed by the railroad over which we were transported, a good and sure supply of breeding fish, at a cost small in comparison with that of methods previously used by us, viz.: Transportation of fish in tanks, placed in baggage cars and in charge of messengers. The cars, when empty, were returned to Quincy by passenger train, again filled and the same process repeated. In this manner 26 trips were made. Each car load contained from 4,500 to 6,500 fish. These fish were from three inches to 14 inches in length, mainly mature or breeding fish. We consider the work of this season, in this branch, to be of more practical benefit than that of many previous seasons combined, as the fish were large enough to reproduce next spring, and in waters almost depleted by past unfavorable seasons, this will give at once a stock of greater numbers and under more favorable conditions than could have been accomplished by planting hundreds of thousands of young fry. That this method of rescuing and distributing native fishes originated by our commission, and carried on by us as for the past few years with such success, meets the approbation of the United States Commission, is evidenced by the fact that during the past season the United States Commissioner has had similar work done in several States under the direction of the United States Commission, and, we understand, intends devoting one branch of the Commission to this work in the future. We consider this a complimentary endorsement of our method, and appreciate it accordingly.

## CARP.

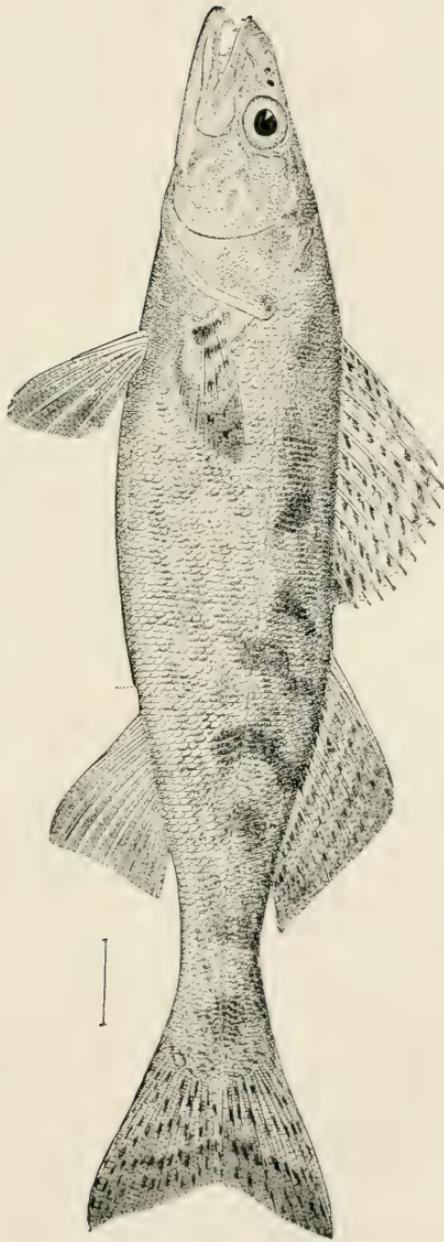
Seven years have passed since the introduction of Carp into the State of Illinois,—two years since they were planted in public waters of the State, and a brief resume of what has been accomplished may not be without interest:

When Carp were first proposed, there were but few, if any ponds in the State for the cultivation of fish, and the subject was considered as relating to the ornamental adjuncts to farm management. Few gave it any thought as a source of profit, or as a probable increase of the products of the farm. One by one began to consider the matter, and applications for the fish became frequent. Much was promised for them. In their natural home, in that thickly populated portion of the old world, Germany, they ranked among the fine fish. They were known to be hardy and prolific, accommodating themselves to almost any kind of water, and to almost any locality. As a result of such theories, a large proportion of those who early applied for Carp, put them into their stock ponds, or ponds to which stock was allowed free access, and left the fish to care for themselves. The result was, to some extent, unsatisfactory, as might have been expected. Such fish as survived the freezing up of the pond in winter, and its drying out in summer, were not found to be of so fine a character as to flavor and general edible qualities, as had been expected. In other words, these experimenters had undertaken to obtain something for nothing, a result very difficult to attain in any business undertaking, and disappointment resulted. As the subject of fish culture, in ponds supplied by surface drainage, began to be better understood, ponds were built for their reception, alone, and at least as good a chance for existence and growth given them, as the average chicken or hog obtained, and results were, consequently, better. Until now, those who undertake to cultivate fish, do so with the understanding that good results only follow good care and proper appliances.

As a glance at the tables of carp distributed will show, the interest in their culture is far from abating, and the practical evidence on every hand tends to show the following facts, viz.: Carp can be successfully raised in inland lakes; that the percentage of profit from an acre of water is largely in excess of an acre of land with equal amount of care and expense; that carp are fully up to the average as an edible fish, if properly treated, and, in spite of adverse criticism, they still hold their own as a desirable adjunct to economic farming, as is shown by the large number of applicants filed this year to be supplied by our distribution of November next. In the proper place, in this report, will be found copies of some of the many letters we have received, from those who have obtained carp through our commission, bearing upon this subject. From estimates based upon the reports of those who have undertaken carp culture, it is safe to assume that, in this State last year, the product of carp ponds would be, at a small

calculation, 3,500,000 pounds of carp, which, at a low figure, say 3 cents per pound, would save to the agricultural districts \$105,000, and this for an expense of less than \$5,000 to the State for the whole time (seven years) for this branch of our work. As a source of profit, outside of the supply for family consumption, a number have made a business of carp culture, and utilize the increase of their ponds by selling for stocking purposes, obtaining for the young fry about \$5 per hundred. The introduction of carp into our public waters presents still another phase of the value of the fish. During the seasons of 1886 and 1887, and 1887 and 1888, the U. S. Fish Commission gave us carp for our public waters. The trips of distribution of 1886 and 1887 were noted in former reports. We give herewith a summary of our distribution for season of 1887 and 1888: On November 13, 1887, car No. 2, U. S. Fish Commission, in charge of Mr. George H. H. Moore, arrived at Quincy with a load of carp for distribution in the public waters of the State. Leaving Quincy at 5 o'clock same day, on Wabash R. R., 1,500 blue carp were planted in Illinois river, 500 in lake at Jacksonville, 1,000 in ponds on State Encampment Grounds, at Springfield. Car left Springfield at 4:30 P. M. of 14th, on Illinois Central R. R., planting 500 at Clinton, Ill. Central Reservoir, arriving at Kankakee at 4 o'clock on morning of 15th. Planted in Kankakee river, at Kankakee, 5,000. Left Kankakee at 7 o'clock same morning. Ran to Centralia, where carp were left for the following points: Crooked creek, 250; Clear river, 250; Little Wabash river, 250; Big Muddy river, 250; Okaw river, 250. Leaving Centralia at 8:50 morning of 16th, ran to Decatur, where 1,000 carp were deposited in Sangamon river. Left Decatur at 4:30 P. M. on Wabash R. R. for Quincy, arriving at 12 o'clock at night. Left Quincy on C., B. & Q. R. R. on morning of 18th. Left 250 carp in ponds of C., B. & Q. R. R. at Galesburg. Arrived at Mendota at 12 o'clock, sending 1,000 carp by messenger to Rock river, at Dixon, and leaving 1,000 at Mendota, for Mendota lake. Arrived at Aurora at 1:15, planted 2,000 in Fox river, and sent 500 by messenger to Naperville, for Des Plaines river. Arrived at Chicago at 2:45, from there 250 carp sent to Rockford, for Rock river, and 400 to Richmond, for lakes in McHenry county. Car left for Washington on the night of November 18.

The transportation of car No. 2 for this trip, as indicated by memoranda of trip, was furnished by Wabash, Illinois Central and C. B. & Q. railroads, free of charge. As to the results of such planting this season, it would be impossible to make any estimate as yet, but of former planting, the results have been apparent. Carp are very frequently taken in Illinois river, of large size, and in splendid condition. Along the Mississippi river, where the men were dragging the drying sloughs, etc., for native fish, it has been almost a daily occurrence to take a fair proportion of carp, varying from 1 to 15 inches in length, showing conclusively that they not only grow in our river waters, but in



**THE WALL-EYED PIKE.**

*Stizostedion vitreum.*



crease, as well. From one pond near the river, known as the Workhouse pond, just at the southern limit of the city of Quincy, and formed by the overflow from river, at one haul of the seine, 34 carp averaging 12 inches in length, were taken with the other fish. Then, too, the extent of territory over which they have been taken, proves that they are fast taking on the habits of our native fish, and will soon be numbered among them as plentiful as the buffalo, which enter so largely into commercial circles as a standard fish for market. Much has been said about the carp. Much that has been adverse as well as favorable, as to its edible qualities. They have been called the hog among fish; a poor argument against them when the value of pork as an article of food is considered. Among the many criticisms, unfavorable to their quality as food fish, some such have been sent us. But investigation generally shows that such fish as were condemned, have been taken from some warm, muddy pond, or at time of the year when none of our fine fish are considered fit for the table. It is a well-known fact that if your best fish, such as bass and croppie, are taken from similar ponds, the flesh is found to be vastly inferior to the same fish taken from pure water. Taking such facts into consideration, one need not wonder if now and then a dissatisfied carp-eater is heard from. Carp, like everything else, require a fair chance to succeed well in life. Given a good pond of good water and food sufficient and of proper quality, they will compare as to quality of flavor, etc., very favorably with our average native fish, provided they are killed at proper season, and properly cooked. So, at least, say 90 per cent. of those who have tried them. The whole question as to whether carp culture is a profitable one is simply one of figures, and each can easily solve it for himself. Given a pond of any size and carp sufficient to stock it, purchased, say measuring three inches in length in fall, they will in following fall, measure from 12 to 14 inches, and weigh from two to three pounds each.

Thus, 1,000 carp cost, say.....	\$30
Feeding .....	5
Interest on expenditure and care.....	10
<b>Total.....</b>	<b>\$45</b>

One thousand carp weighing two pounds each at one year of age at five cents per pound, \$100, a net profit of \$55. Where can a like profit be obtained from any similar amount of expenditure or care? But to obtain all this requires, as with everything else, care, common business sense, and judgment. Carp cared for properly are profitable and a success. Carp neglected and in poor water, a failure.

#### WHITE FISH.

Considerable attention is paid to this fish by a number of our adjoining States, contiguous to the great lakes. All of them are provided with hatching stations, where spawn is utilized and the

fry placed in the lakes. As stated in a previous report, Illinois has contributed but little towards this work, although commercially very largely benefited by their protection. To this work the present United States Commissioner of Fisheries, Col. Marshall McDonald, has devoted a large amount of time and money, and as nearly as possible has undertaken to do the whole of it, by paying the expense of operating the various stations in the several States during the white fish season, beside the regular U. S. Commission hatching stations at Duluth, Northville, etc.

The Commissioner has submitted a proposition to our Board, which, in our opinion, is more than fair, and should be considered promptly and favorably. He has offered to equip, maintain and operate a hatching station for white fish in our State, if the State would furnish the location, water and buildings; and, after the white fish work was completed, the State Commission could have the use of it for such purposes as needed, hatching wall-eyed pike, trout, etc., if desired. And if at any time the work should be abandoned by the U. S. Commission, the outfit would revert to the State Board. With a view to getting this matter in definite shape, we submitted the proposition to the Chicago Park Commissioners, thinking it possible to find a location for such a station in Chicago. We were offered all the ground we could use in any of the West Side parks, with a probability of a sufficient supply of water for all purposes, free, the question of buildings alone remaining to be considered. We have no doubt of the utility of such an enterprise, as the practical demonstration of the success of artificial production of white fish by the United States and various State commissions has been of such a nature as to admit of no controversy. Mr. A. Booth, of Chicago, has offered the use of his boats and crews, and all aid necessary in procuring the spawn, and depositing it when hatched. We would recommend such an expenditure as necessary to complete buildings for this purpose as an essential one, and that the proposition of Col. McDonald be accepted.

#### FISHWAYS.

The hardest problem we have had to solve has been the fishway question, and we find this has been true in almost every State in the Union which has a fish commission. The first difficulty was to find a proper fishway. It is, and has been, a matter of deep concern among those who have made the habits of fish a study, to find some practical method to enable fish to overcome the obstacles placed in the way of their efforts to ascend the streams and find their natural spawning grounds. It has been demonstrated beyond any question, that the obstruction of water-courses by dams has done more to decrease the supply of fish than any other one cause. It needs but a casual observation in spring at the first dam on any river, to convince any one of the truth of this assertion; for gathered at base of dam will be found at be-

ginning of spawning season all the varieties of our native fish, unsuccessfully striving to get up the stream to their natural breeding grounds, and these fish can be, and are, taken by the hundreds at a single dip of the net.

If these fish were allowed to go on unmolested up the stream, deposit their spawn and harbor their young until they could care for themselves, they would people not only the stream itself, but every tributary, each with the kind best suited to the locality, and the food supply found there. The legislature, appreciating the situation and the necessities occasioned, gave us a law making it obligatory on all owning such dams or obstructions to provide means to allow fish to pass over them. Various plans were examined, but many of them proved impracticable, in that they either would not accomplish the purpose for which they were intended, or were of such construction as to offer insufficient resistance to flood and ice, and so, of course, would not be permanent. After carefully reviewing the work of other commissions, examining and proving the practicability of the different fishways used, we found two which seemed to possess both requirements, viz.: practical results and permanency. This much having been accomplished, we proceeded to give owners of dams the notice required by the law, as indicated by section 3, viz.:

Sec. 3. That it shall be the duty of any person or persons who now own or hereafter may erect any dam or other obstruction across any of the rivers, creeks, streams, bayous or other water courses within this State, to place therein suitable fish-ways, in order that the free passage of fish up and down such waters may not be obstructed; and in case the owners, operators, lessors, or other persons operating, using or controlling any dam or other obstruction across any of the rivers, creeks, streams, bayous or other water courses of the State, shall fail or refuse after ten days' notice by the Fish Commissioners of this State, or any one of them, to construct and maintain suitable fish-ways as provided in this act, then the Fish Commissioners may construct or cause to be constructed, suitable fishways, and recover in action of debt in the name of the people of the State of Illinois, before any justice of the peace or any court of competent jurisdiction, double the cost of constructing said fishway; said fund, in excess of the actual cost, shall be paid to the county superintendent of schools.

As will be seen by above section 3, after ten days' notice by the commissioners, or any one of them, if owner fails to comply with the law, the "commissioners may construct, or cause to be constructed, suitable fishways," etc. To build fishways requires money, and it must be paid for as the work progresses. After fishway was completed, and after a due process of law, a lien upon the property could be obtained, but in the meantime some one must furnish means for the work. This the commissioners could not do, as is evident to any one, when the cost of each fishway and the number of dams to be provided, is considered.

With this as the situation, the people along Fox river and Fox lake, becoming impatient at delay of dam owners to put in fishways, formed themselves into a corporation known as the Fox River Fish and Game Association, and made a demand upon the commissioners to enforce the law, in the following letter:

THE FOX RIVER FISH AND GAME ASSOCIATION.

CHICAGO, March 26, 1888.

*To the Fish Commission of the State of Illinois.*

GENTLEMEN:—At a meeting of the Fox River Fish and Game Association, held at the Sherman House, Feb. 17, 1888, on motion of Hon. John P. Reynolds, it was resolved that the President, Secretary, and D. F. Barclay be a committee to notify the Fish Commissioner of the State of the formation of this Association,—to call their attention to the dams on Fox River having no fishways, and to ask them to inform the committee what they consider to be suitable fishways under the law, and to request them to see to the immediate enforcement of the laws of the State in this respect.

This Association was incorporated under the laws of the State of Illinois, February 7, 1888, its object being to aid in enforcing the Fish and Game Laws of the State.

The committee finds that the dams mentioned below in Fox river have no fishways, and earnestly hope that the Commissioners will compel the various owners to build suitable fishways in accordance with the laws of the State.

CHAS. F. HILLS.  
JOHN WILKINSON.  
D. F. BARCLAY.

List of dams on Fox River unprovided with fishways, with names of owners:

Dayton, owned by the State of Illinois.

Yorkville, owned by M. B. Castle & Son.

Oswego, owned by Wm. Parker.

Montgomery, owned by Hoard & Bradford.

Aurora, owned by J. G. Stolp and Hoyt Brothers.

Batavia, owned by John Van Nortwick.

Geneva, owned by Gates & Bennett.

St. Charles, owned by Thomas and Robert Stewart.

Clintonville, owned by O. Davidson.

Elgin, owned by Elgin Hydraulic Company, I. C. Townner, Secretary.

Carpenterville, owned by Illinois Iron & Bolt Company.

Algonquin, owned by George Peacock.

In response to above communication, we met the officers of the association, by appointment, in Chicago, about April 1st, 1888, and the situation was explained to them. The matter of the appropriation of \$2,000 for expense of Commission in enforcing the laws relative to fishways, was brought up, and the question asked, if that amount could not be used for such purposes. The matter was referred to Hon. W. H. Henkle, Chief of Auditor's office, for his opinion, which he gave as per following letter:

STATE OF ILLINOIS,  
OFFICE OF THE AUDITOR OF PUBLIC ACCOUNTS,  
SPRINGFIELD, April 4, 1888.

*S. P. Bartlett, Secretary State Fish Commission, Quincy, Illinois:*

DEAR SIR—Yours of the 3d instant received.

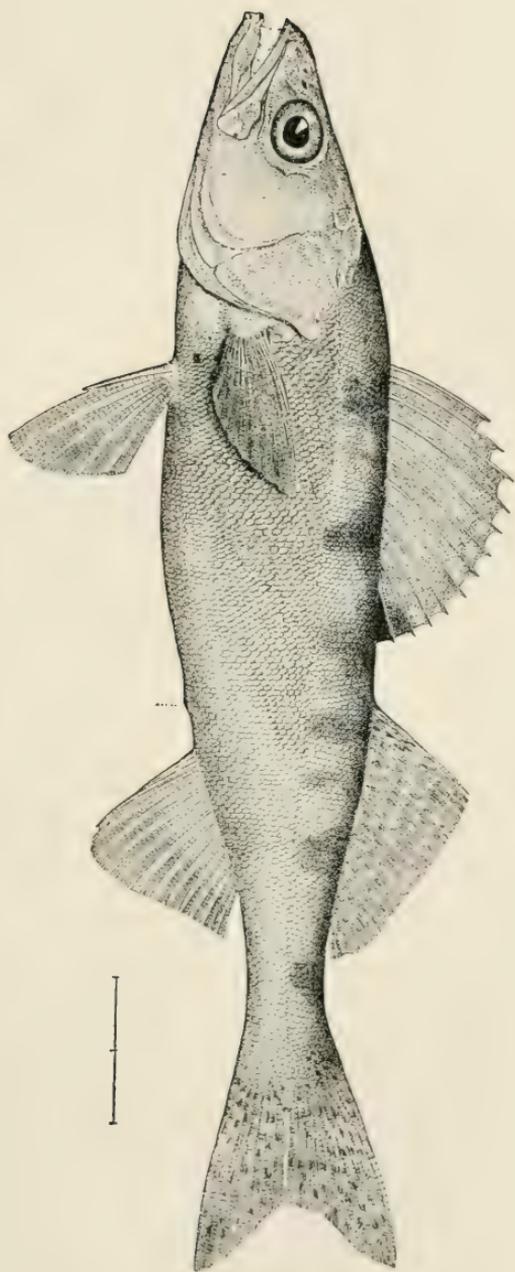
The appropriation to which you refer, is limited to the payment of the *personal expenses* of the Commissioners or such persons as may be appointed by them, to act in the enforcement of the laws relative to fishways, etc.

No part of such appropriation could be properly used for the purpose of construction of fishways, as inquired about.

I will be pleased to see you when next in the city.

Yours truly,

W. H. HENKLE.



**THE SAUGER.**  
*Microstedion Canadense.*



The matter was then left in abeyance for some days, when upon June 22nd the following letter was received from the Association, through their attorney, Hon. S. A. French.

*S. P. Bartlett, Esq., Quincy, Illinois:*

CHICAGO, July 7, 1888.

DEAR SIR—I received your telegram, but have not received any letter explaining delay as indicated by telegram. At a meeting of the Fish and Game Association the enclosed paper was unanimously approved, and a fund was raised sufficient to carry out the purposes of the Association.

The petition, or rather demand, has been signed by a few of our leading members, and if it would be considered any more emphatic or have any greater effect, the signatures of every person interested in the object of the association can be obtained in a short time.

As it is thought to be desirable that this matter should be promptly brought to your notice, and as I am now uncertain when I shall see you here, I am instructed to forward you this demand and guarantee by mail, and I herewith enclose for your consideration the same. Personally, and as your warm friend and well wisher I will say to you that these people mean business, and that I consider it to your best interests as I have before indicated to give heed to their request, and take immediate and prompt action.

Trusting I may see you at an early day, I am,

Yours truly,

S. A. FRENCH,  
*Attorney for Association.*

CHICAGO, ILLINOIS, June 21, 1888.

*To the Board of Fish Commissioners of the State of Illinois:*

GENTLEMEN—We, the undersigned citizens and residents of the State of Illinois, hereby call your attention to paragraphs two and three, of section one, chapter fifty-six, of the revised statutes of this State, being an act approved June 29, 1885, and in force July 1, 1885, which is as follows, to-wit:

"That no person shall place, or cause to be placed or erected any seine, net, weir, fish dam or other obstruction in, or across any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous, or other water courses wholly within this State, or in that part of such stream or water course wholly within this State, in such manner as shall obstruct the free passage of fish up and down or through such water courses, and that it shall be unlawful for any person to catch or take fish, except minnows for bait, with any device other than a hook or line or spear, within one-half mile of any dam constructed across any of the rivers or creeks of this State.

"2. That it shall be the duty of any person or persons who now own or hereafter may erect any dam or other obstruction across any of the rivers, creeks, streams, bayous or other water courses within this State, to place therein suitable fish-ways in order that the free passage of fish up and down may not be obstructed. A failure to perform this duty for thirty days after the passage of this act shall be deemed a violation of this section, and a failure to perform such duty for each fifteen days thereafter, shall constitute a separate offence."

We further call your attention to paragraphs two and three, chapter 56, of said statutes, being an act approved May 21, 1887, in force July 1, 1887.

"That no person shall place, or cause to be placed or erected, any seine, weir, net, fish dam or other obstruction in or across any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous, or other water courses wholly within this State, in such manner as shall obstruct the free passage of fish up and down or through such water courses, and that it shall be unlawful for any person to catch or take fish, except minnows for bait, with any device other than a hook and line within one-half mile of any dam constructed across any of the rivers or creeks of this State.

"3. That it shall be the duty of any person or persons who now own, or hereafter may erect any dam or other obstruction across any of the rivers, creeks, streams, bayous, or other water courses within this State to place therein suitable fish-ways. In order that the free passage of fish up and down such waters may not be obstructed; and in case the owners, operators, lessors, or other persons operating, using or controlling any dam or other obstruction across any of the rivers, creeks, streams, bayous, or other water courses of this State, shall fail or refuse after ten days' notice by the Fish Commissioners of this State, or any one of them, to construct and maintain suitable fish-ways as provided in this act, then the Fish Commissioners may construct or cause to be constructed suitable fish-ways and recover in action of debt in the name of the people of the State of Illinois, before any justice of the peace, or before any court of competent jurisdiction, double the cost of constructing said fish-ways; said fund in excess of the actual cost, shall be paid to the county superintendent of schools."

And in this connection to notify you that unlawful dams have been constructed and now exist across Fox river in this State, at the following points, viz: at Dayton, Yorkville, Oswego, Aurora, Batavia, Geneva, Elgin, South Elgin, St. Charles, Carpentersville, Algonquin, and elsewhere, and that none of said dams are provided with suitable fish-ways as provided by law.

You will further take notice, that under the common construction of the language of above provisions as held by the courts of this State upon the above facts being brought to your notice, it becomes your duty to immediately serve upon the offending owners of said dams, a notice as provided by law to construct proper fish-ways in said dams, and on their failure so to do within the statutory period, to proceed to construct the same, and to collect from the owners of such dams the cost thereof with statutory penalty.

You are hereby notified that the Fox River Game and Fish Association, a corporation organized under the laws of this State, agree to advance the necessary funds in the first instance to be paid back to them out of recovery had from said dam owners by legal proceedings as by law provided.

The agreement of said association in writing being hereto attached. We therefore, for ourselves, and for the people of this State formally and emphatically demand of you that you forthwith perform your duties as Fish Commissioners of this State, and enforce the above provisions of the statute of this State.

CHAS. F. HILLS,  
President Fox River F. & G. Ass'n.  
JOHN WILKINSON,  
Secretary Fox River F. & G. Ass'n.  
GEORGE E. COLE,  
86 Dearborn Street.  
HENRY L. HERTZ,  
278 North May.  
JOHN C. McCONE,  
116 LaSalle St.  
JOHN W. LYKE,  
156 Washington St.  
FRANK I. PEARCE,  
11 South Jefferson St.  
GEORGE C. PRUSSING,  
588 Dearborn ave.

FRENCH & MAY,  
Attys. for Fox River F. & G. Ass'n.  
JOHN A. ROCHE.  
GEORGE B. SWIFT.  
PHILIP KNOPP.  
THOMAS PARKER.  
CHAS. E. HYDE.  
W. L. BROWN.  
W. D. COOPER.  
CHARLES H. FOSTER.  
JOHN P. REYNOLDS.  
W. C. DYER.  
CYRUS H. CLARKE.  
FRANK E. NELTNOR.  
GEO. R. DAVIS.

CHICAGO, ILL., June 21st. 1888.

*To the Board of Fish Commissioners of the State of Illinois.*

GENTLEMEN—WHEREAS, It has come to our notice that certain dams on Fox River in this State are not provided with suitable fish-ways;

And, WHEREAS, It is provided by law that in case the owners of such dams fail to erect such fishways in such dams when properly notified by you, that you may proceed to erect such fishways and recover from the owners thereof double the cost of such fishway;

And, WHEREAS, We are informed that no fund has been provided or is in your hands with which to pay the cost of said fishways in the first instance, and in consequence of such deficiency you are unable to, and decline to act in the matter and carry out the law;

Now, Therefore, We hereby agree to advance to you the necessary funds to pay for such fishways in the first instance whenever such fishways are completed or as the same may be required from time to time during the construction of said fishways.

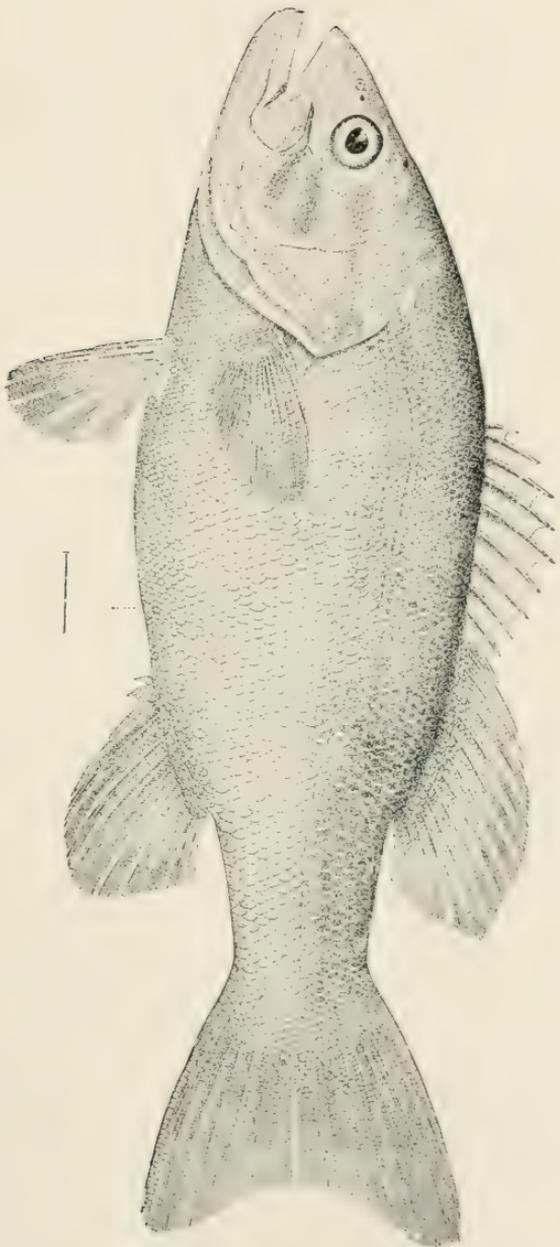
All such moneys so advanced to be paid to us immediately out of recoveries to be had against the owners of such dams as aforesaid, and provided, further, that our attorney be authorized in your name to bring and prosecute all suits for such recovery, whenever such right of action against such dam owners or any of them may from time to time accrue.

CHAS. F. HILLS,  
President.  
JOHN WILKINSON,  
Secretary.

Immediately upon receipt of this letter, another meeting in Chicago was arranged, and acting under the provisions of the letter, the owners of the Elgin Hydraulic Company, of Elgin, Ill., were given notice required by law, and the commissioners proceeded to arrange for suitable plans for the fishways.

A meeting with the directors of the Elgin Hydraulic Company and Mr. Rogers, of Amherst, Canada, was had, and figures were made looking towards a contract to put in fishway without recourse to the enforcement of the legal phases of the notice. The Board appointed Mr. Geo. B. Cole, of Geo. B. Cole & Co. Chicago, to act for them in this matter, and in all matters connected with fishways upon Fox river. Mr. Cole, one of the leading spirits in the Fox River Association, gave his time and personal attention to the matter, visiting every dam on the river, and served notices upon all interested, as per his report herewith.

The dam at Elgin was provided with a Roger's fishway, as were also those at South Elgin and Algonquin. Right here arose an-



THE SMALL-MOUTH BLACK BASS.

*Micropterus Dolomieu.*



other question, which proved a new hindrance to the successful completion of the work of the Commissioners. It was this: The dam at Dayton, belonging to the State, was unprovided with a fishway. It was the first dam on the river, and the argument was used by those above that it was useless to force them to comply with the law without first having the State open its dam. The argument was a hard one to controvert, and it would have seemed like a mere display of authority to force those above to comply with the law without the State was, first, in a position to make it possible. Correspondence with the Canal Commissioners was had, with reference to the joint resolution of the Thirty-second General Assembly, as herewith:

JOINT RESOLUTION 32D GENERAL ASSEMBLY.

*Concerning the construction of fishways by the Canal Commissioners.*

WHEREAS, It appears from statements made by the Fish Commissioners of the State of Illinois, that the dams constructed by the State of Illinois are not sufficient to meet the requirements of the present law in regard to fishways; therefore, be it

*Resolved by the House of Representatives, the Senate concurring herein,* That the Canal Commissioners of the State of Illinois be, and are hereby instructed to complete or reconstruct said dams so that they may afford easy and ample opportunity for fish to pass over said dams.

The Commissioners agreed to put in a fishway, and at present writing we understand that they have commenced operations, thus making it possible for us to proceed to open up Fox river entire. This will give to Fox lake its proper annual supply of fish from the Illinois river, and through it from the Mississippi river, while the natural breeding grounds to which they can then find free access will soon give the increase in millions of young fish, thus thoroughly and effectually repopulating the waters of that portion of the State.

On Rock river the situation is different. There no dam obstructs save those owned by private corporations, and due notice has been served upon the owners. At Rockford the law is being complied with and a fishway in process of construction. On the Kankakee river arrangements have been made for putting in fishways, private parties arranging to take the line and furnish the money, provided the owners do not put them in themselves. Thus all over the State in almost all the inland streams, we find the stream obstructed by dams, some of them quite small, some massive, but all needing to be provided with fishways; and, as we have shown, it is simply impossible to enforce the law if commissioners are obliged to put them in, without sufficient means are provided for the purpose. With one dam so provided upon a stream, there is no question but that all others interested would comply. We would recommend that a sufficient sum of money be made available to be used in enforcing the provisions of the law. The State for its expenditure, which would be only temporary, being fully indemnified by the lien obtained upon the property. We would also recommend that the law be so amended as to make the Fish Commissioners the judges as to what shall constitute a good and sufficient fishway. This would enable them to approve

and adopt some practical, durable and economical plan. As it is, each owner of a dam may put in a fishway that in his opinion will give a free passage for fish, up and down the stream, and leave it to time and those interested, to prove that it does not.

There can be no question as to the importance of the thorough enforcement of the law. With the rivers fully opened, fish will find their way from the larger rivers—the great arteries—up into the headwaters of the smaller streams and their tributaries, re-peopling where now are only such as are planted there, and in an incredibly short time the waters will be filled to the extent nature designed, with fish native to them. Without it, it will be a work of constant care on the part of those whose duty it may be to not only stock these waters annually, but to guard them from the in-roads made upon them not only by natural causes, but by the use of seines, which the obstruction of streams makes so easy at the season when fish are struggling to carry out in nature's ways, nature's plans, and make the water as productive to man's use as the land.

---

REPORT OF GEO. E. COLE IN MATTER OF FISHWAYS ON FOX RIVER.

CHICAGO, ILL., August 18, 1888.

*To S. P. Bartlett, Secretary, Quincy, Illinois:*

DEAR SIR—Thanking you for selecting me as the representative of the State Fish Commission to notify the owners of dams on Fox river that they must comply with the law, relating to the placing of proper "fishways" in their dams, I beg leave to submit the following as the result of my notification tour:

I served written notices on all the owners of dams on Fox river from Algonquin to Yorkville, both inclusive.

Andrew Doig owns the dam at Algonquin. When served with the notice he said: "I am not able to put in a fishway; but I am perfectly willing that one should be constructed in my dam, and I will do half the work." Notice served August 14.

The Illinois Iron and Bolt Company owns the dam at Carpentersville—Henry E. Edwards, president. When served with the notice Mr. Edwards said that he had already constructed a fishway, as per model furnished him by ex-Fish Commissioner McDole. He says that he will have nothing more to do with the matter as he has obeyed the law fully. I examined the "fishway" and found that at its best fish can pass through it only at certain stages of high water. At present no water passes through the fishway. Notice served August 14.

The Clintonville (or South Elgin) dam gave me a good deal of trouble on account of the numerous parties interested therein. However, I am satisfied that they will comply with the law. I served the following persons who are interested, either in the dam, or have certain "water privileges." Dr. J. A. Teffert, (Elgin) who is ready to do his part. V. W. Pantou, (Clintonville) owns certain "water privileges" and is liable for any part of fishway, will do his part. Frank Hutchison, (West Elgin) owns "water privileges" and says he has nothing to do with the fish-way. Alfred Bosworth, representative of the I. Bosworth estate, and cashier of First National Bank of Elgin, says the estate only has "water privileges" and he has nothing to do with fishway. Orlando Davidson (East Elgin) owns part of the dam, and is willing to do his part. Notices served August 15th.

The St. Charles dam is in the same condition as that of Carpentersville. A "fishway" was put in at the instance of Mr. McDole, but was never formally accepted or rejected by him, though built according to his plans and specifications. Charles Haines, one of the owners will contest the matter, in court if another fishway is required. Charles A. Miller, E. Brownell, and Stewart Bros., are willing to put in new one. S. S. Bignell and O. M. Butler also owners, were absent, and I served notices on their employes. Notices served August 18th.

Bennett & Gates, C. E. Mann, Chas. Pope Glucose Company, and the W. H. Howell Co., are the owners of the dam at Geneva. Notice was served personally upon all of them, except Charles Pope, who was absent. His superintendent was served instead. There will be no trouble at this dam. I would respectfully state in connection with this dam, that the Glucose factory is bitterly complained of by everyone residing on the river south of Geneva to as far as Yorkville. Fishermen claim that the refuse matter from the Glucose factory kills the fish, and ruins the water for drinking, cooking and manufacturing purposes. Certainly, it is very filthy, and I have no doubt as to its injurious effects on fish. It is at the earnest request of all persons residing south of Geneva that I make mention of this matter. Notices served August 16th.

The dam at Batavia is owned by the Van Warwick Paper Mills and Challenge Mills, and the Newton Wagon Company, and Shumway & Bishop have "water privileges." There will be no trouble here. The dam owners are ready to begin work at once. The firms who have "water privileges" say that they have nothing to do with the fishway. Notice served August 16th.

The dam at North Aurora is owned by several, though I could only find one of the owners—Mr. Alonzo George, cashier of the Second National Bank of West Aurora. I served notice on him, and he will act as the law directs, notifying all the others interested with him, the notice being directed to each, and all of them. Notice served August 17th.

J. J. Stolp, Hoyt Bros., and Jameson & Sheets own the two dams at Aurora. Stolp and Jameson & Sheets are ready to go to work, while Hoyt Bros., say that they would rather allow other parties to put the fishway in their dam at double cost so they would have redress in the event the dam should be damaged. Notice served August 17th.

Hoard & Broodhead, at Montgomery, are ready to go to work at once. Notice served August 17th.

William Parker, at Oswego, is ready to put in the fishway. Says he fought the State once, on the question, but will not do so again. Notices served August 17th.

M. B. Castle & Co., and Sheridan Black own the dam at Yorkville and are ready to put in the fishway. Notice served in person on Castle & Co., and on Black's foreman. Notices served August 17th.

All the owners insist that some one clothed with the proper authority wait on them and designate place for fishway, and that as soon as that is done they are ready to proceed at once.

With great respect, I remain, yours very truly,

GEO. E. COLE.

#### FISH LAWS.

### *An Act to Encourage the Propagation and Cultivation and to Secure the Protection of Fishes in all the Waters of this State.*

[Approved May 31, 1887, in force July 1, 1887.]

SECTION 1. *Be it enacted by the People of the State of Illinois, represented in the General Assembly, That it shall be unlawful for any person to catch or kill any fish with any seine or any other device used as a seine, in or upon any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous or other water courses wholly within or running through the State of Illinois, nor shall the meshes of any weir basket or trap, or any device used for catching fish in such waters not above prohibited, except for catching minnows for bait, be less than two inches square: Provided, however, that seining shall be lawful and allowed between the 1st day of July in each year and the 1st day of March in the following year, with seines, the meshes of which shall not be less than two inches square, in such rivers or streams as are used for navigation, wholly within the State, and not above or beyond any private or corporate dams on said rivers or streams, and, also, in the navigable bays or lakes connected with such navigable streams wholly within the State, and not extending beyond the overflowed bottoms of such rivers or streams: Provided, also, That it shall be lawful for the Fish Commissioners, or persons authorized by them, to take fish in any way at any time they deem best, for purposes of propagation or distribution.*

§ 2. That no person shall place, cause to be placed, or erected, any seine, weir, net, fish dam or other obstruction in or across any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous or other water courses wholly within this State, in such manner as shall obstruct the free passage of fish up and down or through

such water courses; and that it shall be unlawful for any person to catch or take fish, except minnows for bait, with any device other than a hook and line within one-half a mile of any dam constructed across any of the rivers or creeks of this State.

§ 3. That it will be the duty of any person or persons who now own or hereafter may erect any dam or other obstruction across any of the rivers, creeks, streams, bayous or other water courses within this State, to place therein suitable fish-ways, in order that the free passage of fish up and down such waters may not be obstructed; and in case the owners, operators, lessors, or other persons operating, using or controlling any dam or other obstruction across any of the rivers, creeks, streams, bayous or other water courses of the State, shall fail or refuse after ten days' notice by the Fish Commissioners of this State, or any one of them, to construct and maintain suitable fish-ways as provided in this act, then the Fish Commissioners may construct or cause to be constructed, suitable fish-ways, and recover in action of debt in the name of the people of the State of Illinois, before any justice of the peace or any court of competent jurisdiction, double the cost of constructing said fish-way; said fund, in excess of the actual cost, shall be paid to the county superintendent of schools.

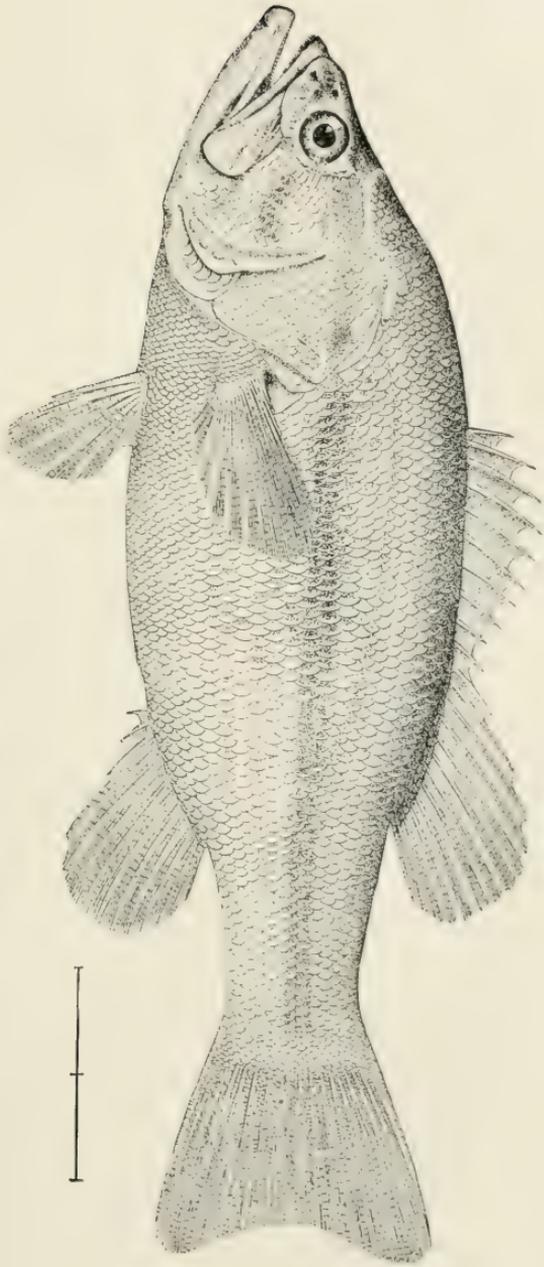
§ 4. That it shall be unlawful for any person or persons, at any time, to catch or kill any fish in any of the rivers, creeks, ponds, lakes, sloughs, bayous or other water courses within the jurisdiction of this State, by use of spear, lime, acid, medicinal or chemical compound or explosive.

§ 5. It shall be unlawful for any person or persons to take by any device or means whatsoever, brook trout from any of the streams, lakes or other water courses within the State, between the 15th day of July and the 1st day of April following, in each year, and at no time with any device whatever, except a hook and line.

§ 6. Any person or persons violating any of the provisions of the preceding sections of this act shall be deemed guilty of a misdemeanor, and upon conviction shall be fined not less than ten (10) nor more than two hundred (200) dollars and cost of suit.

§ 7. Any person or persons who shall, for the purpose of fishing, without the consent of the owner, trespass upon the lands of another, containing any fish pond or lake, whether natural or artificial, when and where the waters of such pond or lake are not directly connected with any water course of this State, shall be deemed guilty of a misdemeanor, and on conviction shall be fined in any sum not less than ten nor more than one hundred dollars and cost of suit for the first offense, and not less than thirty nor more than two hundred dollars for the second offense, and the same for each subsequent offense as for the second offense.

§ 8. To enforce the provisions of this act, all suits brought under the same shall be brought in the name of the People of the State of Illinois, and shall be brought on the complaint of any



**THE BIG-MOUTHED BLACK BASS.**

*Micropterus Salmoides.*



person or persons showing by affidavit that some section of this act has been violated, giving the names of the person and persons violating, if known, and if unknown, such affidavit shall state by some person or persons whose name or names are unknown, and such complaint shall be made before any justice of the peace of the county in which such violation has been made.

§ 9. Where such violation is alleged to have been committed upon that portion of a stream or water course which may be the dividing line between two counties, then the complaint may be made to any justice of the peace of either of such counties.

§ 10. If the justice before whom such complaint shall be made shall be satisfied that there is reasonable cause to justify the making of such complaint, he shall issue his warrant, directed to the sheriff or constable of such county, commanding him forthwith to arrest and bring before him, or in his absence, before some other justice of the peace within such county, the person or persons alleged to have been guilty of violating any of the sections of this act.

§ 11. Whenever any person or persons shall be brought before any justice of the peace, in the manner provided in this act, it shall be the duty of such justice to hear and determine the complaint. The person or persons so charged may demand a jury at any time before the commencement of the trial, and the case shall be tried as cases before justices in civil cases, and judgment shall be for conviction or acquittal of the defendant or defendants in the case. In case a jury is called, the form of the verdict shall be, if for conviction: "We, the jury, find the defendant guilty, and assess the fine at. . . . ." and if for acquittal: "We, the jury, find the defendant not guilty." The justice shall pronounce judgment in accordance with the verdict.

§ 12. Whenever any judgment of conviction shall be rendered against any defendant or defendants, as above provided, execution shall issue forthwith on such judgment, and the sheriff or constable to whom the same shall be directed, shall pay one-half of all penalties collected on such execution in payment of such judgment to the person or persons who shall have made the complaint, and the remaining one-half to the superintendent of schools of the county wherein such trial shall be had.

§ 13. Whenever any execution issued as above provided, shall be returned "No property found," the justice issuing the same, or in case of his death or absence, any other justice having possession of the docket in which such judgment was entered, shall issue his warrant to the sheriff or any constable of such county, commanding him to take and deliver the defendant or defendants in the execution, to the jailor of said county, who shall receive such defendant or defendants into his custody and commit him to the county jail of such county, or workhouse of such county, whenever one exists, for a period of not less than ten nor more than sixty days, as the justice shall decide and direct in his warrant, but such defendant or defendants so arrested or committed shall be discharged at any time on payment of such fine and costs.

§ 14. Any defendant or defendants against whom such judgment of conviction shall be rendered, and, in case of acquittal, the party making the complaint, or any person who will give the necessary bond, shall have the right of appeal, on the same terms as in civil cases before justices, but no proceedings herein provided for shall be stayed until such appeal shall be fully perfected.

§ 15. It shall be the duty of all sheriffs, deputy sheriffs and constables of this State to look after the violation of any of the sections of this act; to make complaints where such violations come to their knowledge; and they shall have power to arrest any person or persons they may find in the act of violating any of the provisions of this act without a warrant, and keep him or them in custody until complaint can be made against him or them, as hereinbefore provided.

§ 16. All acts and parts of acts in conflict with this act are hereby repealed; but such repeal shall not disturb the status of the present Board of Fish Commissioners.

The foregoing is a copy of our Fish laws, as now in force. The intent of the law is in itself, good, but it lacks the element of proper provision for its enforcement, and does not clearly define violation. As the law now stands, the burden of proof rests with the State, and while fishermen have been taken but a short distance from a lake, with a wagon loaded with fish, and with a wet seine on the load, yet even with such seemingly conclusive evidence of violation, conviction has failed, as it was necessary to prove that the fish were taken by such means, by parties in possession. Men have repeatedly been detected coming out of bay or lakes, with boat load of fish, and with a seine in sight, but conviction was impossible for the same reason.

Again, the law does not define, as closely as it should, what kind of nets, if any, may be used.

We think that the possession of a seine, net or trap, in the portions of the State where their use is unlawful, or the possession of an unusual amount of fish, under circumstances which would lead one to believe they were unlawfully taken, should be considered a violation of the law, and warrant seizure and confiscation of fish and nets, unless the possessor could show that the fish were lawfully obtained. It is difficult to obtain evidence against fishermen who violate the law, even when there are witnesses of the violation. Men hesitate to testify against them, fearing that harm to themselves or their property will grow out of it. Then the work, for the greater part, is done after night, and unless a business is made of watching them from start to finish, conviction is very difficult. For reasons given in this report, under head of fishways, as regards the use of the \$2,000 per annum, appropriated for paying personal expenses of the Commissioners, or persons authorized by them, we cannot use that fund for other purposes than to pay personal expenses of any one we might set at such work, their per diem being, of

course, not allowable as a proper item of expense. And, even if it could be so used, it would only be sufficient, with the other expenses depending upon it, to cover the expense contracted in the most flagrant violations, and entirely insufficient for any considerable number of cases. On the other hand, if a law was so worded as to compel burden of proof to fall upon defendant, and violation of law clearly defined, in our opinion, short work would be made of the illegal taking of fish.

The construction of the law, seems, in our opinion, faulty, in that it admits of a diversity of opinion as to its interpretation.

Section 1 says:

"Nor shall the meshes of any weir, basket, trap, or any device used for catching fish in such waters not above prohibited, except for catching minnows for bait, be less than two inches square." This section could be construed, if taken independent of section 2, to permit the use of almost any kind of net except such as had meshes less than two inches square. The second section, however, would seem to make such an interpretation doubtful.

"Sec. 2. That no person shall place, cause to be placed or erected, any seine, weir, net, fish dam or other obstruction in or across any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous or other water courses wholly within this State, in such manner as shall obstruct the free passage of fish up and down or through such water courses."

If it were accepted as a fact that a net, trap or seine can not be placed in the water so that it will not to some extent constitute an obstruction to the free passage of fish, then would the law fulfill its purpose. But this is not the understanding of this section, as the decisions in a number of cases have shown. The law, to be effective, should be so clearly defined, in all its provisions, as not to admit a doubt as to its meaning. Convictions have been quite frequent, notwithstanding the many difficulties attending, but the penalties imposed have been so trifling in comparison to the extent of damage, as to discourage, not the violator, but those seeking to enforce the law.

We would recommend that the laws be so amended as to cover, as nearly as possible, the points set forth, and authority delegated to the commissioners, or to some properly authorized person, to legally enforce them.

#### MORTALITY AMONG FISHES.

During the month of August, 1887, immediately after a severe rain storm, report reached us that an immense number of fine fish were floating on the water, dead, in a lake at head of Quincy bay. On going to the place indicated, we found the report to be true, and the shores lined with dead bass, croppies, sunfish, buffalo, catfish, white perch, etc., evidently having been dead some days. Prof. Forbes, State Entomologist, was telegraphed for and came immediately.

Repairing to the locality again, an examination of surroundings was made. A seine was hauled in the lake and all fish taken out, of which there seemed yet a plentiful supply, seemed to be lively and healthy, showing no indications of disease. The fish along the shore were in such an advanced state of decomposition as to make any detailed examination an impossibility. At Galena a similar state of things existed, and a telegram from Mr. G. W. Perigo, Chicago Times correspondent at Galena, said that the river at that point was fairly covered with dead fish. The same trouble was encountered there, however, as at Quincy. The fish came to the surface all in one night, and, as in former case, too badly decomposed to admit of an examination, and as soon as water cleared up the remaining fish were found to be as usual, lively and in good condition. At Carlinville, at Beaver Dam Lake, a similar instance occurred at same time. On going on to the lake no indications of any unusual conditions could be found. The fish had ceased dying, and such as remained were doing well. In every instance a large proportion of the fish were of the larger ones, yet not confined to any variety.

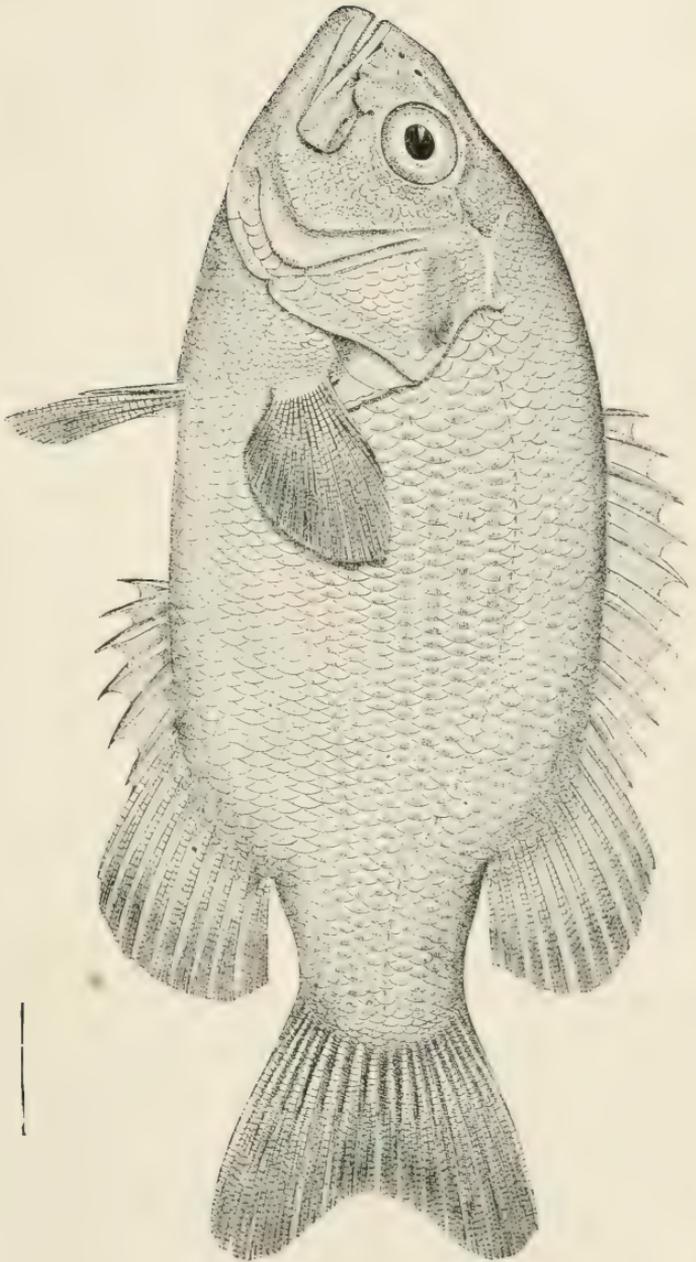
Prof. Forbes, who promptly gave the matter his time and attention, did not give an opinion as to cause of this mortality, owing to the impossibility of making any examination as before stated, and as in no instance could a sick fish be found, and none dying after the one day, the cause could be only a subject of conjecture. We were also informed that a large number of carp ponds were similarly affected, part of fish dying and only found when in a decomposed condition they rose to the surface.

#### PROTECTIVE ORGANIZATIONS.

An unusual amount of interest taken of late years in the matter of protecting fish and enforcing the laws, has resulted in the forming of a large number of strong and influential organizations in various parts of the State, and the sections of country affected by these organizations have been greatly benefited by their moral influence, as well as by their efforts for the enforcement of the laws.

Fox lake and river have an organization whose membership comprises all those who own property on Fox lake, many of these being influential citizens of Chicago. To Mr. Geo. E. Cole, of Chicago, our commission and the people of Fox river valley are indebted for his energetic work in perfecting such an organization and carrying out its provisions. The C., B. & Q. Rod and Gun Club, another strong organization, taking in its membership residents of all the territory lying along the C., B. & Q. R. R., from Aurora to Chicago, through its Secretary and Superintendent, Mr. Wm. Wright, of Naperville, is doing a splendid work.

At Galesburg a club, comprising about one hundred members, is in process of organization, whose object is the better protection of fish.



THE ROCK-BASS OR RED EYE.

*Ambloplites rupestris.*



At Gladstone, the Crystal Lake Club has located a beautiful club house, taken in about 4,000 acres of land and water, and has effected a systematic organization for protection of game and fish. At Springfield, the Springfield Fishing Club, numbering 100 members, is working towards the same end. They have secured Clear Lake, six miles east of the city, built a club house and beautified the grounds and are affording protection, as far as possible, against illegal fishing in the lake and river.

At Waterloo a similar association controls and protects a series of beautiful lakes, as does, also, the Murdock Lake Club, in the same locality.

At Charleston, on the Embarras river, the Charleston Protective Association is doing good and effective work, and to such an extent has this been done, that illegal fishing is almost unknown in that locality. Mr. Otto Weiss, secretary, reports an unusual increase of fish resulting from the care of natural supply, and such planting as has been done by the commission. So at Danville. With a beautiful lake at the junction of the three branches of the Vermilion river, controlled by a strong club, efforts are being made to protect the fish as fully as may be.

At Carlinville, Beaver Dam Lake, owned and controlled by a club of same name, but few violations occur. At Rockford, Winnebago county fish club has a strong organization.

So, all over the State, an increased interest is shown. And if our laws can be constructed so as to admit of proof being made, and with a gradual but encouraging growth of public sentiment in favor of fish protection, good results can be obtained, and a work which every one admits to be a good one in theory, may prove, in practice, a profitable one to the people of our State.

#### OFFICE BOAT.

The appropriation of one thousand dollars for building an office and storage boat, by the last General Assembly, gave us what had been so long a necessity, an office large enough to transact the business of the Commission, a place for our books, papers and blanks, and storage room for boats, live boxes, tools, etc. We built a boat forty-eight feet long, over all, by thirty-one feet wide, with a house, or cabin, forty feet long by twenty-five feet wide, giving us two office rooms, one 12x15 feet, the other 10x12, with a storage room 25x25 feet; height of eaves 10½ feet, in center 11¾ feet; roof rounding; the whole surmounted by a small cupola and flag-staff.

The house stands on three hulls, each 25 feet long by eight feet wide, and three feet deep. The floor, two inches thick, is laid on heavy timbers, running across hulls, and leaving a space between hulls, of eight feet. The hulls are constructed of 4x6 timbers, laid flatwise on each other, drift-bolted through, for gunwales. Bottom and rake of two inch stuff. The office rooms are

finished by covering in sides and ceiling with yellow pine. Floor first covered with tarred paper, and then by matched yellow pine. Office provided with book-case, and case for boxes, and office railing. Cost of structure was as follows:

Contract for hulls—three—\$85 each.....		\$255 00
“ “ floor or deck.....		120 00
“ “ house or cabin.....		480 00
“ “ ceiling and office.....		60 00
Roofing material, asbestos.....		55 00
Painting material, asbestos.....		26 00
Two anchors, \$5 each.....		10 00
Curtains and painting office.....		18 00
Water closets.....		11 00
Spuds.....		15 00
Shutters, screens, etc.....		31 50
		<hr/>
		\$1,081 50
Appropriation.....	\$1,000 00	
Sale of old boat.....	50 00	1,050 00
		<hr/>
Deficit.....		\$31 50

The boat is held in place by four spuds, 8x8 inches thick, 24 feet long, one at each corner of boat. The hulls are so arranged, that any one of them may be taken out, independent of the others, caulked or repaired, and put back. This will save, in itself, a considerable amount yearly, as the expense of hauling out on ways of so large a craft, is quite considerable. Arranged as this is, work can be accomplished by a man or two, in a short time, without interfering materially with the house or cabin. The painting was done by the man in charge, during the interval between seasons. Stage planks, and inside fixtures for store rooms also arranged by him. We designed, when building boat, space for placing hatching jars, with necessary piping, pump and boiler to enable us to hatch artificially, the eggs of the Wall-eyed Pike, etc., and thus lessen the expense annually incurred when work was done for us by other parties.

In our office, we need furniture sufficient for our purposes, desks, a safe, typewriter, and such appliances as will enable us more easily to care for the constantly increasing work connected with it.

We would recommend that an amount be appropriated sufficient to complete boat, furnish office, and provide for hatching spawn.

#### ACKNOWLEDGMENTS.

We desire to acknowledge our obligation to Col. McDonald, U. S. Commissioner of Fisheries, for the generous gift of the use of U. S. Fish Commission cars Nos. 1 and 2, as well as for our annual supply of carp for distribution to private individuals and to public waters.

To Hon. Geo. H. H. Moore, Superintendent of Distribution U. S. Fish Commission, for valuable aid given in personal supervision in the work of distribution.

To the superintendent of car No. 1, Newton Simmons, and of car No. 2, Will. A. Dunnington, for courteous and constant assistance, aside from the regular work, whenever needed. To the "boys" who comprise the crews of both for the interest taken in the work, and the good will with which it was accomplished.

To our railroads we are, as before stated, indebted for much of our success; for without their aid given just as it was and at the time it was, we would have failed even though all other interests were favorable. They have been generous and accommodating even when worked inconvenience to them to be so.

The employes of the roads over which we worked have always given us careful consideration, and by their ready assistance have made it possible, very often, to overcome obstacles which without their aid would have been insurmountable for the time. To the press of the State, this, as in all other seasons, since the organization of the Board, we owe very much of the interest awakened through the State in fish distribution and protection. By their ready co-operation and the generous use of their columns when needed, we have been able to reach the people with our announcements of distributions, etc. We have been criticised at times severely, but have found them as ready always to bestow praise as censure, if we deserved it.

To Prof. Forbes, State Entomologist, and his assistant, Prof. W. H. Garman, we are indebted for the elaborate and valuable papers found in appendix to this report.

#### UNITED STATES FISH COMMISSION.

Since our last report Prof. S. F. Baird, so long at the head of the Smithsonian Institute and of Fish Commission, has passed away. His labors have given the work of fish culture an impetus that has made it widespread, and by his scientific investigation and experiments he has made the practical working of our commissions possible to-day. Prof. Baird was succeeded by Col. Marshal McDonald, who had served under him as Chief of Division of Distribution for a long period of time, and to whom the fish culturists of to-day are indebted for very many of the practical appliances for artificial propagation of fish, and for the general work of the Commission. Col. McDonald has undertaken to arrange his work so that he can co-operate with the various State Commissions, and do for them such work as could be accomplished in conjunction with that of the U. S. Commission, such as the propagation and distribution of whitefish and shad.

Long connection with the U. S. Commission has enabled Col. McDonald to appreciate the wants of every portion of the country and apply practically such means of relief as his great experience

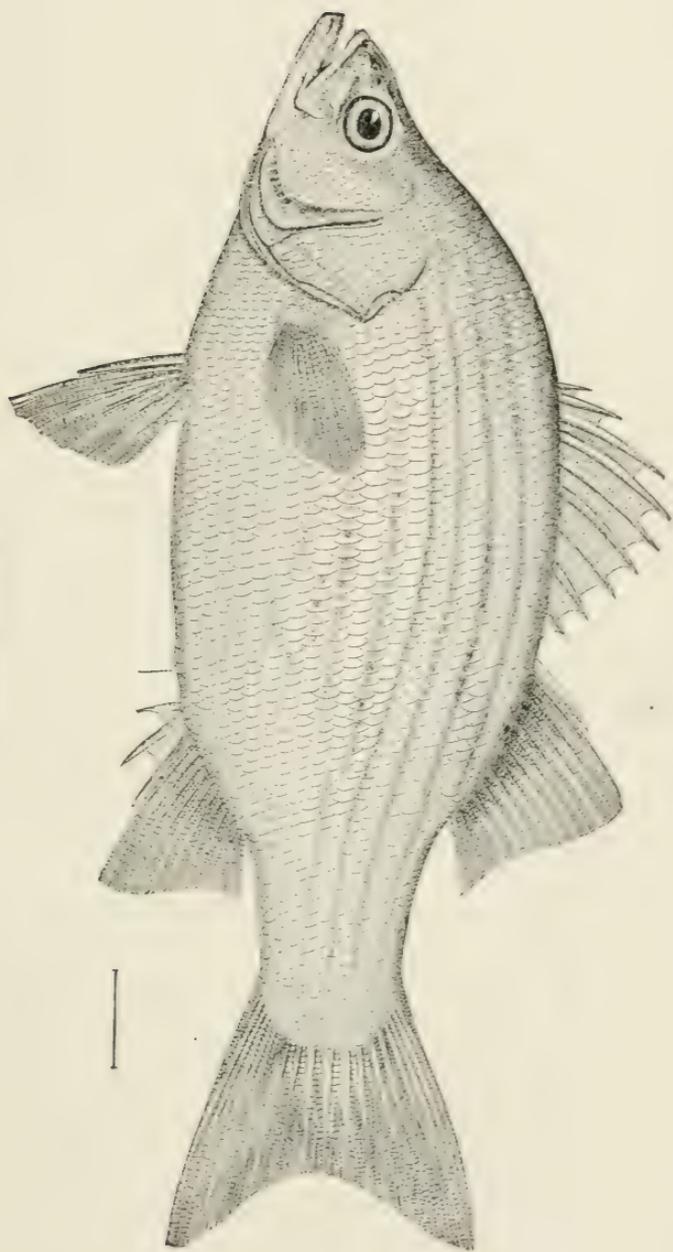
would suggest. He thoroughly understands his business and gives it closest attention. His appointment has given universal satisfaction to the various State Commissions, and to every one who has an interest in the practical development of fish culture and protection throughout the Union. Col. McDonald has proved himself to be "the right man in the right place." A conscientious, industrious worker, and always for the best interests of the whole country.

#### SUMMARY.

We leave our work and its merits to be judged by those interested. We have undertaken to follow nature's ways as nearly as possible, and give back to the barren streams, that which nature designed should be found there. We have endeavored to impress upon the people interested the fact that protection now means future plenty, and, at the same time, give to them, when needed, the necessary start in the direction of plenty.

It has been, necessarily, a work of slow, but, we are glad to be able to say, of steady growth. And, reviewing the situation as it now is, and comparing it with what it was at introduction of our work, we can not but feel encouraged. The importance of this matter of propagation and protection of fish, and its relation to the food question of the day, is thought of but by the few. If the facts regarding their increase, and its probabilities, could be generally understood by the many, it would be considered not only a work of merit, but one of absolute necessity. It is not working only to supply the needs of to-day, but anticipating those of the future. For it needs not a far-seeing eye to see a day when the ever increasing tide of emigration shall have filled up the great west, and in its ebb, flow back again toward the east. And even now, the present prophesies of a future when our new world shall be peopled as is the old one, and the ever-present, ever-recurring question will be to procure cheap, yet wholesome food for the people. Then the water will be expected to produce its share, as does the land, and instead of wholesale depletion, and reckless waste, every means will be used to re-populate our streams, and jealous care exercised to protect them. For there can be no doubt, in view of facts, that the water is capable of producing equally as valuable results as does the land. It has been so in the past, before the natural enemies of the fish were distanced by the cunning devices of man to enrich himself, at the expense of the public, and for the sake of a few dollars more to-day, destroy all chances of future benefit, not only to others, but himself as well. We believe that with the increased interest, and better protection, it will be so again.

To accomplish this, we would suggest that cognizance of the following needs be taken: First, laws that can be definitely understood and readily enforced, looking toward the benefit of the people, as a whole, although they should work hardship to a few. Next, to give fish an absolutely free passage up all our streams.



**WHITE BASS.**

*Morone chrysops.*



as nature intended they should have, and making the provision for such free passage, of so practicable and durable a nature that it can be permanently maintained.

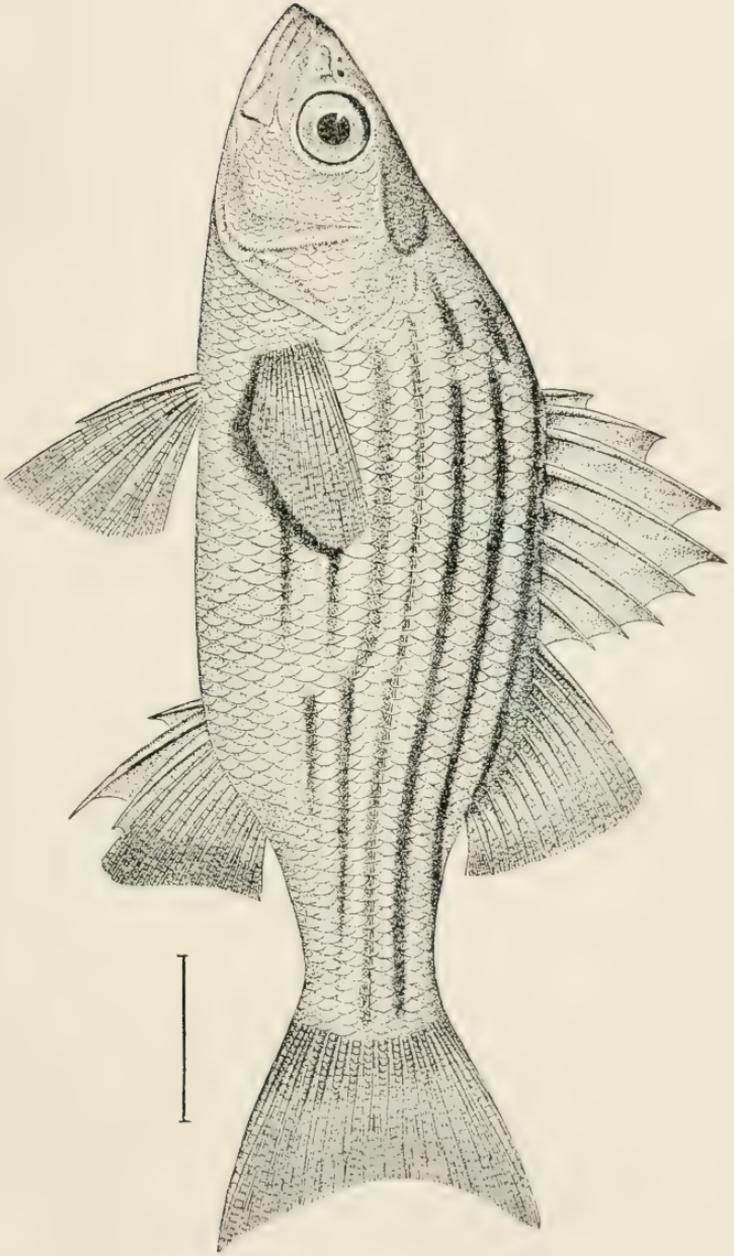
A sufficient appropriation made, to meet the wants, not only of the work of taking and distributing the native fish, but, as well, for their protection when put into the streams, and for carrying out the suggestions made in the body of this report. The work of this season has demonstrated the necessity of having a car for use in the transportation of fish through the State. By this means, and with the appliances which we are thus able to use, the expense of transporting the fish for distribution, is materially lessened, while a much greater number can be carried than by the old plan. The work of aerating can be accomplished almost wholly by mechanical means, thus reducing the number of attendants to only such as are requisite in loading and unloading the fish. A number of railway managements have tendered us free transportation for a car for 1889, as in 1888. We believe this to be the most practical, effective and economical method of distribution which has yet been attempted, and hope that the question of a car for the work, will receive consideration.

In concluding our report, we desire to say, as modestly as may be, that we feel that our work has been a successful one, not only in the practical benefits to the people, in giving to depleted streams a new supply, but also in the largely increased interest in the protection and propagation of fish, which has been everywhere awakened, and for which, we believe, the work of the Commission has been, at least partially responsible. The benefits arising from such work, are being better understood and appreciated each year, and the results of past endeavors both of the United States and the various State Commissions have been sufficiently satisfactory to encourage the most sanguine hopes for the success of future efforts.

Respectfully submitted,

N. K. FAIRBANK.  
S. P. BARTLETT.  
GEO. BREUNING.





**THE YELLOW BASS.**

*Morone intermedia.*



---

---

APPENDIX.

---

---



*Recapitulation of Expenditures by Illinois State Fish Commission from October 1, 1886, to September 30, 1888.*

BILLS OF PARTICULARS AND SUB-VOUCHERS ON FILE WITH AUDITOR.

To amount to credit of Commission October 1, 1886 .....	\$2,863 05	
To appropriation for 1887 .....	7,500 00	
	\$10,363 05	
Cr.		
By general expenditures for taking, propagating and distributing native fish and carp, etc., for October, 1886 .....		\$536 35
By personal expense of Commission for October, 1886 .....		59 50
“ general expenditures for November, 1886 .....		328 85
“ personal expenditures for November, 1886 .....		49 75
“ claim B. F. Herrington, fishway suit .....		155 00
“ general expenditures for December, 1886 .....		399 41
“ personal expenditures for December, 1886 .....		41 35
“ general expenditures for January, 1887 .....		226 65
“ personal expenditures for January, 1887 .....		27 45
“ general expenditures for February, 1887 .....		125 20
“ personal expenditures for February, 1887 .....		8 25
“ general expenditures for March, 1887 .....		145 95
“ personal expenditures for March, 1887 .....		44 75
“ general expenditures for April, 1887 .....		867 69
“ personal expenditures for April, 1887 .....		27 80
“ general expenditures for May, 1887 .....		631 00
“ personal expenditures for May, 1887 .....		9 75
“ general expenditures for June, 1887 .....		514 47
“ personal expenditures for June, 1887 .....		48 90
“ general expenditures for July, 1887 .....		695 20
“ “ “ August, 1887 .....		338 65
“ “ “ September, 1887 .....		597 02
	6,178 94	\$6,178 94
By amount to credit of Commission October 1, 1887 .....	\$4,184 11	
To appropriation for 1887 .....	7,500 00	
“ proceeds sale of boat .....	6 00	
“ earnings steamer Eagle to October, 1, 1887 .....	195 00	
	\$11,885 11	
Cr.		
By general expenditures for October, 1887 .....		451 67
“ “ November, 1887 .....		462 08
“ “ December, 1887 .....		290 83
“ “ January, 1888 .....		319 91
“ “ February, 1888 .....		454 44
“ “ March, 1888 .....		393 51
“ “ April, 1888 .....		434 93
“ “ May, 1888 .....		368 87
“ “ June, 1888 .....		480 39
“ “ July, 1888 .....		697 85
By purchase steamer Eagle .....		300 00
By general expenditures for August, 1888 .....		1,064 98
“ “ September, 1888 .....		926 50
	6,641 96	\$6,641 96
Amount to credit of Commission October 1, 1888 .....	\$5,339 15	



## DISTRIBUTION OF NATIVE FISH.

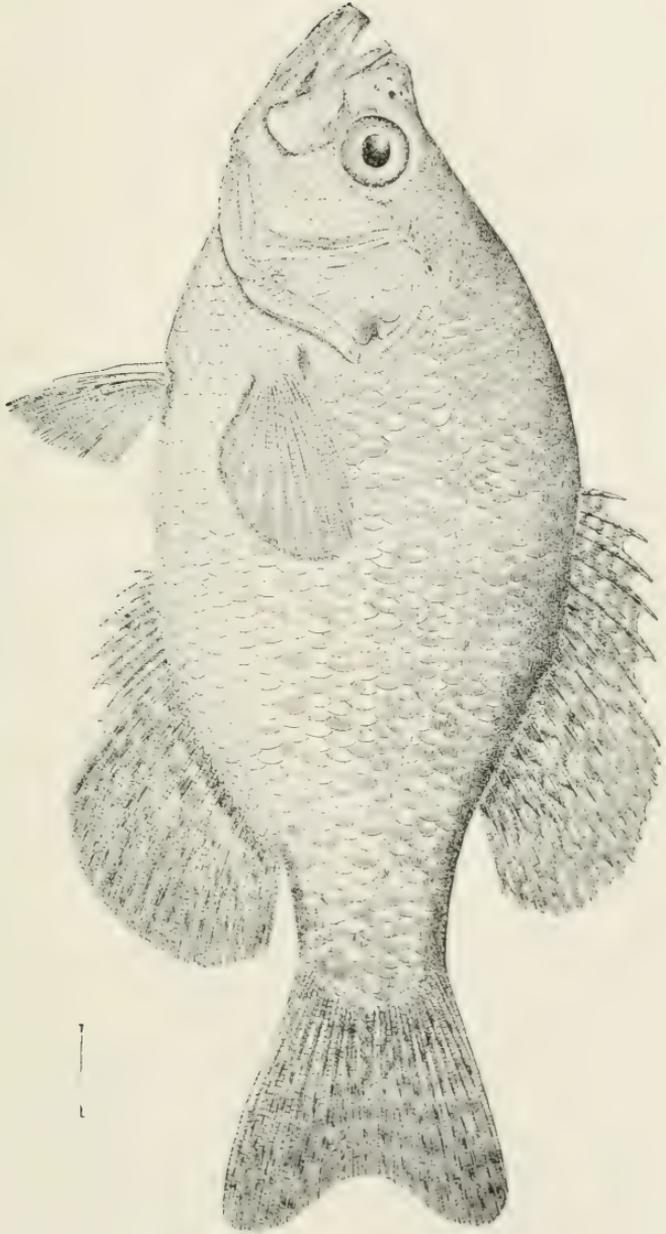
We give herewith a list of streams restocked in season of 1887.

On account of the dry season and consequent low water, our work was commenced quite early, while fish were yet very small, which will account for the greater number distributed. Estimate of the number being made, through the season, on a basis of 20,000 to the bushel, and plant averaging about 5,000 fish to each point of distribution. In some instances the plant would exceed this number, as many were deposited in nearest deep water. Only about one-third of the fish saved were transported to inland streams.

## DISTRIBUTION OF NATIVE FISH, 1887.

NAME OF STREAM.	RAILROAD CROSSING STREAM.	COUNTY.
Desplaines River	C., B. and Q. R. R.	Cook.
East DuPage River	" "	DuPage
West " "	" "	" "
Indian Creek	" "	" "
Fox River	" "	Kane
Somanank Creek	" "	DeKalb
Little Indian Creek	" "	" "
" "	" "	LaSalle.
Henderson River	" "	" "
Fox River	C. and N. W. R. R.	Kane
" "	Illinois Central R. R.	" "
" "	C. and N. W. R. R.	McHenry.
Greene River	C., B. and Q. R. R.	Lee
Rock River	" "	Whiteside
" "	C. and I. R. R.	Ogle
" "	C. and N. W. R. R.	Lee
Rock Creek	" "	Whiteside
Greene River	C., B. and Q. R. R.	Bureau.
" "	C., R. I. and P. R. R.	" "
Rock Creek	C., B. and Q. R. R.	Whiteside
Coal Creek	" "	Bureau.
Spoon River	" "	Stark.
Sugar Creek	" "	Schuylcr.
Otter Creek	" "	Fulton.
Spoon River	" "	Knox.
" "	T., P. and W. R. R.	Fulton
Kickapoo River	C., B. and Q. R. R.	Peoria
Ripple Creek	" "	McDonough.
Crooked Creek	" "	" "
Edwards River	" "	Henry
" "	" "	Mercer
Henderson River	" "	Henderson
Sny Ecarte	" "	Pike
Rock River	" "	Rock Island.
Pope Creek	" "	Knox
Kaskaskia River	L., E. and St. L. R. R.	Washington.
N. F. Saline River	L. and N. R. R.	Gallatin.





**THE CRAPPIE.**  
*Pomoxis annularis.*



## DISTRIBUTION OF 1888.

---

The distribution of native fish for 1888 amounted to 26 car loads, which were planted in streams crossed by the following railroads:

Chicago, Burlington & Quincy Railroad, main line and branches.  
Wabash Railway.

Illinois Central Railroad.

Chicago & Northwestern Railroad.

Indianapolis & St. Louis Railroad.

St. Louis, Alton & Terre Haute Railroad.

Ohio & Mississippi Railroad.

Peoria, Pekin & Jacksonville Railroad.

Chicago, Milwaukee & St. Paul Railroad.

Indianapolis, Bloomington & Western Railroad.

Indianapolis, Decatur & Springfield Railroad.

Louisville & Nashville Railroad.

Mobile & Ohio Railroad.

This plant included—

Perkin's Lake, near Athens.

Murdock Lake.

Fox Lake.

Park Lake, at Danville.

Railroad Reservoir at Lanesville.

“ “ Berlin.

“ “ Sadorus.

Long Lake, Madison county.

Reno Lake.

Lake George, Knox county.

Crystal Lake, near Gladstone.

Railroad Lake, Galesburg.

Park Lakes, Chicago.

## MISSISSIPPI RIVER AND ITS TRIBUTARIES WHOLLY OR PARTLY WITHIN THE STATE OF ILLINOIS.

*Ohio River.*  
*Big Muddy River.*  
*Kaskaskia River.*  
*Mary's River.*

*Illinois River.*  
*Fox River.*  
*Henderson River.*  
*Edwards River.*

*Rock River.*  
*Plum River.*  
*Apple River.*  
*Sny Ecarte River.*

### CREEKS TRIBUTARY TO MISSISSIPPI RIVER:

Clear Creek.  
Fountain Creek.  
Cahokia Creek.  
Piasa Creek.  
Kiset Creek.  
Mill Creek.  
Rock Creek.  
Bear Creek.  
Honey Creek.  
Dugout Creek.  
Cedar Creek.  
Ursa Creek.  
Pope Creek.  
Eliza Creek.  
Copper Creek.  
Johnson Creek.  
Big Rush Creek.  
Small Fox Creek.

### TRIBUTARIES TO OHIO RIVER:

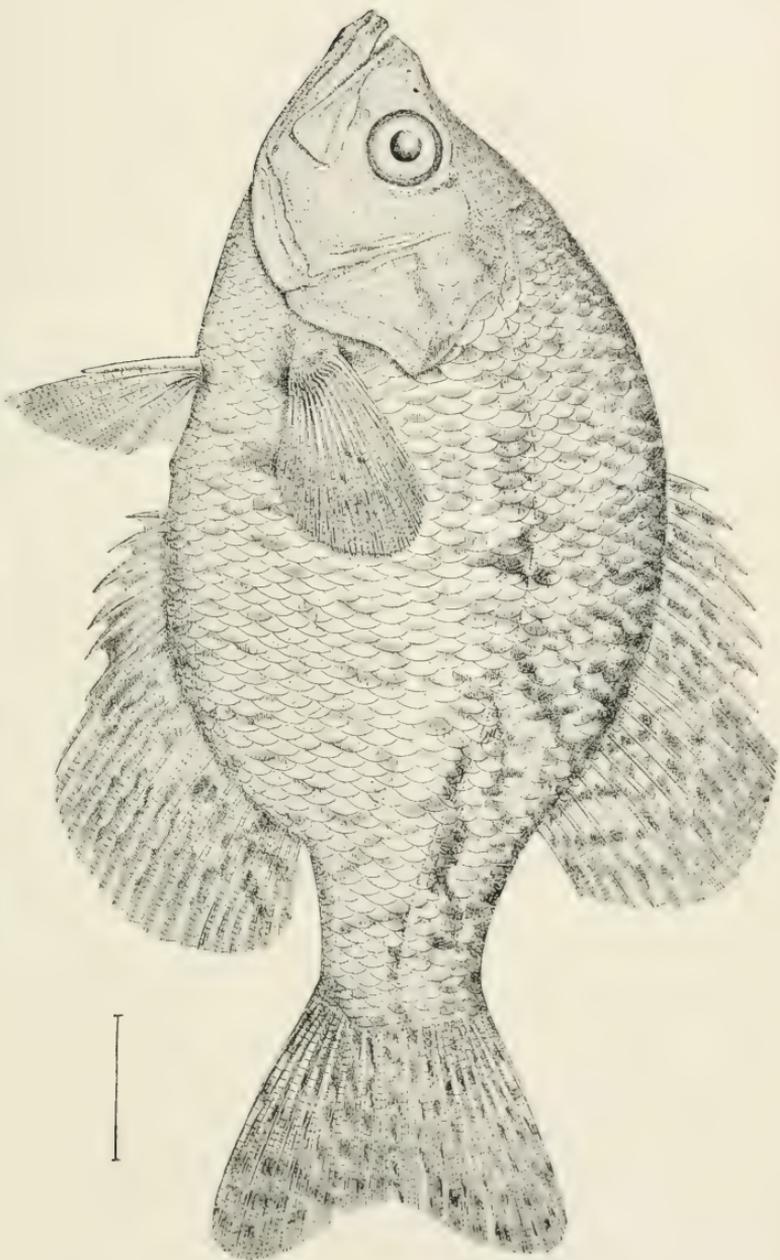
Saline River.  
    North Fork of Saline River.  
    South Fork of Saline River.  
Embarras River.

### TRIBUTARY TO BIG MUDDY RIVER:

Kingkaid Creek.  
Beaucoup Creek.  
    Pipe Stone Creek.  
    Galum Creek.  
    Little Beaucoup Creek.  
    Swanwick Creek.  
    Locust Creek.  
    Painter Creek.  
Big Crab Orchard Creek.  
    Crab Orchard Creek.  
Little Muddy River.  
    Carson Creek.  
Middle Fork of Big Muddy River.  
    Ewings Creek.  
Gum Creek.  
Casey Fork.  
    Atchinson's Fork.  
    Ray's Creek.

### TRIBUTARIES TO KASKASIA RIVER

Nine Mile Creek.  
Plumb Creek.  
Silver Creek.  
    East Fork.  
Big Muddy Creek.  
Elk Horn Creek.  
Sugar Creek.  
Shoal Creek.  
Beaver Creek.  
    Flat Branch.  
East Fork of Shoal Creek.  
    Dry Creek.  
Middle Fork of Shoal Creek.  
West Fork of Shoal Creek.  
Crooked Creek.  
Lost Creek.  
Great Point Creek.  
Prairie Creek.



THE CALICO BASS, OR STRAWBERRY BASS.

*Pomoxis strimoides.*



Coles Creek.  
 Gibbs Creek.  
 East Fork Kaskaskia River.  
     Bear Creek.  
     Hurricane Creek.  
 Hickory Creek.  
 Camp Creek.  
 Booz Creek.  
 Suck Creek.  
 Big Creek.  
 Beck's Creek.  
 Richland Creek.  
     Brush Creek.  
 Robinson Creek.  
 Sand Creek.  
 West Fork of Kaskaskia River.  
     Apple Creek.  
     Lake Fork.

## TRIBUTARIES TO ILLINOIS RIVER:

Otter Creek.  
 Macoupin Creek.  
     Taylor's Creek.  
     Joe's Creek.  
     Solomon's Creek.  
     Otter Creek.  
     Bear Creek.  
     Honey Creek.  
 Apple Creek.  
 Big Grassy Lake.  
 Big Sandy Creek.  
     Little Sandy Creek.  
 Walnut Slough.  
 Bay Creek.  
 Mauvaisterre Creek.  
 McKeel's Creek.  
 Willow Creek.  
 Indian Creek.  
     Prairie Creek.  
 Crooked Creek.  
     Little Missouri Creek.  
     Cedar Creek.  
     Grindstone Creek.  
     Carter's Creek.  
     Camp Creek.  
     Troublesome Creek.  
     Panther River.  
     Bronson's Creek.  
     Middle Creek.  
     Long Creek.  
     North Branch of Crooked Creek.  
     Spring Creek.  
 Sangamon River.  
     Big Panther Creek.  
     Clary's Creek.  
     Crane Creek.  
     Salt River.  
         Prairie Creek.  
         Sugar Creek.  
         Kickapoo Creek.  
         Deer Creek.  
         Salt Creek.  
         North Branch Salt Creek.  
         Lake Fork Salt Creek.  
     Rock Creek.  
     Spring Creek.  
     Lick Creek.  
     Sugar Creek.  
     Brush Creek.  
     South Fork.  
         Bear Creek.  
         Flat Branch.  
     Lake Fork.  
     Willow Branch.  
     Goose Creek.  
     Camp Creek.  
     Madden Creek.  
     Stevens Creek.  
 Otter Creek.  
 Spoon River.  
     Big Creek.  
     Putnam Creek.

Coal Creek.  
 Cedar Creek.  
     Swan Creek.  
 French Creek.  
 Sugar Creek.  
 Walnut Creek.  
 Quiver Creek.  
 Bucklin Creek.  
 Mackinaw Creek.  
     Mill Creek.  
     Walnut Creek.  
     Panther Creek.  
     Northwestern Branch Mackinaw River  
     East Branch.  
     Six-Mile Creek.  
     Honey Creek.  
     Bray's Creek  
     Henline Creek.  
 Kickapoo Creek.  
 Richland Creek.  
 Crow Creek.  
     North Branch of Crow Creek.  
     South Branch of Crow Creek.  
 Strawn's River.  
 Crow Creek.  
 Sandy Creek.  
 Clear Creek.  
 Big Bureau Creek.  
 West Bureau Creek.  
 Negro Creek.  
 Vermilion River.  
     Wolf Creek.  
     Otter Creek.  
     Scattering Point Creek.  
     Rook's Creek.  
     South Fork Vermilion River.  
     North Fork Vermilion River.  
 Covei Creek.  
 Fox River.  
     Big Indian Creek.  
     Indian Creek.  
     Mission Creek.  
     Somonauk Creek.  
     Battle Creek.  
     Blackberry Creek.  
     Fox Lake.  
     Squaw Creek.  
     Nipper Sink Lake and Creek.  
 Nettle Creek.  
 Waupcan Creek.  
 Mazon River.  
     West Fork of Mazon River.  
     East Fork of Mazon River.  
         Gooseberry Creek.  
 An Sable Creek.  
     Saratoga Creek.  
 Kankakee River.  
     Prairie Creek.  
     Forked Creek.  
     Rock Creek.  
     Iroquois River.  
         Sangamon River.  
         Prairie Creek.  
         Spring Creek.  
         Sugar Creek.  
     Exline Slough.  
     Trim Creek.  
 DuPage River.  
     Lilly Cache River.  
     West Branch of Du Page River.  
 Jackson's Creek.  
 Des Plaines River.  
     Calumet River.  
         Little Calumet River.  
     Salt Creek.  
     Mill Creek.

## TRIBUTARIES TO ROCK RIVER:

Mill Creek.  
 Greene River.  
     Mineral Creek.  
     Spring Creek.

Mud Creek.  
 Coal Creek.  
     Hickory Creek.  
     Willow Creek.  
 Rock Creek.  
     Little Creek.  
 Sugar Creek.  
     Spring Creek.  
     Elkhorn Creek.  
 Five-Mile Creek.  
 Three-Mile Creek.  
 Pine Creek.  
 Clear Creek.  
 Kite River.  
 Leaf River.  
 Kishwaukee River.  
     Piasa Creek.  
     Coon Creek.  
     Rush Creek.  
 North Branch of Kent's Creek.  
 Pecatonica River.  
     Rock Run.  
     Pillow Creek.  
 Sugar River.  
     Otter Creek.

#### TRIBUTARY TO HENDERSON RIVER:

Cedar Creek.

#### TRIBUTARIES TO EDWARDS RIVER:

Camp Creek.  
 East Branch.  
 West Branch.

#### TRIBUTARY TO APPLE RIVER:

Irish Hollow Creek.

## LIST OF FISH COMMISSIONERS OF UNITED STATES AND CANADA.

### THE UNITED STATES—

Col. Marshall McDonald, Commissioner ..... Washington, D. C.  
 Capt. J. W. Collins, Assistant in charge of Fisheries Division.  
 Richard Rathbone, Assistant in charge of Scientific Inquiry.  
 George H. H. Moore, Superintendent of Distribution.

### ALABAMA—

Col. D. R. Hundley ..... Madison.  
 Hon. Chas. S. G. Doster ..... Prattsville.

### ARIZONA—

J. J. Gosper ..... Prescott.  
 Richard Rule ..... Tombstone.  
 J. H. Taggart, Business Manager ..... Yuma.

### ARKANSAS—

H. H. Rottaken, President ..... Little Rock.  
 W. B. Worthen, Secretary ..... Little Rock.  
 J. W. Calloway ..... Little Rock.  
 (This State has never made an appropriation for Fishculture.)

### DOMINION OF CANADA—

Hon. John Tilton, Deputy Minister of Fisheries ..... Ottawa.  
 Inspectors of Fisheries for the Dominion of Canada, 1888:  
 W. H. Rogers ..... Amherst, N. S.  
 A. C. Bertram ..... North Sidney, C. B. N. S.  
 W. H. Venning ..... St. John, N. B.  
 William Wakeman ..... Gaspé Basin, P. Q.  
 J. H. Duvar ..... Alberton, P. E. I.  
 Thomas Mowat ..... New Westminster, B. C.  
 Alex. McQueen ..... Winnipeg, Man.  
 Officers in charge of fish breeding establishments:  
 S. Wilmot, Superintendent of Fishculture ..... Newcastle, Ont.  
 Chas. Wilmot, officer in charge ..... Newcastle Hatchery, Ont.  
 Wm. Parker ..... Sandwich, Ont.  
 L. N. Catellier ..... Tadoussac, Q.  
 Philip Vibert ..... Gaspé, Q.  
 A. H. Moore ..... Magog, Q.  
 Alex. Mowat ..... Ristigouche, Matapedia, P. Q.  
 A. B. Wilmot ..... Bedford, N. S.  
 C. A. Farquharson ..... Sydney, N. S.  
 Isaac Sheasgreen ..... Miramichi, N. B.  
 Charles McCluskey ..... St. John River, Grand Falls, N. B.  
 Henry Clark ..... Dunk River, P. E. I.  
 Thomas Mowat ..... B. C. Hatchery, New Westminster, B. C.

### CALIFORNIA—

Joseph Routier ..... Sacramento.  
 J. D. Harvey ..... Los Angeles.  
 (Commissioner T. J. Sherwood resigned March 15, 1888.)

### COLORADO

G. F. Whitehead ..... Denver.

## CONNECTICUT—

Dr. Wm. M. Hudson	Hartford.
Robert G. Pike	Middletown.
James A. Bill	Lyme.
(The State has no official superintendent, most of the hatching being done by Henry J. Fenton, Poquonnock.)	

## DELAWARE—

Charles Schubert	Odessa.
------------------	---------

## GEORGIA—

J. H. Henderson	Atlanta.
Superintendent:	
Dr. H. H. Cary	La Grange.

## ILLINOIS—

N. K. Bairbank, President	Chicago.
S. P. Bartlett, Secretary	Quincy.
Geo. Breuning	Centralia.

## INDIANA—

W. T. Dennis	Richmond.
--------------	-----------

## IOWA—

E. D. Carlton	Spirit Lake.
Superintendent, Ole Bjorenson.	

## KANSAS—

S. Fee	Wamego.
--------	---------

## KENTUCKY—

Wm. Griffith, President	Louisville.
P. H. Darby	Princeton.
John B. Walker	Madisonville.
Hon. C. J. Walton	Mumfordsville.
Hon. John A. Steele	Midway.
W. C. Price	Danville.
Hon. J. M. Chambers	Independence.
A. H. Goble	Catlettsburg.
J. H. Mallory	Bowling Green.

## MAINE—

E. M. Stilwell	Bangor.
Henry O. Stanley	Dixfield.
B. W. Counce, Sea and Shore Fisheries	Thomaston.

## MARYLAND—

Dr. E. W. Humphries	Salisbury.
G. W. Delawder	Oakland.

## MASSACHUSETTS—

E. A. Brackett	Winchester.
E. W. Putnam	Cambridge.
E. H. Lathrop	Springfield.

## MICHIGAN—

John H. Bissell	Detroit.
(Term expires January 1, 1889.)	
Herschel Whitaker	Detroit.
(Term expires January 1, 1891.)	
Joel C. Parker, M. D.	Grand Rapids.
(Term expires January 1, 1893.)	
Walter D. Marks, Superintendent	Paris.
George D. Mussey, Secretary	Detroit.
Wm. A. Butler, Jr., Treasurer	Detroit.

## MINNESOTA

William Bird	Fairmount.
Niles Carpenter	Rushford.
Robert Ormsby Sweeny, President	St. Paul.
S. S. Watkins, Superintendent	Willow Brook, St. Paul.

## MISSOURI—

H. M. Garlich, Chairman.....	St. Joseph.
J. L. Smith.....	Jefferson City.
H. C. West.....	St. Louis.
A. P. Campbell, Secretary.....	St. Joseph.
Superintendents:	
Phillip Kopplin, Jr.....	St. Louis.
Elias Cottrill.....	St. Joseph.

## NEBRASKA—

William L. May.....	Fremont.
R. R. Livingston.....	Plattsmouth.
B. E. B. Kennedy.....	Omaha.
Superintendent:	
M. E. O'Brien.....	South Bend.

## NEVADA—

W. M. Cary.....	Carson City.
-----------------	--------------

## NEW HAMPSHIRE—

Geo. W. Riddle.....	Manchester.
Elliott B. Hodge.....	Plymouth.
John H. Kimball.....	Marlborough.
Superintendent of Plymouth and Sunapee Hatcheries—	
Com. E. B. Hodge.....	Plymouth.

## NEW JERSEY—

William Wright.....	Newark.
Frank M. Ward.....	Newton.
J. R. Elkinton.....	Pennsgrove.

## NEW YORK—

E. G. Blackford, President.....	New York.
Gen. R. U. Sherman.....	New Hartford.
Wm. H. Bowman.....	Rochester.
A. S. Joline.....	Tottenville.
Henry Burden.....	Troy.
Secretary:	
E. P. Doyle, Room 311, Potter Building.....	New York City.
Superintendents:	
Fred Mather.....	Cold Spring Harbor.
Monroe A. Green.....	Caledonia.
James H. Marks.....	Bloomingtondale.
E. L. Marks.....	Fulton Chain.
E. F. Bochm.....	Mill Creek.
Shellfish Commission:	
E. G. Blackford, Commissioner; Wm. G. Ford, Engineer; J. W. Merserau, Oyster Protector, 80 Fulton Market, New York.	

## NORTH CAROLINA—

Wm. J. Griffin, Chairman.....	Elizabeth City.
J. B. Watson.....	Englehard.
Wm. T. Cahoon.....	Bayboro.

## OHIO—

C. V. Osborn, President.....	Dayton.
A. C. Williams, Secretary.....	Chagrin Falls.
J. C. Hofer.....	Bellaire.
John H. Law.....	Cincinnati.
Hon. Emory D. Potter.....	Toledo.
Superintendent:	
Henry Douglass.....	Sandusky.
Chief Warden:	
L. K. Buntain.....	Dayton.

## OREGON—

F. C. Reed, President.....	Clackamas.
E. P. Thompson.....	Portland.
R. C. Campbell.....	Rainier.
(Terms expire in February, 1889.)	

## PENNSYLVANIA—

Henry C. Ford, President, 524 Walnut street.....	Philadelphia.
James V. Long, Corresponding Secretary, 75 Fifth avenue.....	Pittsburg.
H. C. Demuth, Secretary of Board.....	Lancaster.
S. B. Stilwell.....	Seranton.
A. S. Dickson.....	Meadville.
W. L. Powell, Treasurer.....	Harrisburg.
Superintendents—	
John P. Creveling.....	Allentown.
William Buller.....	Corry.

## RHODE ISLAND—

John H. Barden, President .....	Rockland.
Henry T. Root, Treasurer.....	Providence.
Wm. P. Morton, Secretary.....	Johnston.

## SOUTH CAROLINA—

Hon. A. P. Butler .....	Columbia.
-------------------------	-----------

## TENNESSEE—

W. W. McDowell.....	Memphis.
H. H. Sneed.....	Chattanooga.
Edward D. Hicks.....	Nashville.

## UTAH—

A. Milton Musser.....	Salt Lake City.
-----------------------	-----------------

## VERMONT—

Herbert Brainard.....	St. Albans.
F. H. Atherton .....	Waterbury.

## VIRGINIA—

Dr. J. T. Wilkins.....	Bridgetown.
------------------------	-------------

## WEST VIRGINIA—

C. S. White, President.....	Romney.
F. J. Baxter, Treasurer.....	Sutton.
James H. Miller, Secretary.....	Hinton.

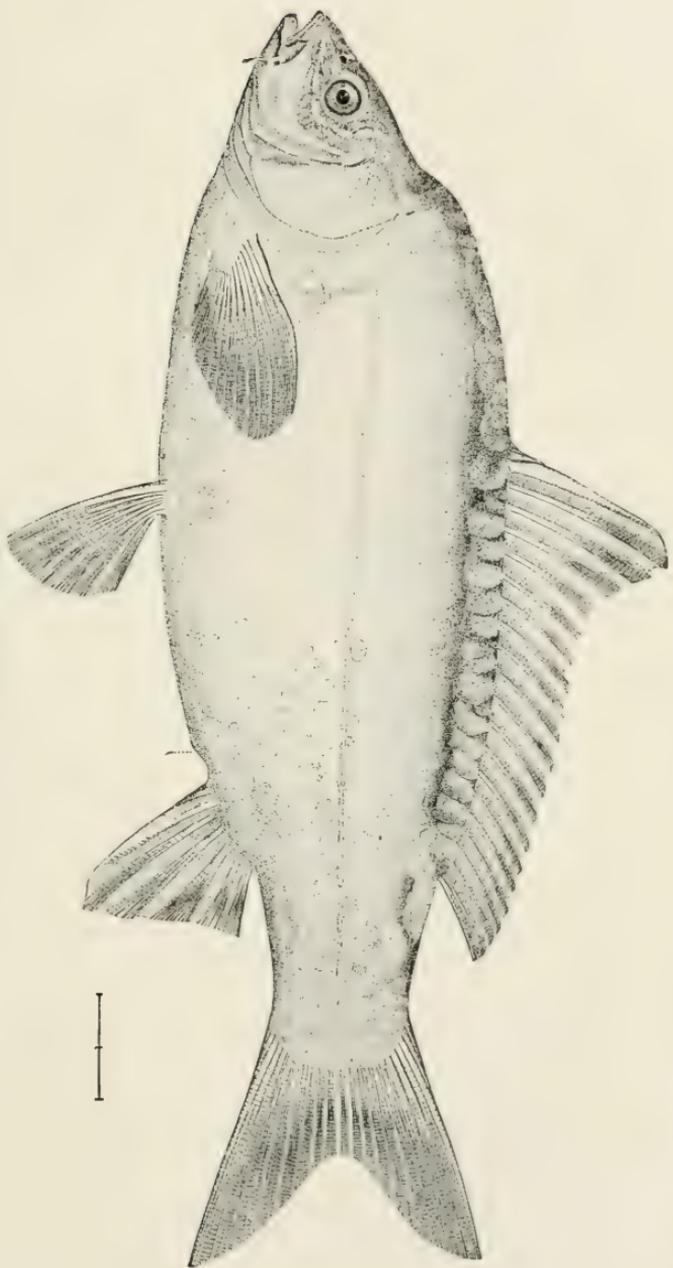
## WISCONSIN—

The Governor, <i>ex-officio</i> .....	
Philo Dunning, President.....	Madison.
C. L. Valentine, Secretary and Treasurer.....	Janesville.
Mark Douglas.....	Melrose.
A. V. H. Carpenter.....	Milwaukee.
Calvert Spensley.....	Mineral Point.
E. S. Miner.....	Sturgeon Bay.
Superintendent:	
James Nevin.....	Madison.

## WYOMING TERRITORY—

Louis Miller.....	Laramie.
-------------------	----------





**THE LEATHER CARP.**

*Cyprius Carpis.* (var. *Corticus.*)

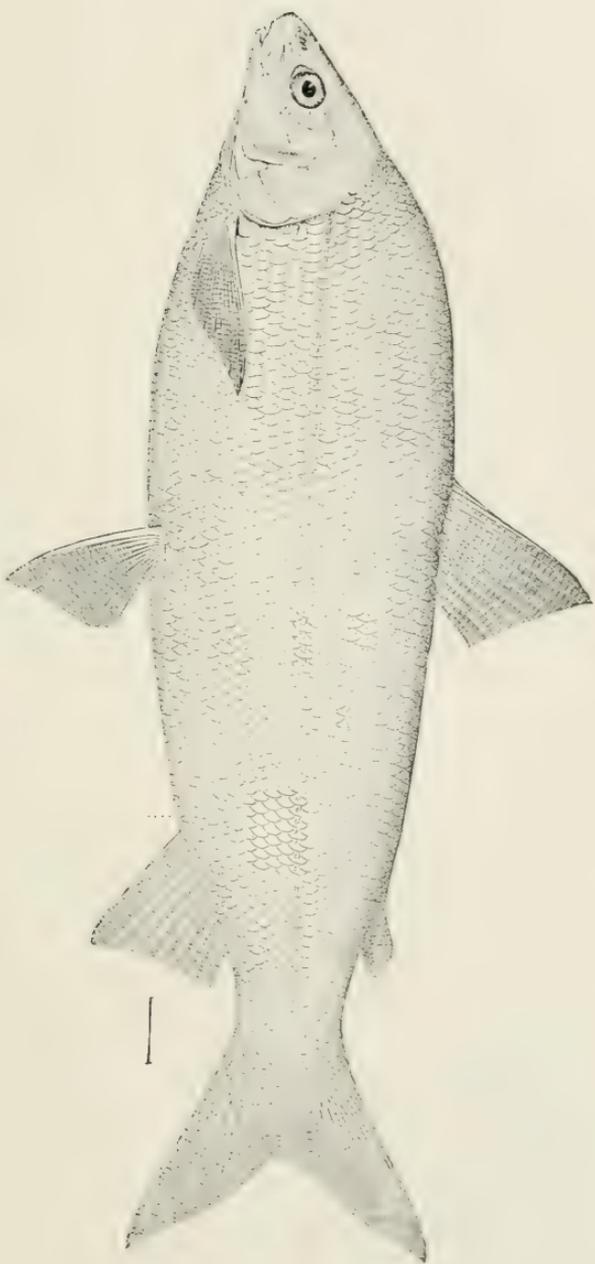


## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
J. Wisenburger.	Liberty	Liberty	Adams.	20
Oscar Furst.	Peoria	Peoria	Peoria	20
H. A. Gras.	Ashley	Ashley	Washington	20
John W. Lambird.	Latona	Newton	Jasper	20
Jeptha Clark.				20
Schnlyer Thompson	Danvers	Danvers	McLean	20
Wm. W. Wilson	Marissa	Marissa	St. Clair	20
F. W. Thornton	Magnolia	Lostant	LaSalle	20
A. E. Meyers	Millbrook	Millbrook	Kendall	20
Pete Swisher.	Amboy	Amboy	Lee	20
Thomas Harris	Neoga	Neoga	Cumberland	20
Bailey Bolin	"	"	"	20
James Cane.	"	"	"	20
Henry Jaeger	Bloom	Bloom	Cook	20
B. J. Orendorf.	Hopedale	Hopedale	Tazewell	20
C. L. Aten	Astoria	Astoria	Fulton	20
M. Humes	Colchester	Colchester	McDonough	20
J. W. Coyhill.	Roseville	Roseville	Warren	20
L. H. Diehl.	Sammum	Sammum	Fulton	20
Luther B. Hicks	White Hall	White Hall	Greene	20
J. B. McDavitt.	Nevins	Paris	Edgar	20
John T. Lee.	Arthur	Arthur	Moultrie	20
Josephine Febo.	Mound Station	Mound Station	Brown	20
E. T. Williamson	Cuba	Cuba	Fulton	20
G. W. Dillon.	Mill Creek	Mill Creek	Union	20
Edward Moran.	Great Creek	Great Creek	Vermilion	20
Charles Buchler.	Highland	Grant Fork	Madison	20
H. A. Sampson	Pana	Pana	Christian	20
J. E. Dadds	Cazenovia	Cazenovia	Woodford	20
James Thirlwell.	Galesburg	Galesburg	Knox	20
Mrs. Jas. Thirlwell.				20
John Vasey.	Jacksonville	Jacksonville	Morgan	20
J. K. and F. L. Sharp.				20
John Hartan.	Mendota	Mendota	LaSalle	20
Henry Staas	Stanford	Stanford	McLean	20
M. B. Perry.	"	"	"	20
Chas. Wagner	Good Hope	Good Hope	McDonough	20
Wm. Oliver	Norris City	Norris City	White	25
Valentine Brownbeck.	Belleville	Belleville	St. Clair	20
J. W. Francis.	La Fox	La Fox	Kane	20
Robt. Zempel.	Woodland	Woodland	Iroquois	20
G. L. Fornbelle.	Elgin	Elgin	Kane	20
C. H. March	Taylor	Taylor	Ogle	20
J. T. H. Brady, M. D.	Little Rock	Plano	Kendall	20
W. H. Norton	Earlville	Earlville	LaSalle	20
John A. Meyers	Casner	Casner	Macon	20
N. A. Caldwell.	Nokomis	Nokomis	Montgomery	20
N. Leister	Green Valley	Green Valley	Tazewell	20
Jas. A. Walter	Fairmount	Fairmount	Vermilion	20
Ellen Lambord.	Latona	Newton	Jasper	20
Simon Elbert.	Sauemin	Sauemin	Livingston	20
Sam'l Jones	Lanark	Lanark	Carroll	20
Prosper Morrison.	Maquon	Maquon	Knox	20
A. F. Winslow	Osceola	Bradford	Stark	20
Sam'l C. Deal	Bloomington	Bloomington	McLean	20
A. F. Randolph	Green Valley	Green Valley	Tazewell	20
W. W. Johnson	Secor	Secor	Woodford	20
G. W. McGee	"	"	"	20
Everett Carter	Bryant	Bryant	Fulton	20
J. H. Wolf.	Lewistown	Lewistown	"	20
C. V. Brooks	Monmouth	Monmouth	Warren	20
Dan'l V. Miller.	Westfield	Westfield	Bureau	20
John O. Martin	Paxton	Paxton	Ford	20
Edward Watson	Millersburg	Millersburg	Mercer	20
S. W. Solenberger.	Polo	Polo	Ogle	20
Henry Martin	Henderson	Henderson	Knox	20
H. W. Walton	Chesterfield	Chesterfield	Macoupin	20
Geo. G. Guenther	Galloway	Stratton	LaSalle	20
Wm. Aikman	Marion	Marion	Williamson	20
M. Riner	Altona	Altona	Knox	20
Philip Miller.	Dixon	Dixon	Lee	20
Wm. Cunnan	Aledo	Aledo	Mercer	20
W. H. Losey	Ashley	Ashley	Washington	20
Boyd Baldwin.	Ellisville	Ellisville	Fulton	20
Alonzo M. Throp	West Liberty	West Liberty	Jasper	20
Mary Horton.	Folger	Folger	Coles	20
Newton Horton.	"	"	"	20

## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
Emeline Horton	Folger	Coles	Coles	29
A. Kaney	Forreston	Forreston	Ogle	29
R. W. McLaughrey	Joliet	Joliet	Will	100
Wm. Rigel	Lake Creek	Marion	Williamson	20
E. G. Smith	Good Hope	Good Hope	McDonough	29
S. B. Massey	Denver	Denver	Hancock	29
Simon P. Rinor	Loran	Lanark	Stephenson	20
Hon. C. R. Gittings	Terre Haute	Lomax	Henderson	20
A. B. Douglass	Elgin	Elgin	Kane	20
Mrs. H. Deal	Summum	Summum	Fulton	20
Oscar Furst	Peoria	Peoria	Peoria	20
H. A. Gross	Ashley	Ashley	Washington	20
John W. Lambird	Latona	Latona	Jasper	20
John H. Fowler	Blandinsville	Blandinsville	McDonough	20
John Cooper	Lomax	Lomax	Henderson	20
Mrs. C. H. March	Taylor	Taylor	Ogle	20
P. H. Harris	Mendota	Mendota	LaSalle	20
E. Fancher	Westfield	Westfield	Clark	20
John Ruch	Newton	Newton	Jasper	20
Henry Puffer	Downer's Grove	Downer's Grove	DuPage	20
G. H. Peterson	Orion	Orion	Henry	20
J. M. Matlock	Newton	Newton	Jasper	20
Asa Walters	Robinson	Robinson	Crawford	20
E. Gilbert	Charleston	Charleston	Coles	20
R. B. Miller	Crete	Crete	Will	20
V. F. Lacy	Ashley	Ashley	Washington	20
T. B. Lacy	"	"	"	20
J. Donnelly	Spring Bluff	Spring Bluff	Lake	20
J. & J. Donnelly	"	"	"	20
F. M. Herzog	Blandinsville	Blandinsville	McDonough	20
S. S. Clayton	Arthur	Arthur	Moultrie	20
C. E. Jones	Beardstown	Beardstown	Cass	100
Geo. Oasprury	Morrison	Morrison	Whiteside	20
Chas. Allen	Carbondale	Carbondale	Jackson	25
Abram Brokan	Bloomington	Bloomington	McLean	20
C. E. Jones	Manito	Manito	Mason	20
C. E. Jones	Vermont	Vermont	Fulton	20
J. E. Robert	Bardolph	Bardolph	McDonough	20
H. P. Faulkner	"	"	"	20
S. S. Hudson	"	"	"	20
N. H. Jackson	"	"	"	20
N. Haller	"	"	"	20
Abe Horricks	"	"	"	20
W. H. Holmes	Gillespie	Gillespie	Maconpin	20
D. M. Sill	Bloomington	Bloomington	McLean	20
J. Chance	Mt. Vernon	Mt. Vernon	Jefferson	20
J. T. McClard	Buckley	Buckley	Iroquois	20
E. T. Walker	Patoka	Patoka	Marion	20
John Kuhn	Centralia	Centralia	Clinton	20
A. Hausemann	Central City	Central City	Clinton	20
Anton Repking	Veni	Tentopolis	Efingham	20
Mrs. G. N. Clark	Centralia	Centralia	Clinton	20
A. M. Johnson	"	"	"	20
Wm. French	Sanford	Sanford	Hancock	20
J. V. Lefton	Xenia	Xenia	Marion	20
F. A. Taylor	Alma	Alma	"	20
Richard Wilson	"	"	"	20
John Kaley	New Hebron	New Hebron	Crawford	20
A. Blystone	Neoga	Neoga	Cumberland	20
D. & T. Mooneyham	Benton	Benton	Clay	20
D. T. Carlyle	Farina	Farina	Marion	20
Theo. Niemerg	Veni	Veni	Efingham	20
H. Westendorf	"	"	"	20
J. B. Johnson	Newton	Newton	Jasper	20
Henry Kelly	"	"	"	20
Hale Johnson	"	"	"	20
Samuel Brown	Fairfield	Fairfield	Wayne	20
K. L. Frez	Dahlgren	Dahlgren	Hamilton	20
R. W. Stone	New Burnside	New Burnside	Johnson	20
R. Murchison	Kewanee	Kewanee	Henry	20
Abe Bamberger	Marshall	Marshall	Clark	20
Conrad Holly	Crete	Crete	Will	20
F. D. Richardson	Newton	Newton	Jasper	20
L. R. Puffer	Downer's Grove	Downer's Grove	DuPage	20
H. E. Puffer	"	"	"	20
W. S. Puffer	"	"	"	20



**THE WHITE FISH.**

*Coregonus Clupeiformis.*



## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
T. A. Drain	Leon	Prophetstown	Whiteside	20
E. C. Madison	Marshall	Marshall	Clark	20
G. B. Dovel	Latona	Newton	Jasper	20
John R. Gray	Belleville	Belleville	St. Clair	20
Samuel G. Hatch	Vernon	Vernon	Marion	20
James Hanke, Jr.	Trenton	Trenton	Clinton	20
James Hanke, Sr.	"	"	"	20
J. D. Price	Shattuc	Shattuc	"	20
Daniel Wiley	Makanda	Makanda	Jackson	20
Wm. Sieling	Elkhorn	Elkhorn	Washington	20
H. D. Yost	Dubois	Dubois	Perry	20
Hon. C. Beckwith	Chicago	Chicago	Cook	50
H. Frunzen	Basco	Basco	Hancock	20
J. E. Hugo Herman	Sigel	Sigel	Shelby	20
Maria Neighoop	Loran	Loran	Stephenson	20
George Renner	"	"	"	20
Elizabeth Renner	"	"	"	20
Charles E. Renner	"	"	"	20
A. Spurgeon	"	"	"	20
Thomas Butles	Nokomis	Nokomis	Montgomery	20
Hugh Doyle	Anna	Anna	Union	20
R. N. Norris	Vernon	Vernon	Marion	20
A. W. Sikkison	Bellmont	Bellmont	Wabash	20
S. M. Smith	Pana	Pana	Christian	20
Peter Navey	Alma	Alma	Marion	20
D. Bourman	Annapolis	Annapolis	Crawford	20
Ed A. Ebbart	Montrose	Montrose	Jasper	20
Thomas J. Warren	Belleflower	Belleflower	McLean	20
Lewis Boutright	Hartford	Hartford	Saline	20
John Van Gandy	Macon	Macon	Macon	20
Frederick Finger	Centralia	Centralia	Clinton	20
Peter Heiss	"	"	"	20
Amos Woodman	Farmer City	Farmer City	DeWitt	20
W. S. Cocks	Centralia	Centralia	Clinton	20
W. A. Vernon	Rinard	Rinard	Wayne	20
Daniel Mooneyham	Benton	Benton	Franklin	20
J. H. Harris	Holt	Holt	Perry	20
W. W. Young	Marion	Marion	Williamson	20
Samuel Hicks	White Hall	White Hall	Greene	20
Isaac J. Skiles	Enfield	Enfield	White	20
J. W. Hatch	Patoka	Patoka	Marion	20
J. W. Mounts	Browns	Browns	Wabash	20
V. Henzemann	New Baden	Trenton	Clinton	20
George Griesbaum	"	"	"	20
M. S. Dicken	Chrisman	Chrisman	Edgar	20
J. P. Hefner	Enfield	Enfield	White	20
Charles S. Wilson	Barnhill	Barnhill	Wayne	20
F. M. Knowles	Spring Garden	Spring Garden	Jefferson	20
George W. Eoglin	Patoka	Patoka	Marion	20
Wm. H. Evans	Harrisburg	Harrisburg	Saline	20
Eli Cople	Centralia	Centralia	Clinton	20
James Roberts	"	"	"	20
J. Hinds	Cologne	Cologne	Edgar	20
Russel Middleton	Tower Hill	Tower Hill	Shelby	20
I. J. Skiles	Enfield	Enfield	White	20
L. H. Mitchell	West End	West End	Saline	20
J. H. Edwards	Marion	Marion	Williamson	20
F. M. Otev	"	"	"	20
S. O. Millin	"	"	"	20
W. S. Brown	Good Hope	Good Hope	McDonough	20
W. W. McClelland	Shattuc	Shattuc	Clinton	20
W. P. Warren	Freedom	Freedom	LaSalle	20
D. D. Fouts	Salem	Salem	Marion	20
P. N. Hearne	Marion	Marion	Williamson	20
John H. Jackson	Bardolph	Bardolph	McDonough	20
Charles Kittner	Woodstock	Woodstock	"	20
Ellen Brown	Good Hope	Good Hope	"	20
John H. Allison	"	"	"	20
John F. Olson	"	"	"	20
James A. Brown, Jr.	"	"	"	20
M. D. Robinson	Galatia	Harrisburg	Saline	20
S. T. Robinson	Hartford	Galatia	"	20
Jacob Suffman	Albion	Albion	Edwards	20
C. C. McLauran	Sumnum	Astoria	Fulton	20
C. Wright	Mason	Mason	Union	20

*Carriage Distribution—Continued.*

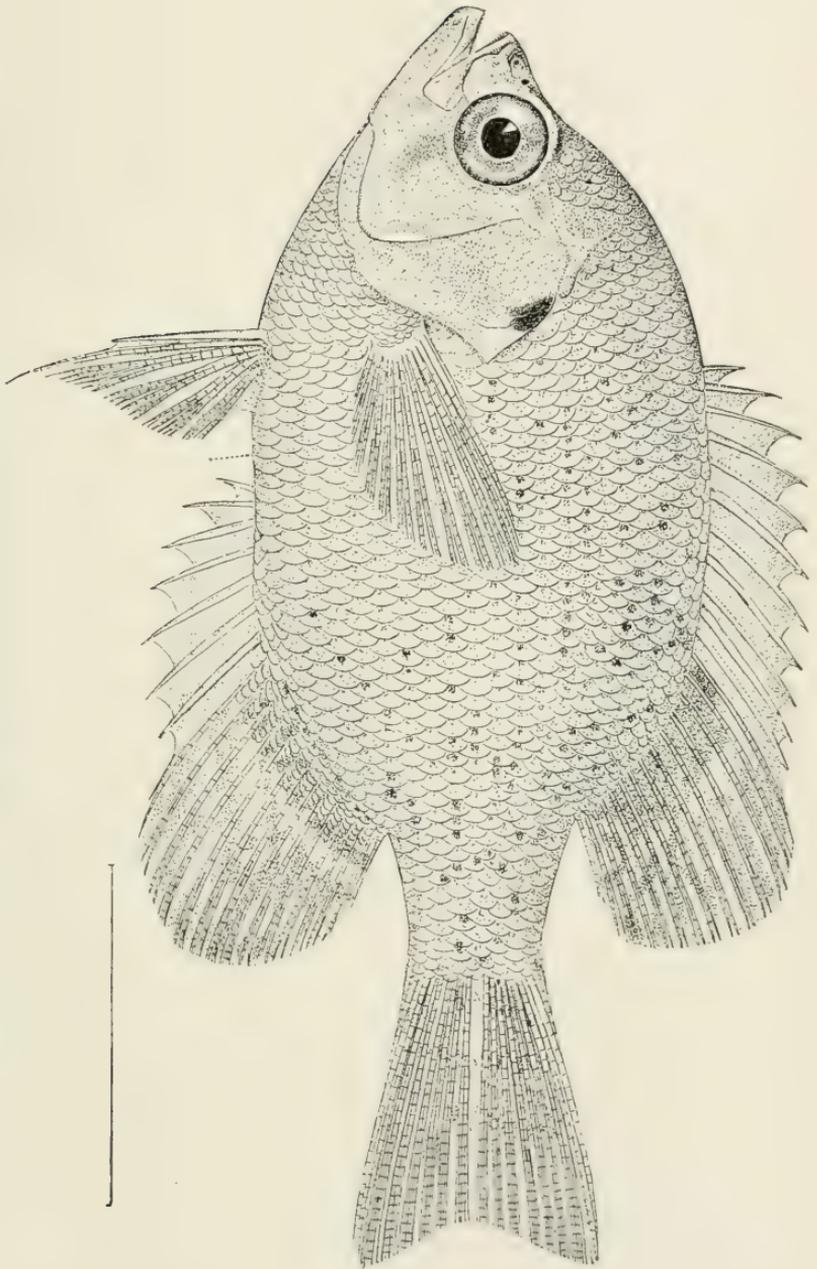
Name.	Post Office.	Express Office.	County.	No.
John Brokaw	Saybrook	Saybrook	McLean	20
J. F. Hight	Samoth	Samoth	Massac	20
Mrs. J. F. Hight	"	"	"	20
Wm. L. Vockrodt	Danvers	Danvers	McLean	20
C. A. Bain, Jr.	Samoth	Vienna	Johnson	20
J. B. Taylor	Rushville	Rushville	Schuyler	20
Samuel A. Deal	Danvers	Bloomington	McLean	20
C. H. Kempf	Mt. Carmel	Mt. Carmel	Wabash	20
J. H. McCartney	Odin	Odin	Marion	20
H. S. Ward	Bowensburg	Bowensburg	Hancock	20
B. E. Parker	Medora	Medora	Macoupin	20
Wm. D. Smith	Chicago	Chicago	Cook	20
S. G. Gardiner	Kane	Kane	Kane	20
S. A. Hendee	Bushnell	Bushnell	McDonough	20
D. K. Doud	Gardner	Gardner	Grundy	20
Walter Murray	Hunt City	Hunt City	Jasper	20
Charles E. Mayal	Springfield	Springfield	Sangamon	20
Thomas Dickinson	Bentley	Bentley	Hancock	20
Samuel Dickinson	"	"	"	20
J. M. Matlock	Latonia	Wheeler	Jasper	20
Will O. Powell	Pontiac	Pontiac	Livingston	100
L. A. Thompson	Golconda	Golconda	Polk	20
E. Emerson	Danway	Danway	LaSalle	20
John M. Hartwell	Marion	Marion	Williamson	20
John Sterns	Carbondale	Carbondale	Jackson	20
Winfrey & Martin	"	"	"	20
S. R. Whitaker	Summerfield	Summerfield	St. Clair	20
Green Johnson	Sandoval	Sandoval	Marion	20
J. Schleschmann	Shattuc	Shattuc	Clinton	20
Geo. C. Wells	Farina	Farina	Marion	20
Peter S. Seibert	Ashley	Ashley	Washington	20
J. T. Ainsworth	Rantoul	Rantoul	Champaign	20
H. K. Granner	Makanda	Makanda	Jackson	20
Wm. C. Crump	Stirrup Grove	Stirrup Grove	Macoupin	20
John Ferguson	Mendota	Mendota	LaSalle	20
Henry Albrecht	Vandalia	Vandalia	Fayette	20
Wm. M. Morris	Gillespie	Gillespie	Macoupin	20
John Dupont	New Burnside	New Burnside	Johnson	20
D. G. Tunncliff	Macomb	Macomb	McDonough	20
Julius Hinderliter	Southfield	Southfield	Fulton	20
A. Carrero	Gillespie	Gillespie	Macoupin	20
M. E. Warren	Stirrup Grove	Virden	"	20
Alfred Adams	Bentley	Bentley	Hancock	20
J. E. Walcher	Millersville	Millersville	Christian	20
Josiah Claridge	Otterville	Otterville	Jersey	20
E. A. Smith, M. D.	Bethalto	Bethalto	Madison	20
Geo. S. Guenther	Streator	Streator	LaSalle	20
Eli Rice	Ingraham	Clay City	Clay	20
W. B. Donaghy	Vienna	Vienna	Johnson	20
Albert Walk	Neoga	Neoga	Cumberland	20
Peter Jacobs	Eberly	Mason	Effingham	20
Jacob Evinger	Westfield	Westfield	Clark	20
E. P. Reynolds	Rock Island	Rock Island	Rock Island	20
M. Tombaugh	Odell	Odell	Livingston	20
Hugh Lager	Atkinson	Atkinson	Henry	20
D. R. Robinson	Hartford	Hartford	Saline	20
J. C. Dool	Aledo	Aledo	Mercer	20
Geo. W. McLaughlin	Neoga	Neoga	Cumberland	20
Garrett McLaughlin	"	"	"	20
Rachel H. McLaughlin	"	"	"	20
B. F. Hummack	West End	West End	Saline	20
W. O. Powell	Pontiac	Pontiac	Livingston	100
C. J. Jones	Beardstown	Beardstown	Cass	100
E. W. Parks	Hunt City	Hunt City	Jasper	20
John F. Tanquary	Bellemont	Bellemont	Wabash	20
H. H. Huminger	Golden	Golden	Adams	20
E. A. Thummel	Prairieville	Prairieville	Lee	20
L. M. Elbert	Montrose	Montrose	Effingham	20
Geo. W. Elbert	"	"	"	20
D. B. Ruth	Summerfield	Summerfield	St. Clair	20
Jos. Morrcocy	Bloomfield	Bloomfield	Johnson	20
J. N. Tate	West End	West End	Saline	20
S. W. Barr	Odin	Odin	Marion	20
Wm. Baldwin	Springfield	Springfield	Sangamon	20
C. W. Heydecker	Wadsworth	Wadsworth	Lake	20

## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
Frank Carson	Gerlaw	Gerlaw	Warren	20
Samuel VanMeier	Mattoon	Mattoon	Coles	20
C. W. Smith	Atwater	Atwater	Macoupin	20
W. H. Jenkins	Girard	Girard	"	20
John Cozzens	Scales' Mound	Scales' Mound	Jo Daviess	20
Geo. Stubblefield	McLean	McLean	McLean	20
G. L. Whitlock	Dix	Mt. Vernon	Jefferson	20
Schwartz Bros.	Salem	Salem	Marion	20
R. A. Bennett	Lake Bluff	Lake Bluff	Lake	20
E. C. Deputy	Maud	Bellemont	Wabash	20
John Soergel	Jonesboro.	Jonesboro	Union	20
J. T. Mitchell	West End	West End	Saline	20
O. M. McIlvain	Scottsburg	Bushnell	McDonough	20
Stephen Herr	Cropsey	Cropsey	McLean	20
W. O. Torrey	Lake Bluff	Lake Bluff	Lake	20
Newton Miller	"	"	"	20
Chas. W. Osser	"	"	"	20
H. Miller	"	"	"	20
B. J. Cloas	"	"	"	20
Will Graff	Ashland	Ashland	Cass	20
C. B. Graff	"	"	"	20
R. A. Burnett	Chicago	Lake Bluff	Lake	20
Samuel Werror	Forsythe	Forsythe	"	20
John Meyers	Freeport	Freeport	Stephenson	20
Richard Reinman	Clara	Clara	Coles	20
H. Fridendall	Batavia	Batavia	Kane	20
E. J. McGrealy	Millbrook	Millbrook	Kendall	20
J. T. Eastham	Carlinville	Carlinville	Macoupin	20
H. Cragg	Chicago	South Chicago	Cook	50
P. Sharp	Elgin	Elgin	Kane	20
J. Clavidge	Otterville	Otterville	Jersey	20
John Klein	Shumway	Shumway	Efingham	20
Prosper Morrison	Maquon	Maquon	Knox	20
J. B. Shup	Toledo	Toledo	Cumberland	20
R. H. Miller	Makanda	Makanda	Jackson	20
D. Sifford	Anna	Anna	Union	20
John McSherry	Jacksonville	Jacksonville	Morgan	20
T. Rinehard	Efingham	Efingham	Efingham	20
E. W. Noakes	Lake Bluff	Lake Bluff	Lake	20
S. Melvin	Greenfield	Greenfield	Green	20
J. D. Robards	"	"	"	20
Albert E. Gould	Edgewood	Edgewood	Efingham	20
H. J. Norris	Lake Bluff	Lake Bluff	Lake	20
Charles Probstmeir	Millstadt	Millstadt	St. Clair	20
George Grossman	Smithton	Smithton	"	20
O. O. Gouch	Belleflower	Belleflower	McLean	20
B. A. Thornhill	Augusta	Augusta	Hancock	20
G. W. Graham	Carbondale	Carbondale	Jackson	20
John Kelly	"	"	"	20
W. C. Martin	"	"	"	20
J. D. Etherton	"	"	"	20
James Payton	Charleston	Charleston	Coles	20
A. J. Staley	Millersburg	Aledo	Mercer	20
Robert Johns	Pana	Pana	Christian	20
James Crily	Thompsonville	Thompsonville	Franklin	20
John W. Greening	Loami	Loami	Sangamon	20
Moses Pfifer	Murphysboro	Murphysboro	Jackson	20
John Hobson	Pana	Pana	Christian	20
R. P. Anderson	Iola	Iola	Clay	20
John Hatson	South America	Harnsbury	Saline	20
John Fuller	Rushville	Rushville	Schuyler	20
John F. Burns	Nora	Nora	Jo Daviess	20
J. B. Taylor	Rushville	Rushville	Schuyler	20
H. D. Carpenter	Joliet	Joliet	Will	20
Thomas Alderson	Pana	Pana	Christian	20
E. J. Ingersoll	Carbondale	Carbondale	Jackson	100
G. W. Witherell	Knoxville	Knoxville	Knox	20
N. B. Wilson	Oliver	Marshall	Clark	20
H. R. Walton	Hagaman	Hagaman	Macoupin	20
James Peyton	Charleston	Charleston	Coles	20
Asahel Burnett	Vienna	Vienna	Johnson	20
Charles G. Vaughn	Winslow	Winslow	Cumberland	20
Thomas Price	Elizabethtown	Hardin	Calhoun	20
James Hethington	"	"	Hardin	20
James Ferrell	"	"	"	20

## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
Thomas Watson	Elizabethtown	Hardin	Hardin	27
Henry Rittenhouse	"	"	"	27
Joseph Mason	"	"	"	27
F. Riggs	"	"	"	27
M. F. Dasset	"	"	"	27
John Tyer	"	"	"	27
Isaac Harford	"	"	"	27
Miner Brobst	Rock Grove	Rock City	Stephenson	27
Francis Meyer	Sterling	Sterling	Whiteside	27
John Weigand	Mt. Sterling	Mt. Sterling	Brown	27
E. H. C. Peck	Ashley	Ashley	Washington	27
N. Gambor	Rapids City	Rapids City	Rock Island	27
Fred Royce	Dallas City	Dallas City	Hancock	27
E. R. Reynolds	Rock Island	Rock Island	Rock Island	27
W. O. Powell	Pontiac	Pontiac	Livingston	27
James O. Mera	Rosemond	Rosemond	Christian	27
H. W. Alien	Kirkwood	Kirkwood	Warren	27
Nelson Johnson	Galesburg	Galesburg	Knox	27
Charles Harris	Loami	Loami	Sangamon	27
J. D. Hammer	Princeville	Princeville	Peoria	27
Benjamin E. Warren	Rosemond	Rosemond	Christian	27
L. A. Howe	Henderson	Henderson	Knox	27
Wm. Hicks	West Point	West Point	Hancock	27
Ben Reynolds	Rock Island	Rock Island	Rock Island	27
J. H. Reynolds	"	"	"	27
Gideon Pitman	Henderson	Henderson	Knox	27
W. P. Collins	Viola	Viola	Mercer	27
F. S. Weller	Quincy	Quincy	Adams	27
C. L. W. Genteman	"	"	"	27
Wm. L. Garvey	Illioipolis	Illioipolis	Sangamon	27
Henry Cole	Crete	Crete	Will	27
J. W. Kitchell	Pana	Pana	Christian	27
W. W. Warner	Warner	Briar Bluff	Henry	27
John Parkinson	Wataga	Wataga	Knox	27
J. O. Chance	Mt. Vernon	Mt. Vernon	Jefferson	27
J. W. Adams	Cedarville	Freeport	Stephenson	27
W. C. Cawood	Janesville	Janesville	Cumberland	27
S. E. Collins	Viola	Viola	Mercer	27
G. Devinney	Rapids City	Rapids City	Rock Island	27
S. E. Russell	Viola	Viola	Mercer	27
John L. Brock	Mackinaw	Mackinaw	Tazewell	27
N. Hatch	Strout	Strout	Pike	27
Wm. Hamilton	Orion	Orion	Henry	27
John Sloan	Fatis City	Fatis City	Knox	27
W. S. Cocke	Creal Springs	Creal Springs	Williamson	27
E. S. Misenaer	Collinsville	Collinsville	Madison	27
W. A. Jackson	North Henderson	North Henderson	Mercer	27
Jacob Miller	Mt. Morris	Mt. Morris	Ogle	27
John Sharer	"	"	"	27
E. B. Yoacum	Salisbury	Farmingdale	Sangamon	27
W. D. Latimer	Aledo	Aledo	Mercer	27
John Londenburg	Joliet	Joliet	Will	27
Russell & Hogan	Collinsville	Collinsville	Madison	27
M. D. Burner	Abingdon	Abingdon	Knox	27
M. Hoyt	Chicago	Chicago	Cook	27
A. Alsip	"	"	"	27
T. G. Morris	LaHoyne	LaHoyne	Iroquois	27
A. J. Beavers	Farmer City	Farmer City	DeWitt	27
A. H. Hunt	Henry	Henry	Marshall	27
A. L. Wood	Crete	Crete	Will	27
W. E. McBride	Belleville	Belleville	St. Clair	27
Mrs. W. E. McBride	"	"	"	27
Bruce Dixon	Browning	Browning	Schuyler	27
A. H. Engleben	Pekin	Pekin	Tazewell	27
Oliver F. Hoyt	Durand	Durand	Winneshago	27
Geo. Brown	Highland Park	Highland Park	Lake	27
A. B. Palmer	Knoxville	Knoxville	Knox	27
James Peyton	Charleston	Charlestown	Coles	27
J. B. Post & Sons	Alena	Carman	Henderson	27
Geo. Simpkin	Jacksonville	Jacksonville	Morgan	27
M. Crockal	Sailor Springs	Clay City	Clay	27
J. E. Walcher	Millersville	Millersville	Christian	27
William Greebort	Red Bud	Red Bud	Randolph	27
C. Jensen	Strasburg	Strasburg	Shelby	27
John Hnyegly	Nashville	Nashville	Washington	27



**THE RAINBOW SUNFISH.**

*Centrarchus macropterus.*

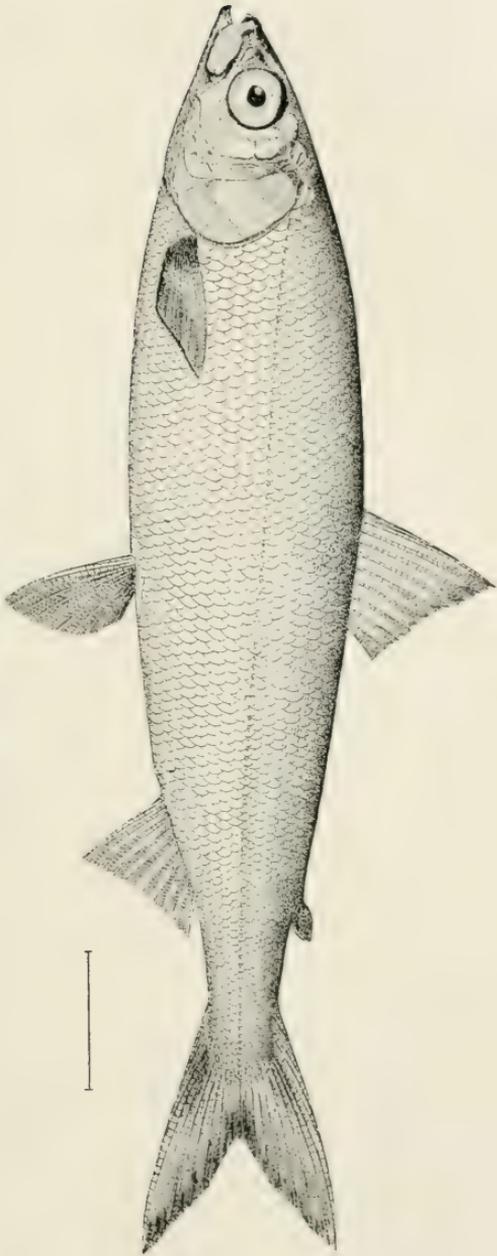


## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
J. F. McCartney	Metropolis	Metropolis	Massac	20
Otto Reutlinger	Effingham	Effingham	Effingham	20
John Hogan	Collinsville	Collinsville	Madison	20
N. A. Wood	Stone Fort	Stone Fort	Saline	20
G. D. Wilson	Jonesboro	Anna	Union	20
Wm. W. Bailey	Rosemond	Rosemond	Christian	20
J. W. Thomas	Wakanda	Wakanda	Jackson	20
J. D. Holdner	Carlyle	Carlyle	Clinton	20
J. M. Maynor	Eddyville	Golconda	Popo	20
D. B. Ruth	Summerfield	Summerfield	St. Clair	20
Swentz Bros.	Salem	Salem	Marion	20
G. L. Whitlock	Dixon	Mt. Vernon	Jefferson	20
G. W. Wilson	Shelbyville	Shelbyville	Shelby	20
J. S. Hammer	Princeville	Princeville	Peoria	20
Frederick Klore	Bradford	Bradford	Sangamon	20
Luther C. Keeler	Chicago	Chicago	Cook	20
Geo. Franck	Sandwich	Sandwich	DeKalb	20
H. Cragg	Chicago	Chicago	Cook	20
B. F. Irwin	Pleasant Plains	Pleasant Plains	Sangamon	20
J. M. Sperry	Nokomis	Nokomis	Montgomery	20
A. Sterzer	Cisma Park	Cisma Park	Iroquois	20
J. F. Cluridge	Otterville	Otterville	Jersey	20
P. G. Gillette	Jacksonville	Jacksonville	Morgan	20
R. Poindexter, M. D.	Thompsonville	Thompsonville	Franklin	20
Charles Nafftz	Sadoris	Sadoris	Champaign	20
John Hettel	Ottawa	Ottawa	LaSalle	20
Wm. C. Gillespie	Aledo	Aledo	Mercer	20
M. Kilbury	Alvin	Alvin	Vermillion	20
H. G. Savage	Chicago	Chicago	Cook	20
Quincy Burgessor	Clayton	Clayton	Adams	20
J. Y. Whitman	Biggsville	Biggsville	Henderson	20
H. M. Whelan				20
R. G. Matthews	Douglass	Douglass	Knox	20
M. Lionberger	Dallas City	Dallas City	Hancock	20
John Schoonhoron	Hirshman	Hirshman	Brown	20
J. W. McEorron	Viola	Viola	Mercer	20
J. W. Bailey	New Haven	Norris City	White	20
J. M. Neff	Cuba	Cuba	Fulton	20
John McGehee	Shawneetown	Shawneetown	Gallatin	20
F. McGehee				20
W. M. Schnalelins	Effingham	Effingham	Effingham	20
Peter Schurrom	Brownstown	Brownstown	Fayette	20
Essex Payn	Woodlawn	Woodlawn	Jefferson	20
John Neal	Shumway	Shumway	Effingham	20
Willie Williams	Tola	Tola	Clay	20
L. F. Tate	Beaucoup	Beaucoup	Washington	20
Robert Alldridgor	Tola	Tola	Clay	20
J. M. Kasey	Salem	Salem	Marion	20
Alvin Schribe	Effingham	Effingham	Effingham	20
Caroline P. Keeler	Chicago	Chicago	Cook	20
J. C. Keeler				20
Florence Keeler				20
M. W. Murphy	Cuba	Cuba	Fulton	20
R. D. Gould	Secor	Secor	Woodford	20
John G. Pettigrow	Ellery	Ellery	Edwards	20
W. W. Wood	Secor	Secor	Woodford	20
T. K. Phipps	Freeden	Jerseyville	Jersey	20
Dan O. Leroy	Renault	Renault	Monroe	20
Wm. Messmann	Sadoris	Sadoris	Champaign	20
S. O. Storms	Richmond	Richmond	McHenry	20
Geo. M. Stubblefield	McLean	McLean	McLean	20
Chas. Breidicker	Columbia	Columbia	Monroe	20
John Weissenstein				20
Silas Wilson	Barnhill	Barnhill	Wayne	20
Jas. O'Leary	New Dorission	Barksville	Monroe	20
H. L. Webb	Tunnel Hill	Tunnel Hill	Johnson	20
J. A. Gaunt	Reynold	Reynold	Rock Island	20
W. O. Jeffery	St. Charles	St. Charles	Kane	20
W. C. Lawshe	Sharron, Wis.	Likey	Boone	20
W. Light	Philo	Philo	Champaign	20
T. L. Block	Sidney	Sidney		20
W. F. Crawford	Taylor Ridge	Taylor Ridge	Rock Island	20
W. G. Culbertson	Mays Station	Mays Station	Edgar	20
B. G. Henry	Decatur	Decatur	Macon	20
Henry S. Shrigley	Salem	Salem	Marion	20

## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
E. W. Vance.....	Mattoon.....	Mattoon.....	Coles.....	29
Benjamin B. Shinn.....	".....	".....	".....	29
Geo B. Shinn.....	".....	".....	".....	29
Clemens Heinzmann.....	Shattuc.....	Shattuc.....	Clinton.....	29
J. A. Chamness.....	Marion.....	Marion.....	Williamson.....	29
W. C. Webb.....	Woodlawn.....	Woodlawn.....	Jefferson.....	29
G. D. Aldrid.....	Pulaski.....	Pulaski.....	Pulaski.....	29
Edgar Lewis.....	Harrisburg.....	Harrisburg.....	Saline.....	29
M. Seinn.....	Casper.....	Casper.....	Washington.....	29
R. J. McElrath.....	Harrisburg.....	Harrisburg.....	Saline.....	29
G. A. Schneider.....	Teutopolis.....	Teutopolis.....	Efingham.....	29
Nelson Neil.....	Tower Hill.....	Tower Hill.....	Shelby.....	29
Wm. Whittaker.....	Fairfield.....	Fairfield.....	Wayne.....	29
H. Knoblock.....	Nashville.....	Nashville.....	Washington.....	29
Jacob Zimmerman.....	Altamont.....	Altamont.....	Efingham.....	29
R. K. Parkhorst.....	Sandoval.....	Sandoval.....	Marion.....	29
C. L. Bickerdike.....	Millersville.....	Millersville.....	Christian.....	29
Wm. Hanseman.....	Central City.....	Central City.....	Marion.....	29
James Johnson.....	Centralia.....	Centralia.....	".....	29
Henry Blanke.....	Carlyle.....	Carlyle.....	Clinton.....	29
S. R. Whittaker.....	Summerville.....	Summerville.....	Peoria.....	29
Wm. Bornman.....	New Design.....	New Design.....	Monroe.....	29
H. H. Stevens.....	Colchester.....	Colchester.....	McDonough.....	29
Wm. Fusler.....	Sparta.....	Sparta.....	Randolph.....	29
Adam Storger.....	Cisna Park.....	Cisna Park.....	Iroquois.....	29
Geo. Goetting.....	Altamont.....	Altamont.....	Efingham.....	29
Samuel Curry.....	Roseville.....	Roseville.....	Warren.....	29
B. H. Martin.....	Biggsville.....	Biggsville.....	Henderson.....	29
C. L. Martin.....	".....	".....	".....	29
W. P. Martin.....	".....	".....	".....	29
Karl Martin.....	".....	".....	".....	29
L. A. Martin.....	".....	".....	".....	29
W. H. Jenkins.....	Girard.....	Girard.....	Maconpin.....	29
Israel Kline.....	Woodstock.....	Woodstock.....	McHenry.....	29
B. A. Kline.....	".....	".....	".....	29
Geo. B. Kline.....	".....	".....	".....	29
A. M. Kline.....	".....	".....	".....	29
John C. Kline.....	".....	".....	".....	29
B. E. Kline.....	".....	".....	".....	29
E. S. Kline.....	".....	".....	".....	29
W. H. Kline.....	".....	".....	".....	29
J. S. Kline.....	".....	".....	".....	29
A. Kline.....	".....	".....	".....	29
D. O. Kline.....	".....	".....	".....	29
Ida E. Kline.....	".....	".....	".....	29
G. F. Snily.....	Vera.....	Vera.....	Fayette.....	29
Frank Wicks.....	Mason.....	Mason.....	Macon.....	29
George Wicks.....	".....	".....	".....	29
Lulie Wicks.....	".....	".....	".....	29
W. H. Wicks.....	".....	".....	".....	29
Ollie Wicks.....	".....	".....	".....	29
Lettie Wicks.....	".....	".....	".....	29
Alice Wicks.....	".....	".....	".....	29
Harry Wicks.....	".....	".....	".....	29
Thomas McDonald.....	Ellis Grove.....	Chester.....	Randolph.....	29
Peter Seebort.....	Ashley.....	Ashley.....	Washington.....	29
John B. Fort.....	Olena.....	Carman.....	Henderson.....	29
J. M. Fort.....	".....	".....	".....	29
A. E. Gould.....	Edgewood.....	Edgewood.....	Efingham.....	29
James Tontz.....	Grantfork.....	Grantfork.....	Madison.....	29
John McBride.....	Samoth.....	Vienna.....	Johnson.....	29
C. D. McBride.....	".....	".....	".....	29
Henry Seibert.....	Ashley.....	Ashley.....	Washington.....	29
Garrett V. Miller.....	Mattoon.....	Mattoon.....	Coles.....	29
S. T. Jennings.....	Mound Station.....	Mound Station.....	Brown.....	29
A. I. Miller.....	Rose.....	Donavin.....	Iroquois.....	29
Cyrus Hartman.....	White Hall.....	White Hall.....	Greene.....	29
Jackson Marst.....	Roodhouse.....	Roodhouse.....	".....	29
J. P. Hunt.....	".....	".....	".....	29
Wm. Cobb.....	White Hall.....	White Hall.....	".....	29
Geo. Parks.....	Greenfield.....	Greenfield.....	".....	29
R. D. Grigg.....	Kankakee.....	Kankakee.....	Kankakee.....	29
E. Nailing.....	Ellis Grove.....	Ellis Grove.....	Randolph.....	29
J. A. Barnes.....	Elliott.....	Elliott.....	Ford.....	29
H. Wesemann.....	LaGrange.....	LaGrange.....	Cook.....	29
A. S. Mellen.....	Rose.....	St. Marys.....	Iroquois.....	29



THE CISCO, LAKE HERRING.

*Coregonus Artedii.*

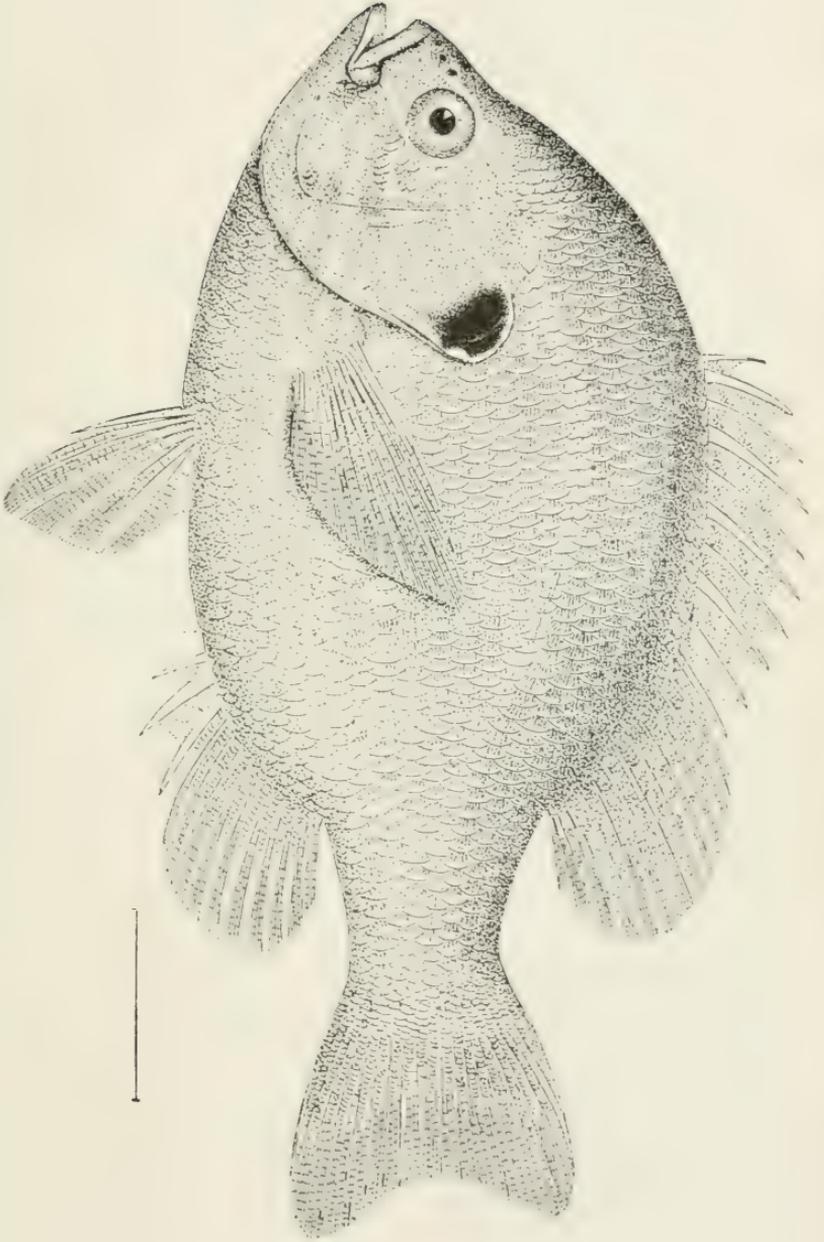


## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
M. Cavanaugh	Decatur	Decatur	Macon	20
Quintas Richards	Winslow	Lena	Stephenson	20
Lyman Quick	Marshall	Marshall	Clark	20
George Baldwin	Trenton	Trenton	Knox	20
S. Bardell & Son	Highland	Highland	Grundy	20
Hon. H. Clark	Mattoon	Mattoon	Coles	20
Chas Rhine	Raleigh	Raleigh	Saline	20
Josua Lindahl	Rock Island	Rock Island	Rock Island	20
S. M. Mitchell	Corinth	Thompsonville	Williamson	20
S. F. Mitchell	"	"	"	20
H. C. Mitchell	"	"	"	20
G. O. Mitchell	"	"	"	20
F. M. Mitchell	"	"	"	20
M. E. Baker	Illipolis	Illipolis	Sangamon	20
J. W. Jaquess	Mt. Carmel	Mt. Carmel	Wabash	20
Geo. Schumachers	Coberg	Coberg	Ford	20
J. W. Utt	Roodhouse	Roodhouse	Greene	20
Willis Marshall	"	"	"	20
Samantha F. Marshall	"	"	"	20
Thos. Drew	Lostant	Lostant	LaSalle	20
Chas. E. Bishop	Charleston	Charleston	Coles	20
P. M. Riehardt	Teutopolis	Teutopolis	Efingham	20
Wm. Kimble	Ferris	Ferris	Hancock	20
John Daner	Vienna	Vienna	Johnson	20
W. B. Donaghy, Jr.	"	"	"	20
J. L. Roberts	Corinth	Corinth	Williamson	20
J. N. Strickland	Greenfield	Greenfield	Greene	20
Jane Lyle	"	"	"	20
S. Melvin	"	"	"	20
J. W. Snyder	Hunt City	Hunt City	Jasper	20
R. T. Robley	Carlinsville	Carlinsville	Macoupin	20
S. L. Johnson	Marengo	Marengo	McHenry	20
David Huntley	Coberg	Coberg	Ford	20
Herman Knoblock	Nashville	Nashville	Washington	20
Wm. Huseman	Central City	Central City	Clinton	20
James Johnson	Centralia	Centralia	Marion	20
J. Clanniger	"	"	"	20
D. B. Kell	Walnut Hill	Walnut Hill	"	20
Henry Ray	Tonti	Tonti	"	20
Jacob Ramsey	Galatia	Galatia	"	20
John T. Mosely	Vienna	Vienna	Johnson	20
C. A. Mosely	"	"	"	20
W. T. Gurrey	Illipolis	Illipolis	Sangamon	20
B. Nussbaum	Matteson	Matteson	Cook	20
Albert Seibert	Ashley	Ashley	Washington	20
J. F. Overstake	Currier Mills	Currier Mills	Saline	20
Henry G. Seibert	Ashley	Ashley	Washington	20
G. F. Blakeslee	DuQuoin	DuQuoin	Perry	20
Wm. Stevenson	Merritt	Merritt	Scott	20
Ira Tyler	Richfield	Richfield	Adams	20
Wm. C. Trotter	"	"	"	20
D. A. Sheretz	Grant	Marion	Williamson	20
T. G. Felder	LaSalle	LaSalle	LaSalle	20
Chas Vaughn	Winslow	Lena	Stephenson	20
Thos. M. McDonald	Ellis Grove	Chester	Randolph	20
Seth N. Griswold	White Hall	White Hall	Greene	20
Etta Griswold	"	"	"	20
J. J. Fitzgerald	Fitzgerald	Fitzgerald	Jefferson	20
J. T. Ainsworth	Rantoul	Rantoul	Champaign	20
W. J. Coplinger	Attila	Attila	Williamson	20
J. W. Springer	Laclede	Laclede	Wayette	20
Wedmayer Bros	Virginia	Virginia	Cass	20
S. Moon	Richfield	Richfield	Adams	20
Marcus A. Farrell	Chicago	Chicago	Cook	20
Otto H. Henderson	Virginia	Virginia	Cass	20
Jos. Plasters	West End	West End	Saline	20
L. Lamb	Markham	Markham	Morgan	20
C. C. Myers	Mendon	Mendon	Adams	20
Benj. A. Jones	Plainview	Plainview	Macoupin	20
O. A. Sneider	"	"	"	20
Wm. F. Patterson	"	"	"	20
Stephen Campbell	"	"	"	20
A. Sneider	"	"	"	20
Gallick Gullickson	Peotone	Peotone	Will	20
L. Nicolai	Camp Point	Camp Point	Adams	20

## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
M. W. Skean	Prairie City	Prairie City	McDonough	20
Samuel C. Donaldson	Bloomington	Bloomington	McLean	21
Van L. Hampton	Colchester	Colchester	McDonough	22
D. C. Wilson	Morris	Morris	Grundy	23
A. O. Bersell	Rock Island	Rock Island	Rock Island	24
John Reddenis	Secor	Secor	Woodford	25
Alex Baird	Carthage	Carthage	Hancock	26
N. C. Marsh	Waukegan	Waukegan	Lake	27
H. H. Atwood	Elliott	Elliott	Ford	28
G. Ziebold & Son	Red Bub	Red Bub	Randolph	29
A. S. Millen	St. Marys	St. Marys	Iroquois	30
H. H. Batherton	Cisco	Cisco	Piatt	31
Wm. Hand	Oliver	Oliver	Edgar	32
James M. Hunter	Elkhart City	Elkhart City	Logan	33
J. A. Baker	Roodhouse	Roodhouse	Greene	34
Mrs. Era Hunt	"	"	"	35
G. E. Bundy	"	"	"	36
Henry Hunt	"	"	"	37
Mrs E. Baldwin	"	"	"	38
E. Howard	Tower Hill	Tower Hill	Shelby	39
Geo. Schunnacher	Coberg	Coberg	Ford	40
J. B. Matthews, M. D.	Mt. Auburn	Mt. Auburn	Christian	41
Cown James	Sciota	Sciota	McDonough	42
A. S. Freeland	Dalton City	Dalton City	Moultrie	43
J. A. Stoll	Diona	Diona	Coles	44
A. Corer & Sons	Tunnel Hill	Tunnel Hill	Johnson	45
Charles E. Zeigler	Cowden	Cowden	Shelby	46
Geo. E. Corey	Murphysboro	Murphysboro	Jackson	47
John A. Henry, Jr.	Decatur	Decatur	Macon	48
Mrs. M. A. Henry	"	"	"	49
Miss Mollie Henry	"	"	"	50
Jacob G. Miller	Mt. Morris	Mt. Morris	Ogle	51
H. W. Strickler	Loraine	Loraine	Hancock	52
Wm. Neimeyer	Mt. Olive	Mt. Olive	Macoupin	53
George M. Blair	Barry	Barry	Pike	54
A. Coon & Sons	Tunnel Hill	Tunnel Hill	Johnson	55
C. C. Breckenridge	Berry	Berry	Sangamon	56
M. A. Hunkins	Vienna	Vienna	Johnson	57
D. W. Maple	Canton	Canton	Fulton	58
H. Wardner	Anna	Anna	Union	59
D. R. Lewis	"	"	"	60
H. C. Borck	Milton	Pittsfield	Pike	61
T. N. Hall	"	"	"	62
F. L. Cox	Viriden	Viriden	Macoupin	63
Mrs. S. A. Sargent	Windsor	Windsor	Shelby	64
W. W. Bristow	Girard	Girard	Macoupin	65
G. W. Stoner	LaPlace	LaPlace	Piatt	66
Martin & Cochran	Mazon	Mazon	Grundy	67
M. E. Warren	Stirrup Grove	Stirrup Grove	Macoupin	68
Peter Walker	Robinson	Robinson	Crawford	69
C. H. Martin	Mazon	Mazon	Grundy	70
H. B. Emmiga	Golden	Golden	Adams	71
John Pogue, Sr.	Prairie Home	Bethany	Moultrie	72
Thos. Price	Elizabethtown	Elizabethtown	Hardin	73
James Ferrill	"	"	"	74
James Wetherington	"	"	"	75
Thos. Watson	"	"	"	76
Judge Tyr	Cave in Rock	Cave in Rock	"	77
Henry Rittenhouse	"	"	"	78
Jerry Simmonds	"	"	"	79
Joseph Mason	"	"	"	80
Dick Frailey	"	"	"	81
Ambrose Riley	"	"	"	82
Thos. Doerr	Lostant	Lostant	LaSalle	83
B. Roedler	Trenton	Trenton	St. Clair	84
L. M. Hoblit	Atlanta	Atlanta	Logan	85
James Dunwiddie	Arcadia	Arcadia	Stark	86
F. M. Harley	McLean	McLean	McLean	87
Prosper Morrison	Maquon	Maquon	Knox	88
John Ferguson	Mendota	Mendota	LaSalle	89
W. H. Holmes	Gillespie	Gillespie	Macoupin	90
W. B. Donaghy, Sr.	Vienna	Vienna	Johnson	91
W. B. Donaghy, Jr.	"	"	"	92
Mark Hankins	"	"	"	93
W. S. Cocke	Creal Springs	Creal Springs	Williamson	94
Allen Hainlins	Arrington	Atlanta	Logan	95



THE PUMPKIN-SEED OR SUNFISH.

*Lepomis gibbosus.*



## Carp Distribution—Continued.

Name.	Post Office.	Express Office.	County.	No.
Edwin Henderson	Greenfield	Greenfield	Greene	20
Mrs. M. J. Girler	Decatur	Decatur	Macon	20
W. H. Herrington	Lanark	Lanark	Carroll	20
August Haeke	Carlinsville	Carlinsville	Macoupin	20
C. Caffery	North Henderson	North Henderson	Mercer	20
John Laris	Frilla	Frilla	DeKalb	20
E. J. Lehman	Lake Villa	Lake Villa	Lake	20
Theo. Schroeder	Benson	Benson	Woodford	20
C. J. Huming	Plano	Plano	Kendall	20
Geo. Franck	Sandwich	Sandwich	DeKalb	20
C. Bensene	Waterford	Burlington	Wisconsin	20
Julius Bicknell	Lovington	Lovington	Moultrie	20
G. W. Witherell	Knoxville	Knoxville	Knox	20
F. W. Priest	Buffalo	Buffalo	Sangamon	20
J. Bardani	Brookfield	Brookfield	Missouri	20
A. Lynch	New Richmond	New Richmond	Wisconsin	20
James T. Kipler	Pittsfield	Pittsfield	Pike	20
Martin Neff	Petersburg	Petersburg	Menard	20
Wm. K. Bundy	Centralia	Centralia	Marion	20
Thos. Cole	Alma	Alma	"	20
Danl. Meacely	Alma	Alma	"	20
W. J. Henry	Centralia	Centralia	"	20
A. G. Benker	"	"	"	20
R. W. Murray	"	"	"	20
John H. Kagy	Salem	Salem	"	20
Lewis H. Kagy	"	"	"	20
J. T. Henry	Irvington	Irvington	Washington	20
L. C. Barton	"	"	"	20
K. M. Lamm	Quincy	Quincy	Adams	20
Dr. J. Ritter	"	"	"	20
Dunway Bros.	Virginia	Virginia	Cass	20
D. B. Girdley	"	"	"	20
James M. White	Farmersville	Farmersville	Montgomery	20
Edwin Schmidt	Bensonville	Bensonville	DuPage	20
E. D. Headley	Lakewood	Lakewood	Shelby	20
Geo. B. Spittler	Mt. Zion	Mt. Zion	Macon	20
Jessie Frank	Tripoli	Tripoli	Peoria	20
J. V. Trammel	Stone Fort	Stone Fort	Saline	20
F. S. Obert	Carpenter	Carpenter	Madison	20
Henry C. Brown	Nashville	Nashville	Washington	20
Fred Ahrens	Smithton	Belleville	St. Clair	20
Saml. C. Deal	Bloomington	Bloomington	McLean	20
J. H. Obert	Carpenter	Carpenter	Madison	20
E. G. Creal	Creal Springs	Creal Springs	Williamson	20
G. Creal	"	"	"	20
Geo. W. Gesking	Ingraham	Noble	Richland	20
J. H. Jewsbury	Markham	Jacksonville	Morgan	20
M. R. Cavanaugh	La Grange	La Grange	Cook	20
E. S. Hoffman	Stillwell	Stillwell	Hancock	20
G. J. Eckhoff	Norwood Park	Norwood Park	Cook	20
Mrs. G. J. Eckhoff	"	"	"	20
L. A. Petifish	Virginia	Virginia	Cass	20
Wm. J. Gharst	Noble	Noble	Richland	20
Z. C. Roberts	Fairfield	Fairfield	Wayne	20
A. B. Reds	Hindsboro	Hindsboro	Douglas	20
J. W. Reeds	"	"	"	20
J. A. Reeds	"	"	"	20
Henry Fulsman	Camp Point	Coatsburg	Adams	20
A. I. Wilson	Red Bud	Red Bud	Saline	20
L. F. Pease	Cisco	Cisco	Piatt	20
Joseph Dugger	Creal Springs	Creal Springs	Williamson	20
Rev. P. Sebastian, O. S. F.	Radom	Radom	Washington	20
Hon. E. F. Mvorsol	Carbondale	Carbondale	Jackson	20
Wm. Brenneke	Eldorado	Eldorado	Saline	20
Jacob J. Meyel	"	"	"	20
John Yost	"	"	"	20
W. C. Yost	"	"	"	20
H. K. Taylor	Green River	Green River	Henry	20
R. H. Maricle, M. D.	Mill Shoals	Mill Shoals	White	20
Crille Loramie	Saint Anne	Saint Anne	Kankakee	20
G. Schilpp	Hopedale	Hopedale	Tazewell	20

## CARP CORRESPONDENCE.

---

The following are a few of the letters received at our office relative to growth and culture of carp :

WATERLOO, ILL., September 29, 1888.

*S. P. Bartlett, Quincy, Ill. :*

DEAR SIR—I take pleasure in sending you a picture of a carp taken from Island pond, during the summer of 1887, by Mr. L. Miller. Its length is 35 inches, weight 24 lbs. The picture was taken by Mr. Harry Talbot, of Waterloo. I give you list of fish taken from pond. Fall of 1885, carp shot by Mr. L. Miller, measuring 31 inches in length, weight 16 lbs. Summer of 1887, carp captured by L. Miller, length 35 inches, weight 24 lbs. In August, 1888, carp 26 inches long, weighing 20½ lbs.

Yours truly,

J. S. SENNOTT, M. D.

NORTH HENDERSON, ILL., February 13, 1888.

*S. P. Bartlett :*

DEAR SIR—I received some carp, two years ago last fall, from you. They are doing well. They have increased so that now there is a large number in my pond. The old fish weigh something over four pounds apiece.

Yours truly,

ALEX. JOHNSON.

ROSEVILLE, ILL., August 27, 1888.

*S. P. Bartlett :*

DEAR SIR—A year ago last spring I received from you some carp. They have made a good growth, measuring in October fifteen inches in length. When I placed them in the pond they were about 1½ to 2 inches in length. They spawned twice this year. Will the carp be good for the table by the middle of September?

Yours truly,

J. W. COGHILL.

(Signed)

HAMILTON, ILL., August 10, 1888.

*To S. P. Bartlett :*

DEAR SIR—Some two years ago in June, I sent to you for some German carp. You sent me some. I put them in my lake, made by water from artesian well (mineral water.) These fish are alive and about fourteen (14) inches long, and I have now over 5,000 young fish much larger than those you sent me.

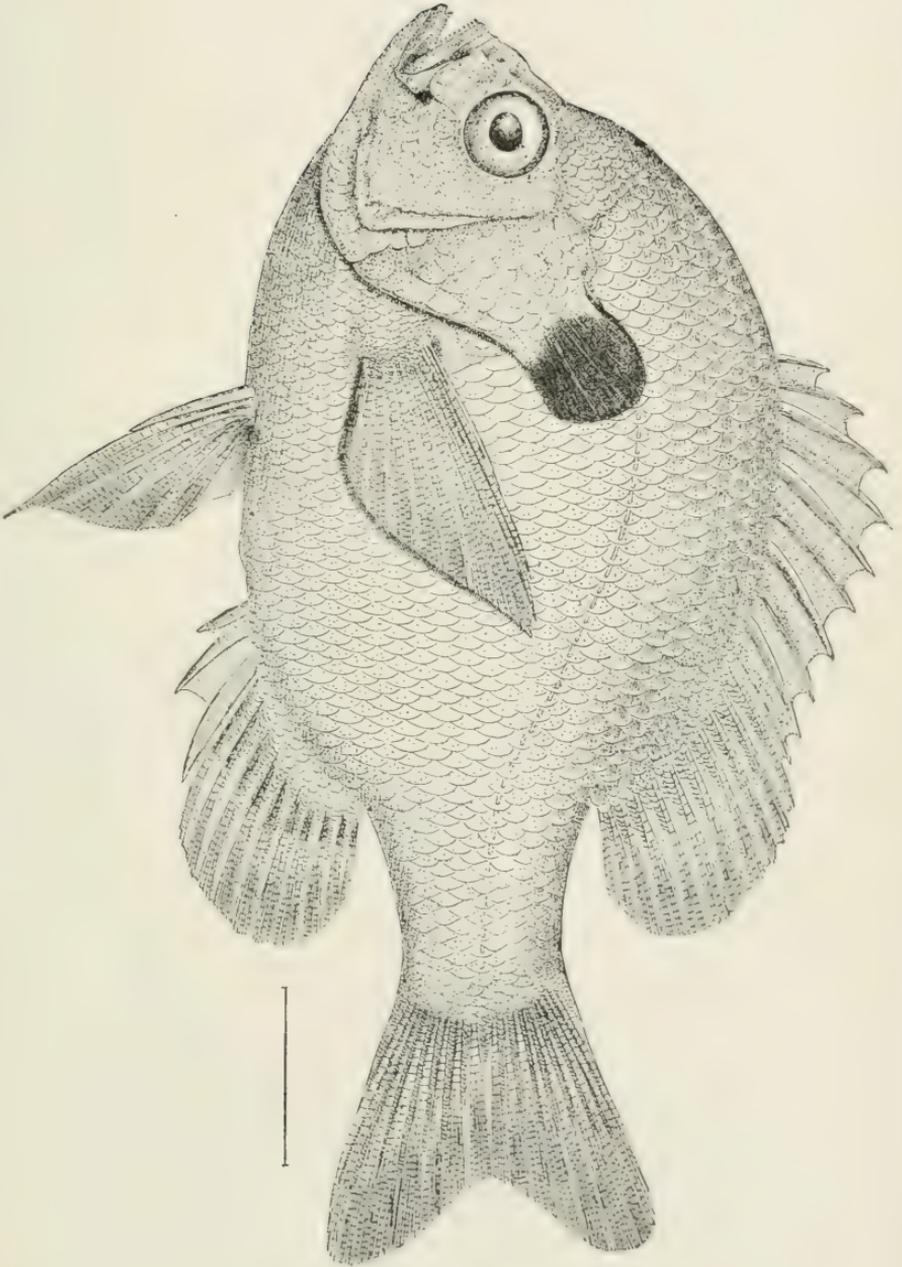
Yours truly,

T. DODGE.

(Signed)

The following statement has been sent us:

J. G. Figley took a Mirror carp from his pond, Sunday, that measured 28 inches in length, 20 inches around and weighed 11 lbs. The fish is three years old. One would hardly believe it possible that a fish could make such a growth and then it is asserted that one is capable of spawning 50,000 eggs of a season, which shows with what rapidity they multiply. Mr. Figley placed a hundred or so minnows in the pond three years ago, has sold thousands out of it, and no doubt many more thousands have gone over the dam, still the pond is alive with them, and there are many large ones. He will probably make a showing of his fish at our fair next fall.



THE BROAD-EARED SUNFISH.

*Lepomis pallidus.*



# STUDIES

ON THE

## AQUATIC LIFE OF ILLINOIS. I.

---

### INTRODUCTION.

---

The investigation of which the present paper is intended to set forth in a general way a few of the results, has for its purpose an exhibit of the animal life of the waters of Illinois as related to fish culture primarily, but also and finally in relation to nature at large. To this end studies have been carried forward on the kinds and comparative abundance of animals of every description occurring in the localities and situations selected for examination, at different seasons of the year, and under various conditions as to food, temperature, stage of water, and the like, and as affected by the general system of relations obtaining among the organisms themselves. In reporting these studies we shall not confine ourselves to annotated lists, but expect to enter into the fullest profitable detail with regard to habits, methods of association, and relations of mutual benefit, rivalry, or injury, and to show how and to what extent these habits and interactions vary from time to time with changes of condition.

The present contribution is based on collections and studies made in the summer of 1888 from the State Laboratory of Natural History at Champaign, with its apparatus and equipment and principally at its expense; but they have been greatly aided and facilitated by the Illinois State Fish Commission, by whom room, workmen, boats, and field assistance were freely furnished for

several weeks. The work here reported was limited to the waters visited by the field parties of the Commission, whose operations were confined to the neighborhood of Quincy, Illinois.

A second contribution, not yet ready for the press, will contain an account of the crustacean inhabitants of the waters studied, and a description of the food, feeding habits, and mutual inter-actions of the forms of animal life observed, as far as these may be determined by a study of the objects actually eaten by the specimens contained in our collections. Numerous illustrations of the most important elements of the food of fishes, and of the more interesting and remarkable animals occurring in our waters, will be given with the later installments of these reports.

Fuller accounts of these researches, with technical details, will be published from time to time, as heretofore, in the *Bulletin of the State Laboratory of Natural History*.

It is hoped also that botanical assistance may hereafter be had sufficient to enable us to include in future reports an account of the plant life of these waters,—indispensable to a full understanding of the biological relationships of the animals treated.

S. A. FORBES,  
*Director of Laboratory.*

PRELIMINARY REPORT ON THE ANIMALS OF THE MISSISSIPPI BOT-TOMS NEAR QUINCY, ILLINOIS, IN AUGUST, 1888. PART I.

By H. Garman, Zoölogical Assistant.

THE LOCALITY.

The peculiar features of the waters examined while with the Fish Commission at Quincy are reflected in the character of the collections taken from them. The locality is not one which would be selected by the naturalist as likely to yield a great variety of species. The waters are too much alike and are too much at the mercy of the Mississippi River for that. It is a locality, however, that is eminently characteristic of the Mississippi Valley, and one that is calculated to yield a fauna equally characteristic of certain influences which the great stream exerts upon its denizens.

The flood-ground of the Mississippi River at Quincy will average six miles in width from bluff to bluff and extends very nearly north and south. The river reaches the bluff on the Missouri side at the village of LaGrange, nine miles northwest of Quincy. From LaGrange it flows southeast in a direct course to the bluffs upon which Quincy stands. As this part of the river is but little more than a mile in width, it will be seen that extensive bottom-lands must lie on both sides of it between LaGrange and Quincy. On the Missouri side these bottoms form an extended and continuous body of land,—all wooded except the upper part, which is known as Lone Tree Prairie.

It is to the forest bottom-lands on the Illinois side northwest of Quincy that we wish to call especial attention, since it was upon them that most of our work with the Fish Commission was done. Unlike the Lone Tree Prairie region, they are cut up by channels into numerous separate bodies of land, upon some of which the water rises in spring, and leaves, as it subsides, numbers of lakes and ponds, some permanent, others transient. Opposite LaGrange some of these tracts are permanently detached from the main-land and form a group of large forest-covered islands. Including the channels between these islands, the river here has the unusual width of nearly three miles. Between the islands and the bluff is a fertile bottom-land, now protected from inundation by the Indian Grave levee. From this, the widest part, the Illinois bottoms become gradually narrower towards Quincy, just as those of the Missouri side do towards LaGrange, and terminate in a point known locally as the tow-head. All of the lower part is without levee protection and is separated from the neighboring bluff by Quincy Bay, a narrow inlet which opens to the river at the tow-head, and extends thence northward close along the bluff for about three miles.

#### .THE RIVER.

As has been said, the river averages about one mile in width. While the general course between LaGrange and Quincy is nearly direct, the low-water channel makes several bends. It runs along the face of the bluff at LaGrange, then turns southeast, at length reaching the Illinois side close to the south end of the LaGrange group of islands, and strikes the Illinois bottom-land about three miles north of Quincy, cutting down the banks vertically, undermining and carrying away the trees, and threatening even to cut across to the bay. It then turns towards the Missouri side again and reaches it two miles below. Thence it is deflected towards Illinois, and passing close along the south end of the tow-head, follows the bluff along the lower part of Quincy. It flows at the rate of three miles an hour. These bends in the low-water channel are not specially noticeable to the landsman at high water, since the river then fills its whole bed. In the latter part of summer, during most seasons, the water subsides to such an extent that a good deal of the extensive sand-bar which has accumulated in each bend becomes exposed, and the river is confined to its low-water channel. One such bar occurs in the bend west of the lower end of the Illinois bottom-land and another on the Missouri side opposite the point at which the current strikes the same bottom-land above. In the river proper no serious work was attempted, because of the protracted high water due to heavy falls of rain in early summer. This was going down when we reached Quincy, in the latter part of July, and the sand-bars in the bends began to appear soon after: but in August heavy rains in the northwest caused a rise which again covered them. This condition of the

river had a decided influence on the abundance and variety of animals, both in the lakes and sloughs and in the river itself. It will be referred to again.

#### BEAR CREEK.

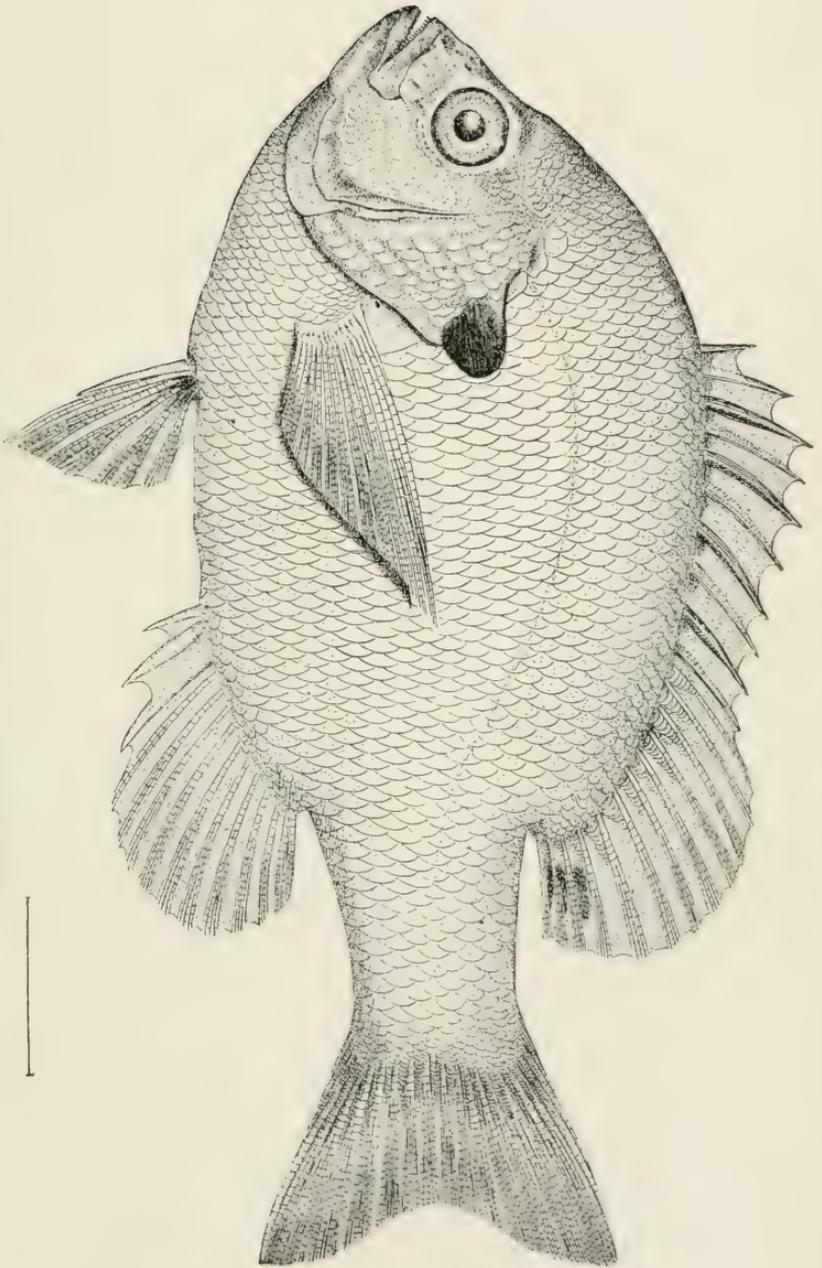
This stream winds down through all the northern part of the Illinois bottom-land, and after giving off several branches to the Mississippi River on the west, reaches the upper part of Quincy Bay, into which it formerly opened. At present the building of the Indian Grave levee across it, a short distance within this mouth, has closed the outlet, and the only water discharged into the bay passes through a sluice-gate. The lower part of the creek is now, therefore, little more than a slough. This was well filled with water when examined, and a small stream issued from a break which, during a recent inundation, it had made in the levee. The banks are steep, as a rule, as would be expected from the alluvial character of the soil through which the channel is cut. The shores are commonly wooded, and originally, doubtless, the whole of the neighboring region was covered with forest. The bottom is extremely muddy, and from the abundance of snags and brush lodged in its channel and its stagnant water, it is not an inviting collecting ground for the naturalist.

#### BALLARD SLOUGH.

This is a channel which has been cut obliquely across from the Mississippi River to Bear Creek, reaching the latter about a mile and a half northwest of the point at which the levee crosses the creek. Its river end, covered by the levee, is a half mile further north, and the length of the slough is probably not far from one and a half miles. It was, when visited, quite shallow and extremely muddy, and varied greatly in width at different portions, sometimes expanding into pools of considerable extent, and again contracting to fifteen or twenty feet in width. It was not continuous at this time, and probably during most seasons dries up in great part before the close of summer.

#### HARKNESS SLOUGH.

Harkness Slough is a channel which extends almost exactly parallel with Ballard Slough, and lies a quarter of a mile further south. It is very narrow,—not fifty feet across in much of the lower part of its course; has steep banks; forms some rather deep pools; and is, like Ballard Slough, extremely muddy. A dense growth of trees lines its banks. It was continuous as far as followed towards the Mississippi River (although greatly reduced at some points), and, judging from the current, was doubtless yet connected with the river. Still there can be no doubt that it commonly dries up largely in summer.



THE BLUE SUNFISH OR COPPER NOSE.

*Lepomis peetidus.*



## GOOSE LAKE.

An eighth of a mile south of the outlet of Harkness Slough into Bear Creek, is a wide opening on the east into Goose Lake,—an open sheet of water, from the shores of which much of the forest has been removed. It becomes shallower and its bottom more sandy towards its south end, from which a channel extends which formerly put it into communication with the bay, three quarters of a mile below.

## LIBBY LAKE.

This name was given me by one of the fishermen for a long, narrow pool on the west side of Bear Creek about midway between the outlet of Goose Lake and the Bear Creek sluice-gate. It is not named on any map at hand. It was in some respects very different from any other water in which collections were made. The water was quite deep, and, for the situation, unusually clear and cool, and gave promise of a growth of aquatic and sub-aquatic vegetation at the edges later in the season. It is scantily edged with willow and button bush and a few other trees and shrubs.

## QUINCY BAY.

The four bodies of water just described are within the levee. Quincy Bay extends from the levee where this reaches the Illinois bluff (about three miles and a half north of Quincy) directly southward along the foot of the bluff to the tow-head opposite the centre of the city, at which point it opens to the river. It varies little in width and will average perhaps a third of a mile. It is little more than an inlet of the Mississippi containing back-water during the latter part of the year, the water in much of it becoming then very shallow and the current almost disappearing. During the month spent at Quincy this year, the water did not reach its usual low stage, and the current due to waters received from Bear Creek, and the sloughs, creeks, and springs, was sufficient to keep the bay quite clear of the algæ which would otherwise have appeared upon it. Its bottom is commonly muddy and no promise of other aquatic vegetation could be seen in it. It is edged with woods quite continuously on the west, and on the east also there is some growth of forest where the strip of level soil between the bay and the bluff gives room for it.

## WILLOW SLOUGH.

This narrow channel extends obliquely across from the river to the bay outside of and parallel with the levee. It enters the bay about one and two thirds miles above the south end of the tow-head, and leaves the river a little over four miles north of the same point. Its length is about two and two thirds miles. At high water a current from the river sweeps through and reaches

the bay; but at the time it was seen but little water ran out; and in the lower part of its course it consisted of stretches of water connected by narrow rivalets. Some of the pools were of considerable depth. The bottom is commonly muddy, but occasional beds of sand occur. There was no vegetation.

#### WOOD SLOUGH.

Wood Slough is also a narrow channel extending obliquely across the lower part of the Illinois bottom-land from river to bay. It formerly entered the bay opposite the north end of Quincy, but the building of an embankment for a railroad bridge cut it off from this outlet so that it now turns west at its lower end and, running along the embankment, empties into the river again. Throughout its course it is very nearly parallel with the west shore of the island, in some cases being only a few rods away from the river. The river enters it four miles northwest of Quincy, and a mile and a half below this it breaks through the bank to the river again, so that at low water its lower part may not be continuous with the rest. It is perhaps three and a half miles long,—a narrow, muddy ditch of shallow water, completely devoid of vegetation, and containing such animals only as are so unfortunate as to be entrapped in it by the subsiding spring floods.

#### CLAUS LAKE.

This lake is a small temporary pool in the bottom-land about one fourth mile east of the north division of Wood Slough. It is very shallow,—at no place up to the mens' waists; has the usual muddy bottom; and lacks vegetation.

#### DEAD MAN'S SLOUGH.

Dead Man's Slough is a name applied by the fishing crew to a shallow, muddy pool in the woods about a quarter of a mile from the river above the north end of Wood Slough.

#### MOSS LAKE.

Moss Lake, on the southern part of Long Island, the largest of the LaGrange group, is very similar to the last two in general character, being an isolated pond in the woods. It is, however, much deeper than they, and its water is cooler and clearer. It is surrounded by a growth of hickory, elm, sycamore, and grape. Its length is less than a fourth of a mile, and its width from 150 to 200 feet. No aquatic vegetation was growing in it when it was seined in August.

#### LILY LAKE.

Lily Lake is one of a group of three lakes which lie between the lower end of Wood Slough and Quincy Bay. They have a common outlet during the fore part of the summer through Wood Slough.

Lily Lake is the smallest of the three, and lies only a few rods from the west shore of the bay. It is an oval pond of shallow water full of the pads of water chinquepin, and is the only water from which I collected that contained a growth of vegetation. It is pretty well protected on the north and west by forest, which probably prevents to some extent the ravages of overflows.

#### LONG LAKE.

Long Lake, the second of the group, lies a short distance north-west of the preceding. It is nearly three quarters of a mile long, and is a narrow body of rather deep water surrounded by forest.

#### BROAD LAKE.

West of the lower half of Long Lake is the third lake of the group. It is broad and shallow, and when visited consisted of a series of detached pools with sloping bottoms of mud so deep as to make it extremely difficult to drag a seine.

#### CEDAR CREEK.

This is a small rapidly flowing creek which comes from the east and, cutting through the bluff, enters the bay half a mile above the city limits. At its mouth it has deposited a large bed of alluvium through which one sinks to his knees in wading. A short distance from the bay it becomes rocky, and between the bluffs and in the upper part of its course flows over almost solid limestone. When visited, it was moderately low, and in places were shallow pools connected with each other by narrow reaches along which the water rushed with considerable speed. The water is quite clear notwithstanding the sewage which it receives; yet the influence of the latter is seen in the comparative scarcity of aquatic life for some distance back of the bluff.

#### OTHER WATERS.

The only situations other than those described above, in which collections were made, were a small creek without name just above Quincy, which is similar to Cedar Creek in every respect except its smaller size, and a muddy pond near the bluff at the southern limit of Quincy.

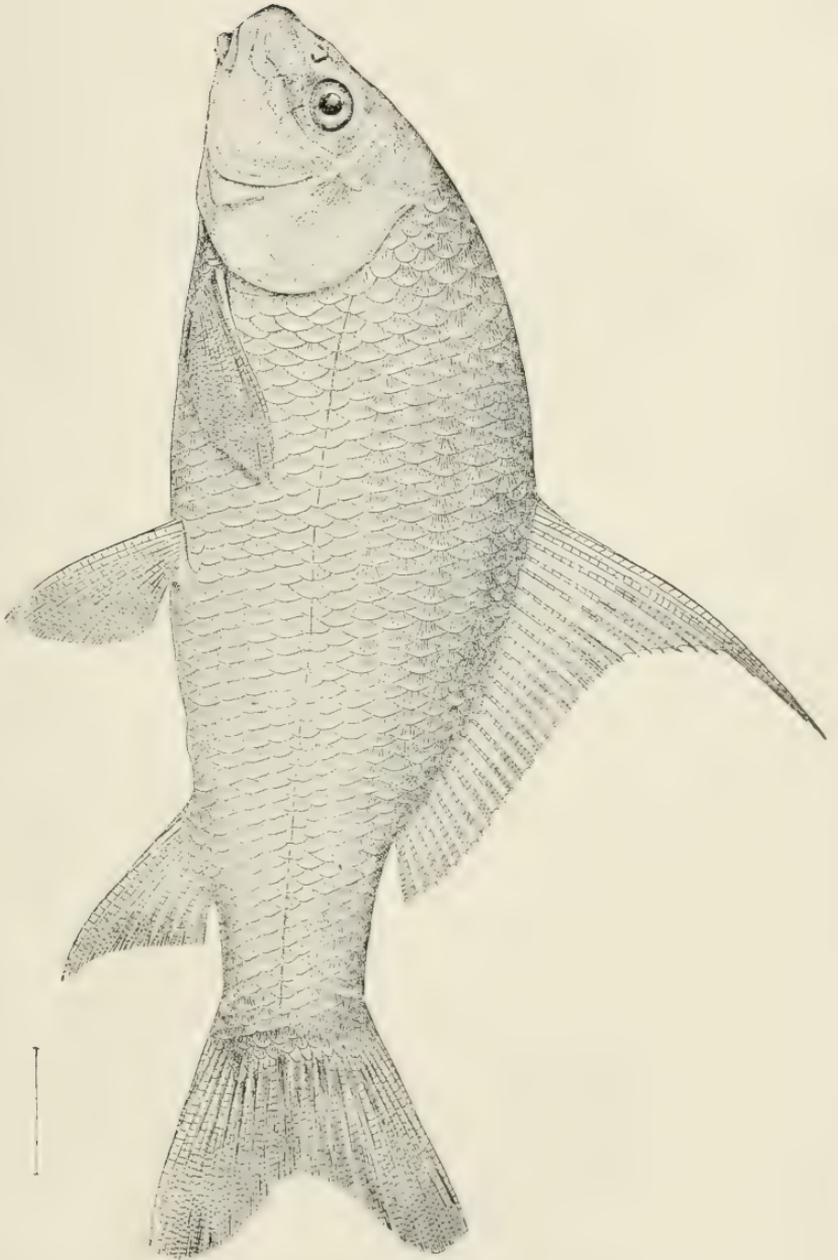
It was from the lakes and sloughs thus briefly described that the material was obtained upon which this paper is based. Omitting Cedar Creek, the bay, and the river, they have much in common. All were, or are now, subject to overflow by the Mississippi. Since the Indian Grave levee was built, the waters within it,—Bear Creek, Harkness and Ballard Sloughs, and Libby Lake,—have not commonly been subject to inundation,—a fact which explains certain special features of the collection taken from them

The condition of the pools with reference to the river was not a usual one. A late rise in the river had flooded them after the spring freshets had subsided, and kept open the communication, with the river much longer than would otherwise have been, thus helping the large fishes to escape from them after spawning, and doubtless carrying away hosts of the smaller organisms which had appeared in the pools. All have very muddy bottoms. In most, this mud was nearly knee deep, and made seining very difficult and disagreeable. In some places deposits of mud were of such recent origin and were so loose that it was unsafe to venture into them. Aquatic vegetation was almost wholly lacking. A scant growth of filamentous algæ was occasionally seen, but in nothing like the quantities in which it occurs in ordinary stagnant or quiet water. In Lily Lake alone there was a rank growth of aquatic vegetation. Here a permanent growth of water lilies (*Nelumbium luteum*) had become established, and to the under sides of the lily pads was attached a scant growth of filamentous algæ. This absence of vegetation is directly traceable to the overflows, since these disturb the bottoms of the pools, displacing the silt in some places, depositing fresh material in others, and dislodging and carrying away the plants which become established during the intervals between floods. The water was not very deep at this time, but of course varied with the river. It could be waded in most places by the men. It was deepest in the larger pools, such as Long and Broad Lakes, and here the temperature was tolerably constant. In the sloughs, where the water was shallow, it often became very warm, and during a few days of unusually high temperature became at the edge of these so hot as to be scarcely bearable.

#### ANIMAL LIFE.—MAMMALS AND BIRDS.

With this sketch of the surroundings we pass to the animals themselves. Of course mammals were not to be looked for on land so recently covered with water, and no trace of the presence of muskrats, even, was noticed. The raccoon, however, is said to remain on the flooded ground at all times, resorting to the trees, and probably often fasting, when surrounded by water. These animals were common about the sloughs, as was shown by the prints of feet, and doubtless depend to some extent on the fishes and other animals there crowded together. Fishes thrown upon the shore were generally devoured by them before the next morning. In the latter part of August they were plainly depending largely on wild grapes for food.

Birds were at no time abundant. A few kingfishers, a solitary green heron, or a couple of spotted sandpipers (*Tringoides macularius*), were about all that were commonly seen during a day's work. As the season advanced these became a little more abundant from accessions of migrating birds to their numbers. At one time a flock of about forty white pelicans appeared for the greater part of a day on the Missouri sand-bar opposite Wood Slough, but



**THE QUILL-BACK.**

*Tetodon nattereri.*



were driven away by gunners and did not again appear. An occasional troop of cormorants was seen, a single blue heron, a dab chick (*Podilymbus podiceps*), and two half-grown ducks, one of which was brought in by the seine. When the wild grapes ripened, the bottom-land was invaded by a good many of the smaller birds which were not often seen there before. Among these, robins, red-headed woodpeckers, and blue jays were conspicuous, though I cannot say that the two latter were attracted by the grapes. One other bird deserves mention as, from the numbers in which it occurs, it must have an important influence upon the insect life of the waters. Certain parts of the bluff presented extensive vertical surfaces of exposed clay, and bank swallows, in great numbers, had excavated burrows in this for nests. In places these exposed surfaces were honey-combed with the burrows. During quiet afternoons and evenings the swallows spent a good deal of time skimming the surface of the water of the neighborhood. Among them was noted occasionally, the white-billed swallow (*Tachycineta bicolor*); but most, seemed to be the bank swallow (*Clivicola riparia*). There can be no doubt that the destruction of winged insects from the water by the hundreds of swallows annually reared in these banks is very great.

### REPTILES.

With one exception, serpents, even of the aquatic kinds, were not seen. I presume they are not able to maintain themselves on the bottom-land during inundations. A single *Regina leberis* was seen for several days lurking about fish boxes at the headquarters of the Fish Commission. The absence of vegetation may also have had something to do with the absence of serpents, since they prefer places in which they are not so completely exposed to observation. The locality was certainly calculated to furnish an abundance of food to the fish-eating species.

Turtles were present in great numbers. They were especially common in the more retired pools when these were first visited. Subsequent visits showed them in diminished numbers, either from their having migrated, or having learned to avoid the seine by burrowing in the mud. The egg-laying season was apparently past, so that no opportunity offered for studying the breeding habits of the species. I am informed that the eggs are sometimes gathered from sandy shores by hundreds, and used as food.

The following brief list includes most of the species of *Chelonia* which occur in Illinois. Doubtless some of the other Illinois species will also be found here when the locality is more thoroughly explored.

#### PAINTED TURTLE (*Chrysemys belli*, Gray).

This turtle was rather common in the sloughs, but was not seen elsewhere. Adults are not easily distinguished from the related *C. marginata*; but I believe none of the latter occurred in the sloughs.

*Pseudemys elegans*, Wied.

Frequent in sloughs.

*Pseudemys troostii*, Holbrook.

Rare. Three examples from Moss lake, on Long Island, in the river. A strong, irritable species.

MUD TURTLE (*Malacoclemmys lesueuri*, Gray).

Equally common with the next species and much like it in habit. The two are not discriminated by river men, and are known to them as mud turtles. Observed in most of the sloughs and in the river and bay.

MUD TURTLE (*Malacoclemmys geographicus*, Lesueur).

This and the preceding species probably constitute more than half of the turtles which one sees on the partly submerged trunks of trees and on sunny banks along the river and sloughs. Scores may be seen on bright days sunning themselves on the edges of the log rafts in the upper part of the bay. They are not used as food, though it is sometimes claimed that the flesh is palatable.

ALLIGATOR SNAPPER (*Macrochelys lacertina*, Schw.).

This species is said by fishermen and sportsmen to occur here occasionally.

SNAPPING TURTLE (*Chelydra serpentina*, Linn.).

Occasional in sloughs and lakes. Those taken were large and very fat. It is prized as food.

SOFT-SHELL TURTLE (*Aspionectes spinifer*, Lesueur).

Abundant in river and not uncommon in the sloughs. Fishermen sell readily those caught in their seines.

SOFT-SHELL TURTLE (*Amyda mutica*, Lesueur).

Common in the river, but less abundant in sloughs than the preceding. Reaches a length of 8 to 10 inches. It is used as food.

## AMPHIBIANS.

Amphibians evidently cannot maintain themselves on these bottom-lands. They were very rare; and probably the few seen had made their way in from the higher land within the levee. A few half-grown leopard frogs (*Rana virescens*, Kalm) were taken in the woods under logs, and at the edges of sloughs. One full grown example was taken at the edge of Claus Lake August 10. A single *R. catesbiana*, Shaw, was heard within the levee in Bear Creek. The cricket frog (*Acris gryllus*, LeConte) was frequently seen at the edges of the water, but was by no means common. Two young toads about half an inch long were taken at the edge of Lily Lake August 7, and another example 1.25 inch long was taken August 15 at the edge of Willow Slough. The former had probably grown

from spawn deposited in the water after the late floods. They were found on the side of the bottom next the bluff. It may be that a few adults succeed in avoiding the current on this side and remain here; but they are certainly rare. Not a single tadpole was noticed in any of the bottom-land sloughs and lakes; but a few small tadpoles of toads were noted in shallow pools of Cedar Creek. All these amphibians were feeding on terrestrial insects,—chiefly beetles belonging to the families Carabidæ, Staphylinidæ, and Heteroceridæ, together with a small fly, and leaf-hoppers of the family Jassidæ. One cricket frog had eaten a single aquatic larva (the *Acilius* described below). There was little difference in the food of the different species from any one locality. Along Cedar Creek a small black fly, which was common on moist sand, was eaten largely.

## FISHES.

The fishes taken from the sloughs and lakes of the bottom-land at Quincy, may be placed in three groups: creek fishes, pond or slough fishes, and river fishes. To the creek fishes belong most of the minnows, the sand darters, and the common sucker,—altogether about half as many species as there are in each of the two remaining groups. The individuals belonging here were probably less than one per cent. of those taken from the pools. This scarcity was due in some measure to the abundance of predaceous fishes in these waters; but the species of this group taken were mostly such as are ordinarily found common in small creeks, and were probably only stragglers from the great body of individuals which live in such streams. Several of the minnows, however, deserve to be placed among river fishes as far as fitness for life in the river is concerned. Such species as *Hybopsis amblops*, *Notropis atherinoides*, *N. jejunus*, and *Hybognathus nuchalis*, though occurring in small streams, generally prove abundant in our rivers, and are certainly perfectly at home there.

I have considered as pond and slough fishes, such as the bull pouts, the top minnows, the two pickerels, the two croppies, the several species of sunfishes, the large-mouthed black bass, and the ringed perch. The members of this group were commoner in the sloughs than were those of the preceding group, but were not as abundant in species or individuals as the next. In the lakes and sloughs outside the levee, probably these pond fishes did not constitute more than one fifth of the individuals taken; but inside the levee they composed one half of those taken in all situations. Some of them were evidently breeding in these protected waters, and I do not think any member of the group was doing so in the sloughs of the lower bottom-land.

The third and largest group includes river fishes, such as the gars, dogfish, channel cat, morgan cat, shovel fish, buffalo, carp, several minnows, the Ohio shad, pile perch, striped bass, white bass, red-spotted sunfish, and the white perch (*Aplodinotus*).

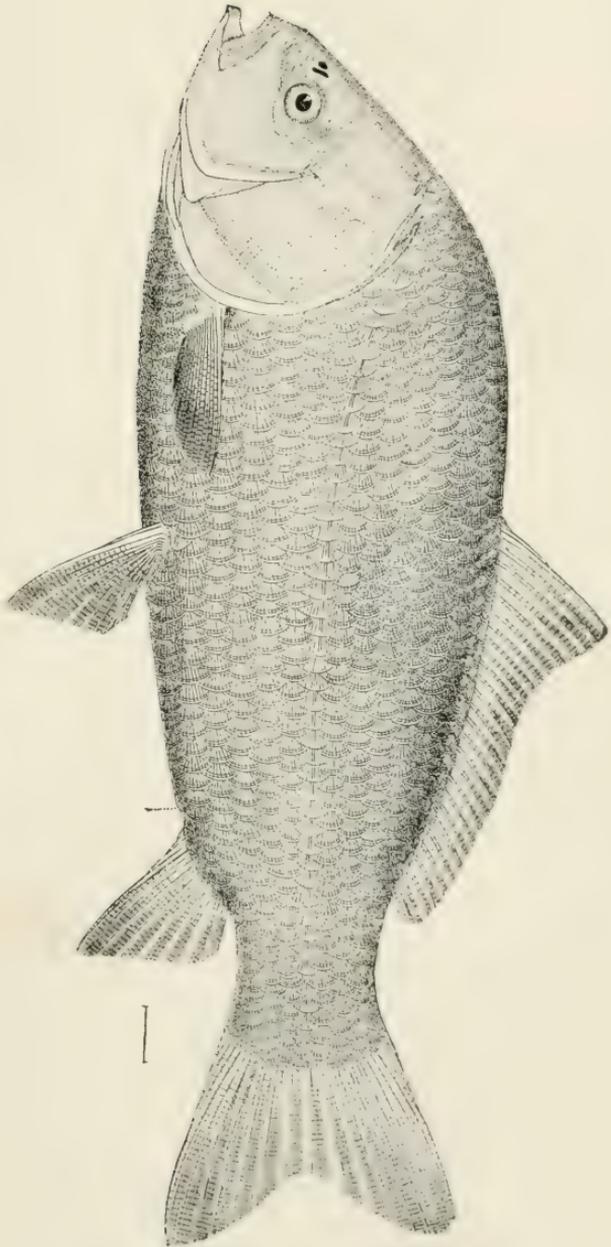
These fishes must have constituted in the neighborhood of four fifths of the individuals in the sloughs and lakes outside the levee. A number of them, notably the hickory shad and the red-mouthed buffalo, occurred there in prodigious numbers. As a rule, these species became gradually less and less common as one went north and away from the river, and accompanying this diminution in the numbers of river fishes was a gradual increase in the numbers of pond fishes. There was, in fact, an overlapping of the two groups in the bottom-land, the river fishes being most abundant in the sloughs near the river, and the pond fishes, within the levee and to the northward. Still, several river fishes were very common inside the levee. Evidently not all of the river fishes taken in the sloughs breed there. Such species as the morgan catfish (*Leptops*), the shovel fish, the minnows, and the red-spotted sunfish (*Lepomis humilis*) had probably wandered here from the river during high water and had been confined when the water became lower. Most of the remaining river fishes had, I think, been spawned on the flooded bottoms. The abundant young of gars, buffalo, carp, hickory shad, pike perch, and white bass in the temporary pools are evidence of this.

#### FAMILY SCIÆNIDÆ.

##### SHEEPSHEAD, WHITE PERCH (*Aplodinotus grunniens*, Raf.).

The young of this fish, varying from 2.50 inches to 4.50 inches in length, were frequent in most of the sloughs and lakes. These are, in all probability, the young of the season. If smaller ones existed in the sloughs, they must certainly have been captured in the seine used by the Fish Commission (a quarter-inch mesh). This species was more abundant inside the levee than in the pools on the lower part of the bottom-land, and was especially common in inlets along the lower part of Bear Creek and in Goose Lake. On a small sand bar in Bear Creek, at the mouth of Harkness Slough, more were taken than at any other one place. No specimens longer than 4.50 inches were taken from the sloughs and pools, so far as I know. In the bay and river, large ones were very common; and probably half of the fishes taken during August with hook-and-line from barges and river banks were of this species. It seems quite at home in the swiftest current of the river, and was caught with minnow bait from banks upon which the current strikes with a force which it would seem no animal could withstand. The largest example seen would have weighed about one pound. The local name for the fish is perch; and it is considered one of the best of food fishes.

Localities: Ballard Slough, Harkness Slough, Bear Creek, Goose Lake, Quincy Bay, Claus Lake, Willow Slough, Lily Lake, Broad Lake, Wood Slough, Mississippi River.



**THE RED MOUTH BUFFALO-FISH.**

*Ictiobus cyprinella.*



## FAMILY SERRANIDÆ.

STRIPED BASS, YELLOW BASS (*Morone interrupta*, Gill).

Young were frequent in certain of the sloughs and lakes, but were not seen elsewhere. In the northern part of Broad Lake and in small isolated pools above it, they were quite common. Examples preserved vary from 1.75 inch to 4.50 inches in length.

Localities: Ballard Slough, Harkness Slough, Goose Lake, Dead Man's Slough, Claus Lake, Willow Slough, Lily Lake, Broad Lake.

WHITE BASS, ROCK BASS (*Roccus chrysops*, Raf.).

This fine species was more abundant than the striped bass, and ranged in a greater variety of situations. I saw it caught from the swiftest current of the river. Only young ranging from 2.50 to 5 inches in length were found in the sloughs. It was nowhere common except in the upper part of Broad Lake and in the pools which had recently been in communication with it.

Localities: Ballard Slough, Bear Creek, Goose Lake, Dead Man's Slough, Moss Lake, Willow Slough, Long Lake, Broad Lake, Wood Slough.

## FAMILY PERCIDÆ. (PERCH.)

SAUGER, JACK SALMON (*Stizostedion canadense*, Smith).

Young frequent in lakes, varying from 3 to 5 inches in length. No adults seen.

Localities: Goose Lake, Claus Lake, Lily Lake, Long Lake, Broad Lake.

WALL-EYED PIKE (*Stizostedion vitreum*, Mitch.).

Young frequent in most of the sloughs and lakes; sometimes abundant. Ranged from 2.50 inches to 6 inches in length. Frequently with large, conspicuous, dusky blotches.

Localities: Harkness Slough, Goose Lake, Willow Slough, Lily Lake, Long Lake, Broad Lake, Wood Slough.

COMMON RINGED PERCH (*Perca flavescens*, Mitch.).

Young ringed perch were occasionally seen in the bottom-land lakes. Those captured ranged from 2.75 to 3 inches in length. In Libby Lake, within the levee, these fishes were abundant,—a fact which was noted with surprise, as they had not hitherto been found common in the State away from the northern part. Those taken from this lake differed from the northern lake form in being rounder; and also especially in color. When taken from the water they were almost uniformly olive green above, with white belly. As they died, faint blackish bars gradually appeared. Mr. Bartlett tells me that he has transplanted perch to this locality,—a fact which probably accounts for the abundance of the fish in Libby Lake.

Localities: Libby Lake, Dead Man's Slough, Long Lake, Broad Lake.

SAND DARTER (*Etheostoma jessia*, Jor. & Brant., var. *asprigene*, Forbes).

Judging by the number of specimens of this little fish taken, it is not common here, although parts of Willow Slough are well suited to it.

Four examples, Willow Slough; one large brightly colored example, Broad Lake; one example, Lily Lake.

SAND DARTER (*Etheostoma phoxocephalum*, Nelson).

Occasional in Wood Slough. Excepting a single example from Willow Slough, it was not seen elsewhere.

BLACK-SIDED DARTER (*Etheostoma aspro*, Cope & Jor.).

One small example approaching *E. phoxocephalum* in colors, was taken in Wood Slough, July 30.

LOG PERCH (*Etheostoma caprodes*, Raf.).

This was the most abundant darter collected. It was quite common in Willow Slough, Long Lake, Broad Lake, and Wood Slough.

JOHNNY DARTER (*Etheostoma nigrum*, Raf.).

An immature example from Willow Slough was the only one seen.

#### FAMILY CENTRARCHIDÆ. (SUNFISHES.)

LARGE-MOUTHED BLACK BASS (*Micropterus salmoides*, Lac.).

The young of this bass were moderately common in all the sloughs and creeks. Examples of considerable size were occasionally taken, showing that this species does not necessarily leave the sloughs after spawning. One example brought in by the net must have weighed seven pounds or more. The smaller examples, which are of interest as in all probability the young of the season, ranged from 2 to 3 inches in length. Between these and the larger ones were various intermediate sizes representing probably three or four generations.

Localities: Ballard Slough, Harkness Slough, Libby Lake, Moss Lake, Dead Man's Slough, Claus Lake, Willow Slough, mouth of Cedar Creek, Lily Lake, Long Lake, Broad Lake.

SMALL-MOUTHED BLACK BASS (*Micropterus dolomieu*, Lac.).

A single young specimen, 2.12 inches long, was taken in Willow Slough August 7. The locality is somewhat unusual for this species. It is certainly not common in the water collected from. Mr. Bartlett informs me that it was brought here some time ago by the State Fish Commission.

COMMON SUNFISH (*Lepomis pallidus*, Mitch.).

Rare in the temporary pools, becoming common in the deeper water of Long and Broad Lakes; also quite common within the levee. The youngest examples taken ranged from 1 inch to 1.75 inches in length. Adults in breeding colors were caught in Long and Libby Lakes. Females contained ova as large as No. 12 shot. An old gentleman who has fished here for years tells me that in the days of the early settlers sunfishes, presumably of this species, were sometimes taken that weighed as much as four pounds.

Localities: Ballard Slough, Harkness Slough, Libby Lake, Dead Man's Slough, Moss Lake, Willow Slough, Lily Lake, Long Lake, Broad Lake, Mississippi River.

RED-SPOTTED SUNFISH (*Lepomis humilis*, Gir.).

This handsome little fish was quite common in sloughs and lakes,—more abundant than we have found it elsewhere in the State. Very few young were seen, and these were nearly mature. It is quite hardy, as is shown by the water it frequents, and may prove a desirable aquarium fish. All the adults taken differed from the descriptions of Drs. Jordan and Gilbert in having the opercular flap with a wide *white* margin instead of a red one. Immature examples have the opercular flap poorly developed and are marked in the sides with numerous small black dots, while the red of the adult is largely wanting.

Localities: Harkness Slough, Goose Lake, Moss Lake, Dead Man's Slough, Claus Lake, Willow Slough, Long Lake, Broad Lake, Wood Slough, pond at southern limit of Quincy.

RED-EYE, BLUE SPOTTED SUNFISH (*Lepomis cyanellus*, Raf.).

Two examples about 3.50 long, taken in Goose Lake, Aug. 13, were the only ones seen.

WARMOUTH, RED-EYED BREAM (*Chenobryttus gulosus*, C. & V.).

A few young, about 1.50 inch long, were taken in most of the pools. Frequent in Libby Lake and Harkness Slough.

Localities: Ballard Slough, Harkness Slough, Libby Lake, Dead Man's Slough, Claus Lake, Lily Lake, Long Lake, Wood Slough.

PALE CROPPIE (*Pomoxys annularis*, Raf.).

The pale croppie was more abundant than we have found it elsewhere in the State away from Southern Illinois. This fact is one of a number which our fish fauna yields, illustrating the influence of the Mississippi River in extending the range of southern species northward immediately along its course. Young, from 2.25 to 2.75 inches long, were common; and between these and the largest taken (8 inches long) were a number of intermediate sizes. The species became a little more abundant in the more northern pools.

Localities: Ballard Slough, Harkness Slough, Goose Lake, Libby Lake, Moss Lake, Dead Man's Slough, Claus Lake, Willow Slough, Lily Lake, Long Lake, Broad Lake, pool at southern limit of Quincy.

DARK CROPPIE, CALICO BASS (*Pomoxys sparoides*, Lac.).

A little more abundant than the preceding species in the sloughs and lakes. Especially common in the more northern pools, but very generally distributed. Most of those seen were young, from 1.50 to 2 inches long. No adults were seen from pools outside the levee.

Localities: Ballard Slough, Harkness Slough, Goose Lake, Libby Lake, Moss Lake, Claus Lake, Willow Slough, Lily Lake, Long Lake, Broad Lake, Wood Slough, at southern limit of Quincy.

## FAMILY ESOCIDÆ. (PIKES.)

PIKE, PICKEREL (*Esox lucius*, Linn.).

This species was not seen in most of the bottom-land sloughs. Probably more work in the pools and lakes within the levee farther north would have shown it common enough. It probably does not often leave its retreats among the vegetation of quiet water for the current of the river.

From Harkness Slough, example 12 inches long; Libby Lake several examples 8 inches long; Long Lake, one example; pool south of Quincy, a half dozen small examples.

LITTLE PICKEREL (*Esox vermiculatus*, Les.).

Not common apparently. Seen only within the levee, and in Lily Lake.

Harkness Slough, one example; Claus Lake, occasional examples five inches long; Lily Lake, four small examples.

## FAMILY ATHERINIDÆ.

*Labidesthes sicculus*, Cope.

Probably more common in the sloughs than it seemed to be, as its slenderness permits it to pass through most seines when they are not encumbered with vegetation. The pools are exactly suited to it.

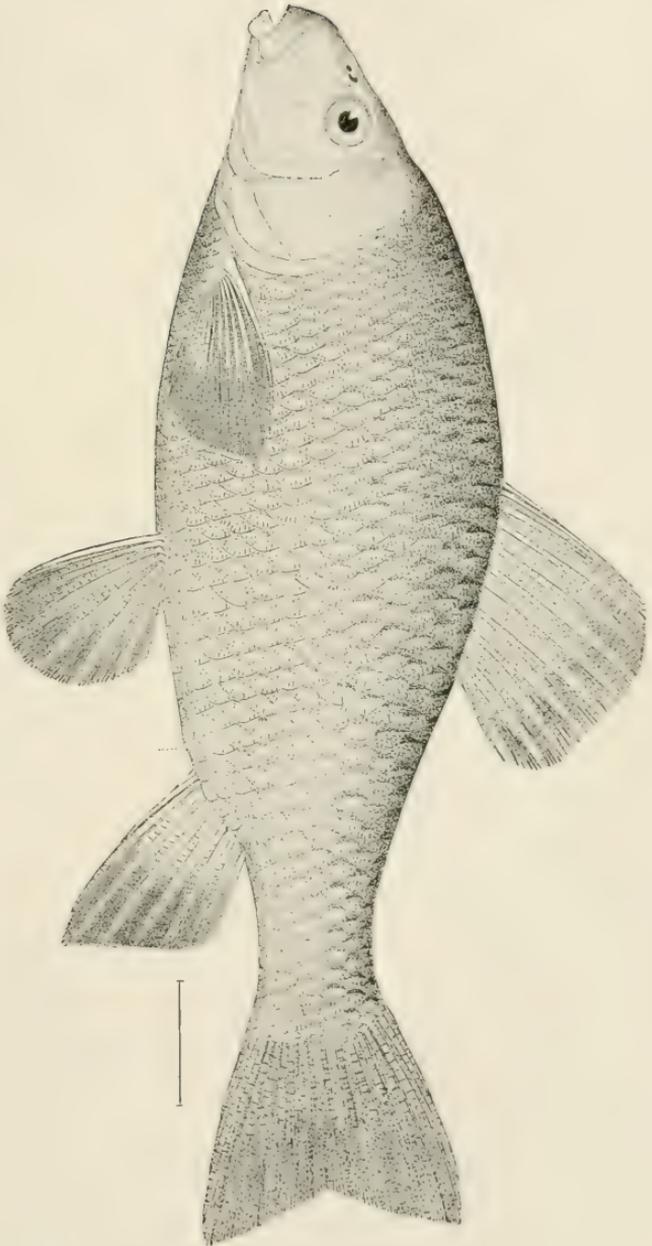
One small example, Long Lake; four examples, Broad Lake.

## FAMILY CYPRINODONTIDÆ. (Top Minnows.)

BLACK-SIDED TOP MINNOW (*Zygonectes notatus*, Raf.).

Frequent and generally distributed, but only a few taken at any one time. Schools of about a half dozen individuals were frequently seen in the bay.

Localities: Harkness Slough, Quincy Bay, Willow Slough, Long Lake.



**THE CHUB SUCKER.**

*Erimyzon succetta.*



## FAMILY CLUPEIDÆ. (SHAD.)

HICKORY SHAD, GIZZARD SHAD (*Dorosoma cepedianum*, Les.).

The bottom-land sloughs and lakes are pre-eminently the spawning ground of this fish. Young of the year, 1.50 to 2 inches long and still wearing the black shoulder mark, occur in countless numbers. Probably more than half of the individuals taken in the Fish Commission seines during the season are these young shad. The temporary pools on the lower part of the bottom-land were crowded with them. They were less abundant farther back, but were still very common in Libby Lake, inside the levee. The adults, on the other hand, were usually scarce; but in the pool south of Quincy both young and adults were common,—a fact explained by the situation of the pool east of a railroad embankment and at a considerable distance from the river. The pool is consequently very early isolated, and the adults which make their way in to spawn are prevented from escaping. Predaceous fishes confined in the sloughs depend very largely on this shad for sustenance.

Localities: Harkness Slough, Libby Lake, Moss Lake, Dead Man's Slough, Claus Lake, Quincy Bay, Long Lake, Broad Lake, Wood Slough, pool south of Quincy.

OHIO SHAD (*Clupea chrysochloris*, Raf.).

Probably not common. The only specimens seen were a half dozen young, 2.62 inches long, from Moss Lake, Long Island, Aug. 14.

## FAMILY CYPRINIDÆ. (MINNOWS.)

GOLDEN SHINER, BREAM (*Notemigonus chrysoleucus*, Mitch.).

Frequent. Abundant in Libby Lake, where examples 5 inches long were seen.

Localities: Harkness Slough, Libby Lake, Dead Man's Slough, Claus Lake, Long Lake, Wood Slough, pool south of Quincy.

*Hybopsis amblops*, Raf.

Common in Willow Slough and of large size, some examples measuring 4.5 inches in extreme length. Elsewhere taken only in Broad Lake and Wood Slough, from each of which one or two examples were obtained.

*Phenacobius teretulus*, Cope.

A single example of this variable minnow was taken from Broad Lake, August 9.

*Notropis atherinoides*, Raf.

Not found common except in Moss Lake and in the river. On the sand bars of the latter it is caught in numbers for bait. It was sometimes seen hurrying up stream near the shore against the force of the current.

Localities: Moss Lake, Mississippi River, Broad Lake, Long Lake.

*Notropis jejunus*, Forbes.

One example, Long Lake; eight examples, Broad Lake.

SHINER (*Notropis megalops*, Raf.).

Rare. Two small examples from Willow Slough, the only ones secured.

SPAWN EATER (*Notropis hudsonius*, Clinton).

Not common. One example each from Goose Lake and Long Lake.

*Notropis cayuga*, Meek.

The above name was assigned some time ago by Prof. Gilbert to numerous examples of a small minnow in the Illinois State Laboratory collection. Mr. Meek's description has not been seen, but a comparison of a single example of a fish obtained in Long Lake, with the specimens examined by Prof. Gilbert, shows this to be the same thing. The species bears a superficial resemblance to *Notropis heterodon*, but has a short, weak mandible, without pigment, and a complete lateral line.

*Cliola vigilax*, Baird and Girard.

Frequent in several of the pools.

Localities: Willow Slough, Long Lake, Wood Slough.

BLUNT-NOSED MINNOW (*Pimephales notatus*, Raf.).

Less common than the preceding.

Long Lake, Wood Slough.

SILVERY MINNOW (*Hybognathus nuchalis*, Ag.).

This species was common in the river, where with *Notropis atherinoides*, it was taken in numbers for bait. Throughout Cedar Creek, also, it was very abundant, and in the upper part of the stream was the only fish seen. In the sloughs and lakes it was not common.

Claus Lake, Willow Slough, Broad Lake, pool south of Quincy, Cedar Creek, Mississippi River.

GERMAN CARP (*Cyprinus carpio*, Linn.).

This hardy fish seems destined to become a permanent part of our fauna. Examples of good size were taken on a number of occasions, showing it to be widely distributed among the pools and lakes of the bottom-lands. A single specimen of the fully-scaled form was taken from Dead Man's Slough August 18. The food of an example from Broad Lake consisted of vegetation and mollusks, the former constituting two thirds of the material in the alimentary canal, and consisting of dead leaves of and seeds. The seeds

were, as far as could be determined in a hasty examination, chiefly those of trees and weeds. Elm seeds, ragweed seeds, and the seeds of *Polygonum* were noted. The Mollusca were partly thin-shelled clams with an occasional *Spharium*, and partly snails, such as *Physa* and *Lioplax*. All the matter was apparently gathered from the bottom. No trace of crustacean or insect food could be detected.

Dead Man's Slough, Broad Lake, Quincy Bay, and pool south of Quincy.

#### FAMILY CATOSTOMIDÆ. (SUCKERS.)

##### RED HORSE (*Moxostoma aureola*, Les.).

Rare. Seen only on two occasions.

Moss Lake, five examples 5.50 to 6.00 inches long; Wood Slough.

##### RED HORSE (*Moxostoma macrolepidotum*, Les. var. *duquesnei*).

Occasional young 4.50 to 12 inches long were taken.

Localities: Moss Lake, Willow Slough, Long Lake, Broad Lake, Wood Slough.

##### COMMON SUCKER (*Catostomus teres*, Mitch.).

Rare. Those taken were about six inches long.

Localities: Moss Lake, Wood Slough, slough south of Quincy.

##### CARP, RIVER CARP (*Ictiobus velifer*, Raf.).

Generally distributed but not very common, and nearly all young. Examples from 3.50 to 7 inches long were taken. Frequent in the slough at south edge of Quincy.

Localities: Harkness Slough, Bear Creek, Goose Lake, Moss Lake, Willow Slough, Long Lake, Broad Lake, Wood Slough, pool south of Quincy.

##### QUILL-BACK BUFFALO (*Ictiobus bubalus*, Raf.).

Not observed in any of the bottom-land pools outside the levee, excepting Broad Lake. The young from 3 to 5 inches long were rather common inside the levee. The only large examples seen were taken from the river, where they seemed to be moderately common. The young are easily distinguished from the young of *I. cyprinella* by their small, inferior mouth, compressed body, and pale colors,—especially of the pectoral and ventral fins.

Localities: Harkness Slough, Bear Creek, Libby Lake, Dead Man's Slough, Claus Lake, Broad Lake.

##### MONGREL BUFFALO (*Ictiobus urus*, Ag.).

In my field notes I have recorded the young of this fish as occurring in the slough at the south edge of Quincy. They were not seen elsewhere. Adults were common in the river, and were sometimes seen of large size. One was noted August 6 which weighed twenty and a half pounds.

Localities: Slough south of Quincy, Mississippi River.

RED-MOUTH BUFFALO (*Ictiobus cyprinella*, C. & V.).

Young 4 to 5.75 inches long were extremely common everywhere in sloughs and lakes. They differ from the young of *I. bubalus* in having a larger mouth, thicker body, and darker colors. The pectoral and ventral fins are blackish, whereas in the case of the quill-back buffalo they are pale. Most of the large buffalo taken from the river were of this species.

Localities: Harkness Slough, Bear Creek, Moss Lake, Dead Man's Slough, Claus Lake, Willow Slough, Long Lake, Broad Lake, Wood Slough, slough south of Quincy, Mississippi River.

## FAMILY SILURIDÆ. (CATFISHES.)

*Noturus gyrinus*, Mitch.

Moderately common in sloughs and lakes.

Localities: Harkness Slough, Dead Man's Slough, Willow Lake, Lily Lake, Long Lake, Broad Lake, Wood Slough.

MORGAN CAT, YELLOW CAT (*Leptops olivaris*, Raf.).

This catfish was rare in sloughs and lakes. A single example 10 inches long from Willow Slough was the only one seen from water of this kind. It was abundant in the river, where specimens of ten pounds weight were frequently taken; and one was noted August 6 that would probably have weighed 18 pounds or more. I am informed that young dog-fish are used on trot lines as bait for this catfish.

BULL-HEAD (*Ameiurus melas*, Raf.).

The most common of the small catfishes in the sloughs. They seem to be gregarious when young and small schools were occasionally seen swimming slowly along in an aimless fashion in the bay. The examples taken measured from 1.25 to 2.75 inches in length. Adults were not seen.

Localities: Claus Lake, Wood Slough, Lily Lake, Long Lake, slough south of Quincy, Quincy Bay.

BULL POUT (*Ameiurus nebulosus*, Les.).

Not seen in most of the pools. Frequent and of large size in Dead Man's Slough.

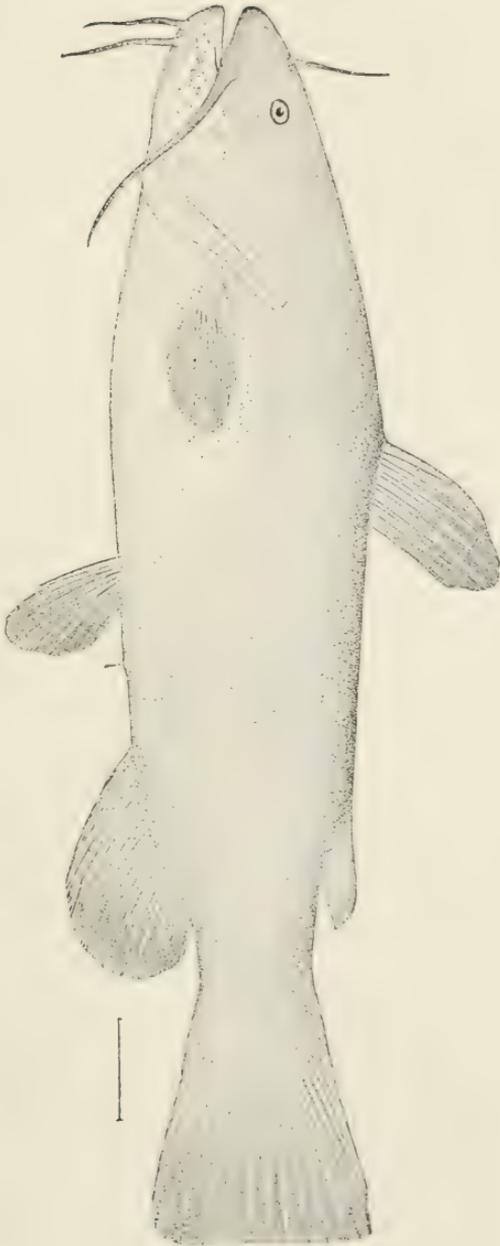
YELLOW CATFISH (*Ameiurus natalis*, Les.).

Not common. Those seen were adults.

From: Harkness Slough, one large example; Moss Lake, several large examples; slough south of Quincy, a few.

WILLOW CAT, CHANNEL CAT, WHITE FULTON (*Ictalurus punctatus*, Raf.).

Young 5 to 7 inches long were frequent in some of the sloughs and were quite abundant in Bear Creek. No large examples were



**THE BULL HEAD.**  
*Ameiurus Vulgaris.*



seen in the sloughs, but specimens weighing from a half to three quarters of a pound were abundant in the river, as was seen by the numbers caught on trot lines. The young are called "fiddlers" by fishermen.

Localities: Bear Creek, Dead Man's Slough, Willow Slough, Long Lake, Broad Lake, Wood Slough.

#### FAMILY AMIIDÆ (DOG-FISH.)

##### DOG-FISH (*Amia calva*, Linn.).

Young dog-fish were not often seen in the pools outside the levee, but inside they were everywhere common. They measured from six to eight inches in length. In Bear Creek they were especially abundant, sometimes sporting at the surface in great numbers. Adults were also taken inside the levee. They certainly spawn on flooded bottom-lands in early spring; and I can account for their almost total absence from the temporary pools only by supposing that the young follow the adults into the deeper waters as the bottom-lands become exposed. Young a few inches in length are caught by the hundred at times for trot line bait, their desirable quality for this purpose being an extreme hardness when on the hook.

Localities: Ballard Slough, Harkness Slough, Bear Creek, Goose Lake, Dead Man's Slough, Moss Lake, Willow Slough, Long Lake, Broad Lake.

#### FAMILY LEPIDOSTEIDÆ. (GARS.)

##### SHORT-NOSED GAR (*Lepidosteus platystomus*, Raf.).

Young examples from 8 to 12 inches long were very common in some of the lakes and sloughs, and were seen frequently lurking about barges and fish boats in the bay. No large examples were seen. They are quite sportive at times, and keep up a constant splashing of the water as a skiff moves among them. Hundreds were seen at the south end of Long Lake. They were lying just beneath the surface, fanning the water with the fins sufficiently to keep the body stationary, and when approached would suddenly lash the tail out of water and disappear. The young of this gar averaged considerably larger than those of the other species and were more uniform in size. Eighteen examples taken at random from different situations average 9.94 inches in length from tip of snout to tip of caudal fin. With two exceptions all those seen had lost the caudal filament, and also, to a great extent, the black blotches of the very young. Those which possessed the filament were two of the three smallest examples taken, and measured respectively 8 and 8.50 inches in length. The largest examples seen measured 12.50 inches. If these young are from the eggs spawned this season, and I believe they are, they indicate a more rapid growth, or an earlier spawning time for this species than for *L. ossesus*.

Localities: Harkness Slough, Goose Lake, Dead Man's Slough, Claus Lake, Quincy Bay, mouth of Cedar Creek, Wood Slough.

LONG-NOSED GAR (*Lepidosteus osseus*, Linn.).

The young were more abundant and more generally distributed than those of the preceding species. Thirty-eight examples give an average length of 8.10 inches. The smallest seen measured 6 inches in length, and the largest 12.25 inches. This last was the only one taken that had lost the caudal filament. The more uniform occurrence of this gar in bottom-land pools of all sorts and its greater abundance there, in addition to the smaller average size of the young as compared with those of *L. platystomus*, suggest a later spawning time. If the short-nosed gar spawns earlier, its young have more time to escape from the temporary pools, and we should expect to find fewer of them present in August. The matter needs further attention, however, as a difference in the relative abundance of adults in the river at this point, or some unknown difference in spawning habit, may have to do with some of the differences we have noted.

Localities: Harkness Slough, Dead Man's Slough, Moss Lake, Claus Lake, Willow Slough, Lily Lake, Long Lake, Broad Lake, Wood Slough.

FAMILY POLYODONTIDÆ. (SHOVEL-FISH.)

SHOVEL-FISH (*Polyodon spathula*, Walbaum).

This fish evidently does not spawn on the overflowed bottom-land. A single example about 14 inches long from Wood Slough was the only one taken. The adults are common in the Mississippi River, where they were occasionally seen leaping above the water.

FAMILY PETROMYZONTIDÆ. (LAMPREYS.)

LAMPREY EEL (*Petromyzon castaneus*, Gir.).

A lamprey taken by the men from Wood Slough was probably of this species. It was not secured for examination.

INVERTEBRATES.

Small animals, such as insects, crustaceans, and mollusks, were not as abundant as they commonly prove to be in permanent bodies of water in other localities. The absence of vegetation and the abundance of their enemies, the fishes, doubtless both had to do with this. The condition of these pools, as we have seen, is not favorable to a growth of vegetation, and the season was exceptionally unpropitious with respect to this. Those small creatures which did occur in the pools were thus deprived of the protection which a rank growth of vegetation affords, and could not be expected to maintain themselves where every square yard of bot-

tom must have been searched each day by hungry fishes. Notwithstanding this condition of things, certain species occurred in considerable numbers. Such as have the curious habit of remaining motionless in the presence of enemies, and such as burrow readily in mud, were very common in some of the pools. Consequently, when it is said that invertebrate animals were not common in these waters, it is meant that, as compared with permanent lakes elsewhere, there was not here a great diversity of forms, represented each by an abundance of individuals.

### MOLLUSCA. (SHELL FISH.)

The Mollusca of the locality belong to two groups,—those with a spiral shell of a single piece (Gastropoda), represented by the river snails, and those with a shell of two halves hinged together along the back (Lamellibranchiata), represented by the clams. Both groups furnish important items of fish-food, and both were well represented in the pools.

The snails were nearly all of small size, none of those seen having shells over 1.25 inches in length. These creatures are well suited to a residence in these ponds. Some of them at least can breathe either in water or in air, and hence can travel to other pools if the water dries up. A part of them never need to do this, for when the pools dry up, either in winter or summer, they resort to the mud and rubbish of the exposed bottom, close up their shells, and remain inactive till the water comes again. They are ordinarily seen creeping about over the bottom, where they feed upon the microscopic plants and animals or upon decaying organic matter in the form of a slimy coat on sticks and mud. If pressed with hunger, they have been known to resort to animal food, and in some instances devour their own kind. Some of them burrow into the mud at the bottom and become torpid in winter, but more active species may be seen moving over the bottom under the ice. The eggs are laid in spring attached in masses to sticks and dead leaves. The young hatch in two or three weeks, according to temperature.

### FAMILY LIMNÆIDÆ. (POND SNAILS.)

*Physa ancillaria*, Say.

(*Physa ancillaria*, Say, Jour. Acad. Nat. Sci. Phil., v, 124, 1825.)

Common in Long Lake and in Willow Slough. The largest examples taken measure about .50 inch in length.

*Physa heterostropha*, Say.

(*Limnea heterostropha*, Say, Am. ed. Nich. Enc., pl. i, f. 6, 1817, 1818, 1819, [as cited by Binney].)

This was probably the most common snail in the bottom-land pools. It is one of the thin-shelled species, with about four whorls, and differs from the preceding in having a longer and

more tapering spire and a narrower aperture. Otherwise they are much alike. This is one of the most active and widely distributed of the species taken. It is said sometimes to attack and devour insects as large as itself. The eggs are deposited, according to Say, in the month of May, but probably at intervals during the summer also. Egg masses, which in all probability were from this snail, were quite frequently found attached to the outside of shells, where they had been left by other individuals. The shells were frequently clothed with growths of stalked infusorians.

Localities: Harkness Slough, Quincy Bay, Willow Slough, Cedar Creek, Wood Slough.

*Helisoma trivolvis*, Say.

(*Planorbis trivolvis*, Say, Am. ed. Nich. Enc., pl. ii, f. 2. 1817, 1818, 1819.)

Common in many of the pools. Easily recognized by its depressed shell,—the whorls lying nearly in one plane so that they can be followed on two sides of the shell. Large examples taken measure five eighths of an inch in diameter.

Localities: Harkness Slough, Willow Slough, Lily Lake, Long Lake, Wood Slough.

#### FAMILY VALVATIDÆ.

*Valvata tricarinata*, Say.

(*Cyclostoma tricarinata*, Say, Jour. Acad. Nat. Sci. Phil., i. 13. 1818.)

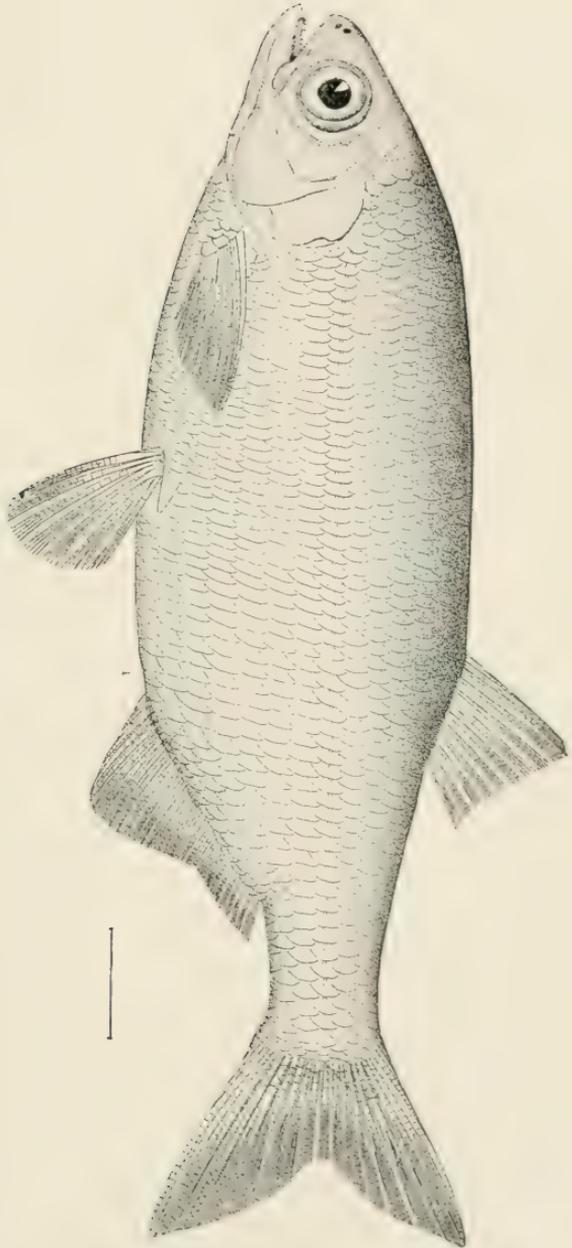
This small mollusk was common in many of the pools, but was not often brought out in the nets from pools in which it was very abundant. The shell is about .20 inch in diameter and may be recognized at once among our species by the strong ridges on the outside of the shell. It is somewhat depressed and the aperture is nearly circular in outline. The food is said to be vegetable matter. The eggs of related European species are deposited singly.

#### FAMILY VIVIPARIDÆ. (RIVER SNAILS.)

*Vivipara intertexta*, Say.

(*Paludina intertexta*, Say, New Harmony Disseminator, ii. 244. 1829.)

A common and uniformly distributed snail of rather large size. Shell rather stout, with about five strongly convex whorls. Adults dull reddish brown in color; young paler, with numerous fine revolving striae on the whorls. The largest example taken measures one inch in length, with the largest whorl .87 inch in diameter. Inside the aperture may usually be seen several large reddish brown revolving bands. The young are born alive.



**THE MOON-EYE.**

*Hiodon tergisus.*



Localities: Harkness Slough, Willow Slough, Lily Lake, Long Lake, Wood Slough.

*Vivipara subpurpurea*, Say.

(*Paludina subpurpurea*, New Harmony Disseminator, ii, 245, 1829.)

Found only in Lily Lake. It is much like the preceding, but has a slightly more tapering shell with the whorls flattened next the revolving suture.

*Campeloma decisum*, Say.

(*Limnaea decisiva*, Say, Am. ed. Nich. Enc. 1, 1817.)

This was the largest and most abundant river snail observed. It may be distinguished from the two preceding by its more slender form, more tapering spire, and less convex whorls. The general color is a uniform olive green, more or less stained towards the apex with brown. Inside the aperture pure bluish white. An example measures 1.37 inches in length, with the largest whorl .87 inch in diameter. The young are brought forth alive, and may be found in the ovaries in the fall preceding the spring during which they are set free. The adults go into the mud at the bottom of the ponds and streams to hibernate.

Localities: Harkness Slough, Quincy Bay, Willow Slough, Lily Lake, Broad Lake, Wood Slough.

*Lioplax subcarinata*, Say.

(*Limnaea subcarinata*, Say, Am. ed. Nich. Enc. 1, 1816.)

Frequent in Willow Slough. Similar to the preceding, but smaller and marked by an obtuse ridge extending along the middle of each whorl. One of the largest examples taken is just .50 inch in length. Like the other members of the family it is viviparous.

#### FAMILY RISSOIDÆ.

*Somatogyrus isogonus*, Say.

(*Melania isogona*, Say., New Harmony Disseminator, ii, 227, 1829.)

Numerous examples from Willow Slough, Aug. 15.

*Ammicola limosa*, Say.

(*Paludina limosa*, Say., Jour. Acad. Nat. Sci. Phil., i, 125, 1817.)

Dredged in 3-5 feet of water, Willow Slough, Aug. 15.

The clams are not very different from the river snails in their way of living. They may be frequently seen in shallow water with the front part of the body buried in the mud and the soft white "foot" thrust out of the shell. If watched intently under such circumstances they may be observed to move slowly forward,

leaving a groove in the mud behind them. In suitable places in quiet water they may become very abundant, forming what are known as clam beds. The food of some of our species consists entirely of microscopic plants and animals, such as algae and protozoans. Some of the unios are very probably scavengers, if we may decide from the condition of food in the stomachs of alcoholic specimens. In winter our species probably all go into the mud at the bottom of the streams and lakes, and there remain torpid until spring. The young are very different from the adults, and some of them were formerly supposed to be different animals,—a mistake due to their having been found adhering to aquatic animals of other kinds by means of a couple of strong hooks with which the valves of the shell are furnished. For a considerable time after leaving the egg they are retained in the gill-pouches of the parent clams.

Their interest, viewed either from the standpoint of the fish-culturist or from that of the scientist, is very great. As Prof. Forbes has shown in his papers on the food of fishes, they constitute a large item of the food of some of our best fishes. The great abundance in which they occur in the water of this region must give them a decided influence, as competitors for food of numerous other animals.

Of the two families represented in the Quincy collection, the first is represented by small species which commonly pass for the young of the true clams (Unionidæ) of the second family. That they are adult animals is, however, easily shown with a magnifying glass, since by its means they may be seen in many cases to contain living young of relatively large size. The shells of these bivalves are not commonly more than half an inch in length.

#### FAMILY CORBICULIDÆ.

*Sphærium solidulum*, Prime.

(*Cyclas solidula*, Prime, Proc. Bost. Soc. Nat. Hist., iv., 158, 1851.)

Common in shallow water in Willow Slough.

*Sphærium transversum*, Say.

(*Cyclas transversa*, Say, New Harmony Disseminator, ii, 346, 1829.)  
Frequent in several of the pools.

Localities: Willow Slough, Long Lake, Broad Lake, Wood Slough.

#### FAMILY UNIONIDÆ. (RIVER CLAMS.)

*Anodonta grandis*, Say.

(*A. grandis*, Say, New Harmony Disseminator, i, 341, 1840.)

This large, smooth, thin-shelled clam is common in most of the sloughs and lakes. It is probably the species which the channel

catfish manages to tear from its shell. The shells recently emptied were sometimes brought out by seines in great numbers. Young and adults were seen in the sloughs and lakes, one of the former measuring .62 in length. A valve of a large one picked up at the edge of Wood Slough measured 6.75 inches in length.

Localities: Lily Lake, Broad Lake, Wood Slough.

*Anodonta imbecilis*, Say.

(*A. imbecilis*, Say, New Harmony Disseminator, 1829.)

Young examples about an inch long were very common in Wood and Willow Sloughs. The adults were not seen.

Localities: Willow Slough, Lily Lake, Wood Slough.

*Unio alatus*, Say.

(*U. alatus*, Nich. Enc., Am, ed., iv, f. 2, 1816, 1818, 1819.)

Taken in Willow Slough and Lily Lake.

*Unio gracilis*, Barnes.

(*U. gracilis*, Barnes, Silliman's Jour. ii, 174, 1823.)

Taken in Willow Slough.

*Unio lævissimus*, Lea.

(*U. lævissimus*, Lea, Am. Phil. Soc. iii, pl. 13, f. 23; Obs. on Genus Unio, I.)

This is one of the large compressed species with angular expansions of the dorsal or hinge portion of the shell. The young are especially noticeable because of the large relative size of these angular processes, and were very common in portions of Wood and Willow Sloughs. In Lily Lake, also, they were numerous, but were not seen elsewhere.

*Unio parvus*, Barnes.

(*U. parvus*, Barnes, Silliman's Jour., vi, 174, 1823.)

Examples of this small clam 1.62 inches long were taken in Harkness Slough. It was not observed outside the levee.

## INSECTA.

Unfortunately, little has been done on aquatic insects by entomologists, beyond describing and naming the species, and a search through the writings of American and foreign authors does not yield much of the particular kind of knowledge of which practical fish work stands in need. The food habits and transformations especially have been greatly neglected. We can not therefore give such an account of the species collected as could be wished, but shall aim to add something to a knowledge of food habits in certain cases, and to point out, as clearly as we can in a brief paper, the forms whose acquaintance the economic ichthyologist needs to make.

The presence of three (and only three) pairs of jointed legs on the body just behind the head will serve to distinguish most insect species at any stage of existence from members of the next group (Crustacea). There are some exceptions to the rule among aquatic larvæ, such as the abundant young of mosquitoes, of *Chironomus* and *Corethra*; but larvæ such as these may be recognized as insects by the absence of jointed appendages on the divisions of the abdomen, crustaceans differing in bearing, generally, such appendages, on most of the divisions of the body.

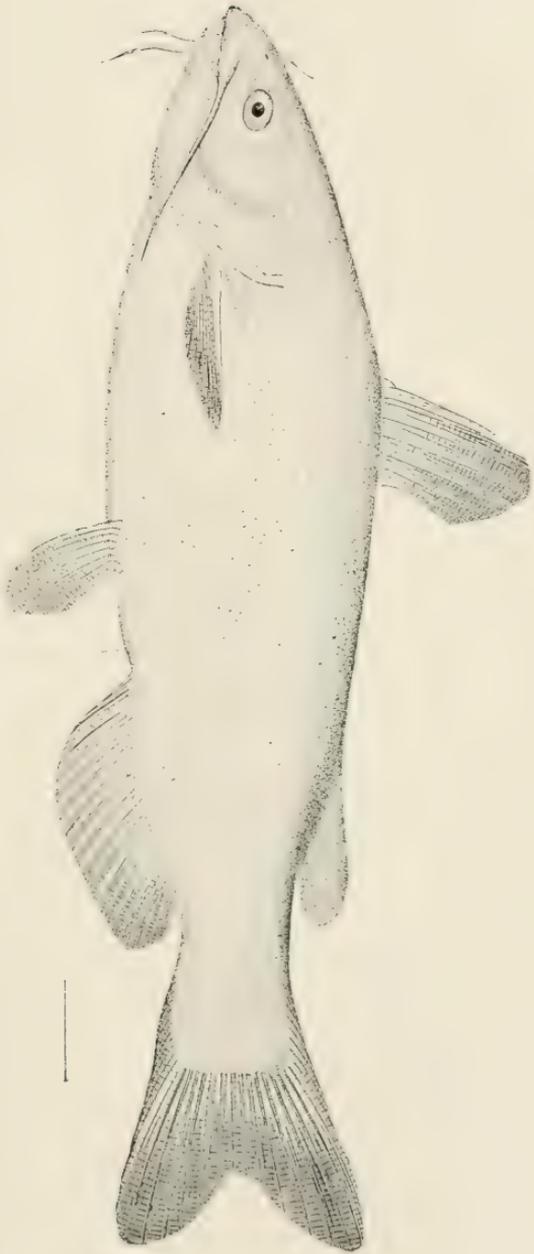
An exhaustive treatment of the group in its relations to fish culture would call for an account of every order of the class; for while such orders as Hymenoptera and Lepidoptera are very largely terrestrial, a glance at Prof. Forbes' most recent paper on the food of fishes will show that even bees, moths, and lepidopterous larvæ are devoured when chance brings them within reach. Freshets surprise and carry into the current of streams great numbers of terrestrial beetles and bugs which live in the earth, under dead leaves, and on vegetation, and these furnish at such times no inconsiderable part of the food of the smaller fishes.

The common aquatic insects belong to the following orders: Diptera (flies), Coleoptera (beetles), Trichoptera (caddis flies), Neuroptera (hellgrammites, etc.), Hemiptera (true bugs), Ephemeroidea (May flies), and Plecoptera and Odonata (dragon flies). Some of these live in the water throughout life; others in the larval and pupal stages; still others in the larval and mature stages; while a part are aquatic only in the larval condition. The food varies greatly with the species and may vary with different stages of the same insect. It consists of decaying organic matter, or of living plants or animals, while some forms constantly take a mixed aliment. It is not possible therefore with our present knowledge of the subject to calculate the effect of a sudden removal of the whole group from its relations to the other life of our waters; but considered only as fish food there can be no doubt that the effect would be decidedly to the detriment of fishes. Even those insects that prey upon the eggs and young of fishes are themselves in turn devoured by the adult fishes, and there seem to be very few indeed of the aquatic insects that are not eaten by fishes in greater or smaller numbers.

#### ORDER DIPTERA. (FLIES.)

Adults with two naked wings and a pair of knobbed balancers. Mouth parts elongated, horny or soft, fitted for taking liquid food. Prothorax not free. Larvæ aquatic or terrestrial, without jointed legs, with or without a developed head. Pupa commonly inactive. Examples: black flies, horse flies, gnats, and mosquitoes; larvæ known as wrigglers, maggots, and grubs.

Flies of at least nine families are aquatic in the larval stage: but the majority of the individuals commonly collected in our waters pertain to the families, Simuliidæ, Culicidæ, Chironomidæ, and Ta-



THE CHANNEL CATFISH.

*Ameiurus Albidus.*



banidæ. To the first-named family belong the notorious black fly and buffalo gnat,—the latter recently the subject of elaborate study by the United States Entomological Department. The larva of a very similar species (perhaps the same as one or the other) is very common in winter and early spring under rocks and wood in spring-fed streams in Illinois, but the flies are not known to damage stock in this region (Central Illinois). The larvæ of this family are eaten by trout, and occur in the stomachs of other smaller fishes. They were supposed at one time to entangle and destroy young fishes in a fine silk web which they spin over surfaces upon which they live. The pupæ live in leathery cases attached to the underside of stones and other objects in the water. The adult fly emerges under water in the spring of the year. Cedar Creek is exactly suited to these insects, and we should expect to find them there at the proper season.

The families Culicidæ and Chironomidæ contain the mosquitoes and gnats. The larvæ are small, elongated, more or less cylindrical worm-like creatures, with well-developed head and often complicated respiratory and tactile structures. The pupæ of the Culicidæ are active, but take no food. The larvæ occur in water at all times of the year, so that in all probability a succession of broods are reared each season. Some species, at least, are found in water when cold weather comes in the fall and doubtless remain in the larval condition till the next season. The eggs are placed in small masses on the surface of the water, where they float till the larvæ emerge. The food is believed, commonly, to be decaying organic matter, so that the larvæ have been thought to offset in a measure, as fish-food and as scavengers, the infirmities of the adults. They are extremely common, and may be captured at night in surface-nets literally by the pint. They swim by alternately flexing and extending the body, hence the name wrigglers.

The family Tabanidæ (the horse flies) contains a number of species with aquatic larvæ. The latter are large, with cylindrical body tapering towards the extremities and consisting of twelve segments. Color whitish, body-wall rather firm. Length as much as 1.50 inch. The eggs, which are elongated, smooth and shining, and of a dark color, are deposited in masses by the flies on rushes and other aquatic plants in the latter part of summer. The larvæ live during the winter in the water, lurking about under submerged wood or refuse. They are carnivorous, and with their strong mouth parts can inflict a severe bite. From their strength and activity they must destroy great numbers of the smaller aquatic animals. One kept by the late B. D. Walsh, fed upon a number of mollusks, pushing its way into the shells as far as it could, as it devoured the owners. Notwithstanding their aggressive ways, quantities of them are sometimes taken by the channel catfish (*Ictalurus punctatus*), and they are eaten, at least occasionally, by bull pout.

## FAMILY CULICIDÆ. (GNATS AND MOSQUITOES.)

*Culex* sp.

The adults of one or more mosquitoes were moderately common about the sloughs. The larvæ were not observed except in one of the more stagnant bodies of water, but were probably present in all. These insects pass the winter in the winged state, hid away in crannies. The larvæ swim head downward, and are the wrigglers of neglected cisterns and rain barrels. The food during aquatic life is probably decaying organic matter.

*Corethra* sp.

The larvæ of this genus are small, worm-like creatures, those from Quincy about .32 inch long and .028 inch in diameter. The body is cylindrical, tapering towards the posterior extremity. The head is provided with a perplexing variety of structures for the perception and management of food, including eyes, antennæ, biting jaws, and a number of other tactile and prehensile appendages. In front of the eyes the head resembles a truncated cone, and at the blunt front extremity is attached a pair of antennæ consisting each of a long basal segment, from the free extremity of which arise from three to five long, curved, and tapering rods. Near the posterior end of the body is a series of long, plumose filaments. The body is beautifully transparent in life, and within it may be seen, near each extremity, a pair of pigmented, kidney-shaped respiratory sacs.

The pupæ may be distinguished from those of the next genus by the presence on each side of the thorax of an odd, bladder-like respiratory structure, the two resembling a pair of ears. At the posterior end of the body is a pair of large fan-shaped fins, by means of which the pupæ swim freely in the water. The adults are small, weak, obscurely-colored gnats, which are not often observed. Two species of *Corethra* are recorded from this country.

Our larvæ resemble those of the European *Corethra plumicornis*, but differ apparently in some details of form,—as in the shape of the eyes, and of certain leaf-like tactile appendages in front of the mouth.

The eggs are laid enclosed in a gelatinous material, arranged spirally in a single series in disk-shaped masses, and float at the surface of the water till the young larvæ emerge. This occurs about a week after the eggs are laid, but probably the time varies greatly with the temperature.

## FAMILY CHIRONOMIDÆ. (GNATS.)

The familiar aquatic larvæ of this family belong to the genus *Chironomus*. Probably no other one genus of insects constitutes as important an item in the food of as large a number of fishes.

They may be recognized by their uniformly cylindrical bodies, small heads, enclosed in an opaque crust, and with a bilobed foot-like process bearing a dense brush of curved bristly hairs extending forward beneath it. At the posterior end of the body is a pair of false feet, also characteristic, each bearing a circle of retractile hooks. The head is smaller relatively than that of the larva of *Corethra*, but under the microscope the parts appear almost as complicated. The structures present, however, are mainly in the nature of biting organs, the parts having to do with perception being here poorly developed. Thus the jaws are well developed, the edges of the mouth-opening are furnished with numerous teeth and hooks, and the labium is a broad plate with strongly toothed edge, while, on the other hand the eyes and antennæ are very small. All this corresponds with what is known of the food of the larvæ. Their digestive tube is often filled with a brown granular material, consisting, as nearly as can be made out with the microscope, of decomposed organic matter, containing great numbers of bacteria and a good many empty frustules of diatoms. In one example was found the fragments of an insect. The organs for mastication, complicated as they are, would hardly be equal to the complete obliteration of the cell-structure of plants and animals, were these the aliment upon which the larvæ depended; and I believe that the material in the alimentary canals examined was dead when taken. The diatoms were not more frequent than they would be if taken in the slimy coating which collects on submerged objects. The insect fragments, which were of rather large size, bore evidence of having formed a rejected skin; while the abundance of bacteria among the alimentary contents points also in the same direction.

The larvæ are often of a blood-red color. They swim by a wriggling movement when in open water, but commonly live at the bottom, under stones and rubbish, where they construct galleries of agglutinated sand in which numbers live together. They may be found in water at all seasons of the year, even under the ice in winter. Quite a number of species are represented by the larvæ taken at Quincy, and some of the forms described below may represent several related species instead of one.

The pupæ differ from those of *Corethra* in having cottony tufts or antler-shaped fleshy respiratory appendages on each side of the thorax; but some apparently lack these structures. Those with the cottony tufts were common in the galleries under rocks. The ones with antler-shaped respiratory structures were taken at the surface in the bay, and may prove to be free-swimming. Several of these latter had the posterior part of the body enclosed in the larval skin.

The winged adults were emerging at the surface of the bay August 8. Those captured, nearly all females, were brought in by the surface-net, and are probably among the smallest of the genus, being only about .08 inch long. Color, pale yellow, with three

large, brown, longitudinal spots on the thorax, the middle one placed before the others, and continued behind by a very narrow median brown line. Segments of abdomen brown centrally above; pale at the margins and below. Antennæ, legs, and balancers whitish. Wings unmarked. One male taken is more distinctly marked, and shows some dusky on the legs and ventral side of the thorax, while the plumose antennæ are decidedly blackish.

*Chironomus, larva (1).*

Large examples of this larva, average about .44 inch in length. Head yellowish brown. Eye-specks two. Labium with strongly arched anterior edge cut into about six black teeth on each side, with a median tricuspid tooth. Posterior segments with three pairs of fleshy (respiratory?) appendages; the first pair short and club-shaped, attached at the posterior edge of antepenultimate segment, the second and third pairs long and contorted, attached the one to the middle and the other to the posterior edge of the penultimate segment. The four anal papillæ rather slender, enlarging a trifle distally.

Pupæ constantly found in sand galleries with this larva have a pair of strong frontal hooks and are provided with cottony respiratory tufts on the thorax. Length about .32 inch.

These larvæ and pupæ were taken in numbers under rocks, a short distance within the mouth of Cedar Creek. Young short-nosed gars (*L. platystomus*) had invaded the creek from the bay, and were busily probing the crannies and feeding on the insects. One hundred and eighty-three larvæ and forty-two pupæ were counted in the stomach of a single gar about nine inches long.

*Chironomus, larva (2).*

About equal to (1) in size. Head pale brown, under side black. Two eye-specks. Labium with four teeth on each side; median tooth shorter than the two next it. Hairs of anterior pediform appendage rusty. A single pair of small club-shaped (respiratory?) appendages at posterior edge of the penultimate segment. Anal papillæ conspicuously enlarged distally. Less common than (1), but more widely distributed.

Localities: Willow Slough, Cedar Creek, Broad Lake, Wood Slough.

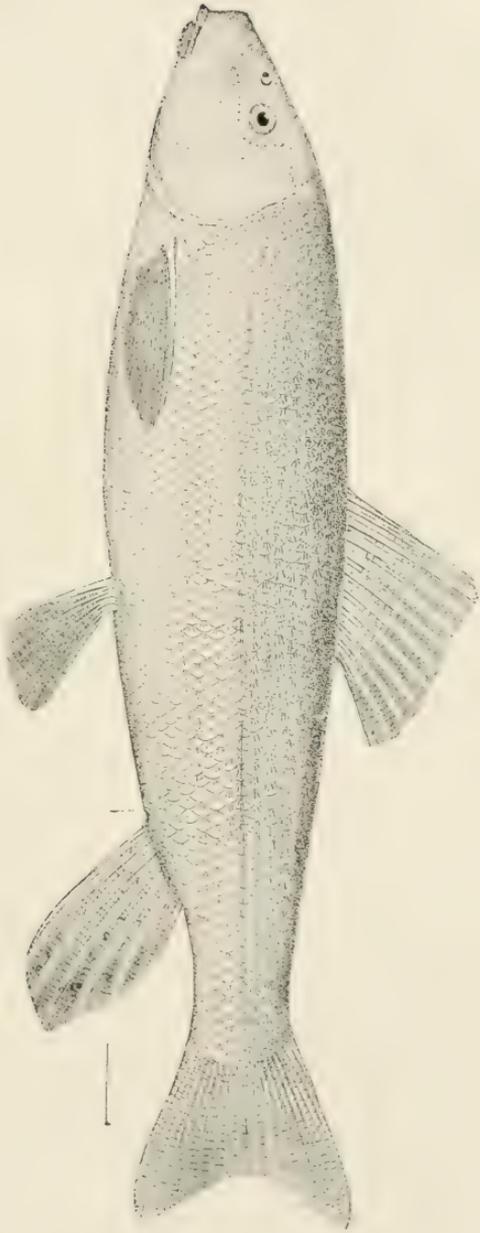
*Chironomus, larva (3).*

Small; the largest of two examples taken, only .24 inch long. A single eye-speck. Posterior segments without fleshy respiratory appendages. Anal papillæ apparently jointed.

One example each from Willow Slough and Cedar Creek.

*Chironomus, larva (4).*

A single very large larva, 1.38 inch long, from Ballard Slough, seems to differ from all the preceding. Head black beneath; eye-specks two. Labium with a large truncate median tooth, with



**COMMON STUCKER.**

*Catostomus lutes.*



a small tooth each side of it; outside the latter, two other large truncate teeth,—about four teeth, large and small, on each side. Posterior segments without fleshy respiratory appendages. Anal papillæ not jointed.

*Chironomus, larva* (5).

A very small pupa (.12 inch long) taken August 7 within the mouth of Cedar Creek still retained its larva skin, the labium of which differs from that of all the preceding larvæ in lacking the median tooth. Its condition would not permit of more extended comparison with the others, and it may prove the same as (3).

*Ceratopogon, larva.*

This is an extremely slender, transparent larva, resembling a vinegar eel, with eight long hairs radiating from the posterior body segment. It has been noted by Professor Forbes in the stomachs of fishes.

Common among algæ in Lily Lake, August 15.

ORDER COLEOPTERA. (BEETLES.)

Adults with four wings, the first pair hard and stiff, covering the hind pair when at rest; not used for flight; hind wings folded both longitudinally and transversely. Mouth parts fitted for biting. Prothorax free. Pupa inactive. Larva aquatic or terrestrial, commonly with three pairs of jointed legs (wanting in certain wood-boring and plant-mining larvæ), with a well-developed head, and biting mouth-parts. Examples: weevils, wire-worms, potato beetles, etc.

The aquatic members of this order of insects frequently have some or all of their limbs flattened and fringed to fit them for rapid locomotion in the water. Others show little in their structure that is adaptive to aquatic life, and simply creep about under water or cling to submerged vegetation much as a terrestrial beetle might. They are all, when adult, obliged to come to the surface for air, which they take and hold in bubbles by means of antennæ, wing-covers, or legs. Some of the larvæ also come to the surface for air, but others are provided with special respiratory structures by means of which they are enabled to get oxygen from water. Only the larvæ and adult beetles are aquatic. The larva quits the water when ready to become a pupa, and commonly burrows into the neighboring banks, where it excavates a small chamber in which it pupates. The adult on emerging returns at once to the water.

Many beetles in both larval and adult stages are very destructive to small aquatic animals of other kinds, and even attack fishes of considerable size. Tadpoles many times larger than these insects, are often devoured. Some eat only the dead of other insects, while still others feed largely on vegetation.

The families containing aquatic species are Amphizoidæ, Halipidæ, Dytiscidæ, Gyrinidæ, Hydrophilidæ, Parnidæ and Dascylidæ. The great majority of individuals and species commonly taken in water pertain to the Haliplidæ, Dytiscidæ, Gyrinidæ, and Hydrophilidæ. Several other families may appropriately be considered in connection with aquatic insects because of their constant abundance in the moist earth along water and on sub-aquatic vegetation. These beetles are unquestionably an important source of food to the carnivorous aquatic animals, and themselves doubtless attack and devour their aquatic neighbors when chance brings these latter ashore.

#### FAMILY CARABIDÆ. (PREDACEOUS GROUND BEETLES.)

A few species of *Bembidium* and *Elaphrus* were generally to be found on sunny days at the edges of sloughs, running over the mud. Under the logs in the neighborhood were the usual carabids of such situations—*Galerita*, *Chlænium*, and *Pterostichus*—but they were by no means common. The seining operations sometimes revealed the presence of certain burrowing species such as *Omophron americanum*, in the moist mud of the shores; and in the latter part of August a sudden rise in the water surprised numerous examples of *Clivina* and *Bembidium*, which were noted floating on the surface at the mercy of predaceous aquatic animals.

#### FAMILY HALIPLIDÆ.

These are small water beetles less than a quarter of an inch long, and commonly to be distinguished at sight from members of the following three families by the slender legs, which are not suited to rapid locomotion in the water, and by the projecting head,—the latter being in most other aquatic beetles, widened, and immersed in the thorax. The antennæ are made up of ten segments, and are inserted in the front. The larvæ are odd-looking creatures with strong spines or long-jointed respiratory appendages on the segments, the 9th (last) segment being produced and divided. Tarsi with a single claw. The larvæ of our two genera may be recognized by the following characters:

*Haliplus*.—Spiracles present, no branchial filaments. Maxillary palpi three-jointed. Clypeus truncate.

*Cnemidotus*.—No spiracles, branchial filaments long and jointed. Maxillary palpi two-jointed. Clypeus notched.

*Cnemidotus 12-punctatus*, Say.

(*Haliplus 12-punctatus*, Say. Trans. Am. Philos. Soc., N. Ser., ii. 106, 1825.)

The beetles were moderately common in Willow Slough, where they were brought out by the dredge and dip net. Females taken August 15 contained ova with advanced embryos.

## FAMILY DYTISCIDÆ. (PREDACEOUS WATER BEETLES.)

Body and legs of the adult beetle generally flattened, suited to rapid locomotion in the water; antennæ 11-jointed, thread-like, inserted behind the mandibles, under the front. The larvæ of these beetles are known as water-tigers from their rapacious habits. They have smooth bodies and long sickle-shaped jaws. In addition to these characters may be mentioned, as distinguishing these larvæ, the laterally placed antennæ, the presence of two claws on the tarsus, and the apparent absence of the 9th segment of the abdomen.

Both adults and young lead a predatory life, attacking and devouring whatever they can master. They do not hesitate to attack animals many times larger than themselves and are very destructive in fish ponds to young fishes. They are in their turn eaten by the larger fishes. They live, in some cases, several years. In the fall some of the beetles go into the mud to hibernate; others may be seen actively swimming about in midwinter; and a few leave the water to hibernate under rubbish. The eggs are laid at intervals and are scattered. Some, at least, of the larvæ become pupæ in the fall, and emerge as adult beetles the following spring.

*Laccophilus maculosus*, Germ.

(Germar, Ins. Spec. Nov., p. 30 (as cited by G. R. Crotch); Say, Compl. Writ., ii, 514.)

From Cedar Creek, Aug. 8. Apparently not common.

*Laccophilus fasciatus*, Aubé.

(Aubé, Species Général des Coléopètes, vi, 423, 1838; Crotch, Trans. Am. Ent. Soc. iv, 400, 1872-73.)

This small beetle, generally common in our ponds and lakes, was seen only in Cedar Creek.

*Bidessus lacustris*, Say.

(*Hydroporus lacustris*, Say, Trans. Am. Philos. Soc., N. Ser., ii, 103, 1825; Compl. Writ. ii, 517.)

A minute species taken in Willow Slough and Cedar Creek.

*Hydroporus aulicus*, Aubé.

(Aubé, Species Général des Coléoptères, vi, 572, 1838; Crotch, Trans. Am. Ent. Soc., iv, 396, 1872-73.)

A handsome beetle about .16 inches long, with bright yellowish brown head and thorax, and with band of this color on the elytra.

Not rare in Wood Slough.

*Hydroporus vittatipennis*, G. & H.

(*H. lineatus*, LeConte, Proc. Acad. Nat. Sci. Phil., vii, 296, 1885.)

A small beetle about half as long as the preceding, with wing covers finely striped longitudinally with black.

Common in Willow Slough.

*Hydroporus consimilis*, Lec.

(LeConte., Agassiz's "Lake Superior," 214, 1850.)

Very abundant in crannies of decaying and submerged wood in Willow Slough.

*Hydroporus hybridus*, Aubé.

(Aubé, Species Général des Hydrocanthares et Gyriniens, 573, 1838.)

Common in Long Lake Aug. 9. Also found in Broad Lake and Willow Slough.

*Coptotomus interrogatus*, Fabr.

(*Dytiscus interrogatus*, Fabr., Systema Eleutheratorum, i, 267, 1801; Crotch, Trans. Am. Ent. Soc. iv, 413, 1872-73.)

Very abundant in Willow Slough and common in Long Lake and Cedar Creek.

*Acilius*, larva.

This larva is a trifle more than an inch long (1.12 inch), with a fusiform body terminating behind in a pair of short naked caudal stylets. It agrees very closely with the account of a European species (*Acilius sulcatus*) given by Schiödte. The head is rather small, with two contiguous brownish black spots in the front, and a median spot of this color midway between these and the posterior margin. Sides of head dusky. Segments of thorax and abdomen pale olive above, the scutes of the abdominal segments narrowly edged with black, under parts and legs chiefly white. It differs from the European species in the form of the ligula, which is produced, and furnished at its tip with two strong setæ.

From Cedar Creek, Aug. 8.

*Thermonectes basilaris*, Harr.

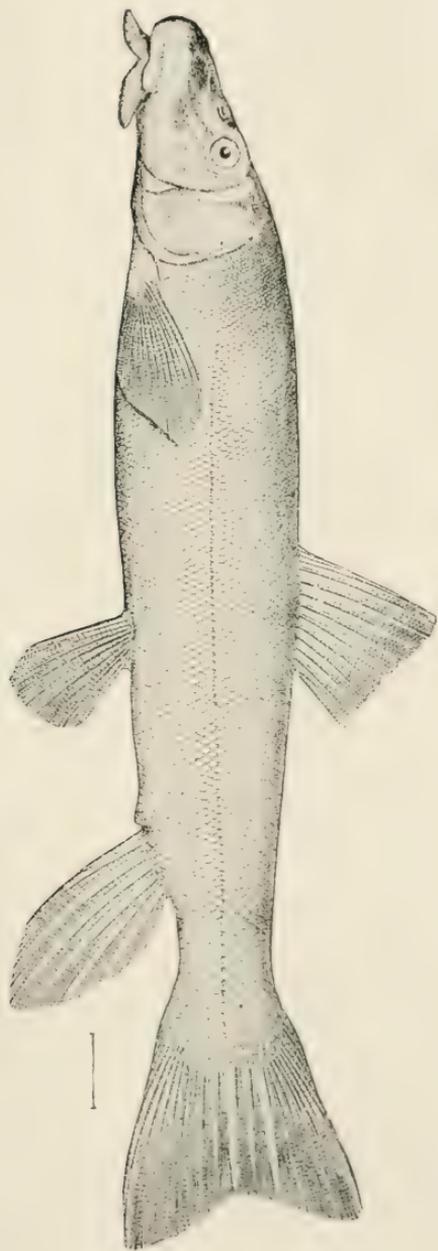
(Harris, N. E. Farmer (as cited by Crotch); Crotch, Trans. Am. Ent. Soc., iv, 402, 1872-73.)

About .44 inch long, general color black, with front, sides of thorax, and elytra yellowish brown. A line of this color also across the middle of the thorax. This was the largest beetle of its family taken at Quincy. It was captured in the same locality as the larva preceding, and may prove to be the adult, since the genera *Acilius* and *Thermonectes* are closely allied.

Locality: Cedar Creek.

## FAMILY GYRINIDÆ. (WHIRLIGIG BEETLES.)

These are the shining black beetles so often seen in large numbers circling about on the surface of the water. The three American genera all have representatives in Illinois. The beetles may be recognized by their flattened bodies, short, stout antennæ,





double eyes (the margin of the head being continued across them), elongated fore legs and short, flattened middle and hind legs. They secrete a milky fluid, which probably is offensive to fishes, since notwithstanding the great numbers in which they occur, they are very rarely eaten by other animals. The eggs are placed in parallel rows on the leaves of plants in the water. The larvae of European species are fully grown at the beginning of August, and creep up rushes and spin upon these a papery cocoon. The adult beetle emerges from this in about a month and returns to the water, where it hibernates in the mud. In some cases the cocoon is placed at some distance from the water, under the bark of trees. The beetles are said to feed on dead insects. The larvae may be known by their long slender bodies, the nine abdominal segments of which are furnished at each side with long fringed respiratory appendages. Tarsi with two claws. Posterior end of body with four curved hooks.

*Gyrinus analis*, Say.

(Say, Trans. Am. Philos. Soc., ii, 108, 1825; Compl. Writ., ii, 520, 562.)

A small *Gyrinus* which I presume to be this species was seen frequently on the pools in immense swarms, often with a few specimens of the larger *Dineutes* among them. When they were dipped up and carried ashore they turned and began making their way back to the water with surprising unanimity. This evident knowledge of their whereabouts and ability to take care of themselves on land was quite in contrast with the behavior, under similar circumstances, of the equally common water bugs of the genus *Corisa*. The latter, when brought ashore by the nets, scattered in every direction, and few of them ultimately reached the water again. The food of those examined consisted entirely of fragments of insects, which, judging by the large number of hairs, scales, and fragments of legs, were from moths which had fallen upon the water. Other species of *Gyrinus* from other parts of the State have been found to contain similar matter, from which it seems probable that they depend upon food of this character.

*Dineutes assimilis*, Aubé.

(*Cyclinus assimilis* Kirby, Fauna Bor. Am. iv, 78, 1837; *Dineutes assimilis*, Lec., Proc. Acad. Nat. Sci. Phil., xx, 366, 1868.)

Two of three specimens examined contained fragments and scales of moths; and the third had eaten fragments of small predaceous land beetles, and an aquatic worm, *Lumbriculus*, or of some allied genus. The beetles are the common large whirligig beetles of ponds and lakes everywhere in the State. They were common in most of the pools at Quincy, and a few were noted sheltered among the branches of a partly submerged tree that had fallen into the swift current of the Mississippi River.

*Gyrinus*, larva.

A small larva about .25 inch long, from Wood Slough, agrees exactly with published accounts of larvæ of this genus. Only one example was taken, though doubtless they were common, judging by the abundance of adult beetles.

## FAMILY HYDROPHILIDÆ.

The beetles of this family bear a close general resemblance to the predaceous water beetles, from which they may be known by their clubbed antennæ. The legs, though generally somewhat flattened, are moved alternately in swimming, and are not as efficient for rapid locomotion as are those of the Dytiscidæ and Gyrinidæ. In the beetle state the food is largely decomposing vegetable matter. Occasionally the large species attack mollusks or amphibians. The larvæ are carnivorous, and, like those of the Dytiscidæ, do a good deal of damage in fish ponds. They have a single tarsal claw. The labrum is wanting. The 8th pair of spiracles is terminal, and the posterior end of the body is devoid of hooks. Some have fringed appendages along the abdomen like those of *Gyrinus* larvæ. The eggs are placed by the female in a silken case, sometimes attached to leaves or sticks which keep it at the surface, in other cases carried about by the beetle. A single case may enclose a hundred or more eggs. After hatching, the young larvæ remain for some time in the case, where they are protected from their enemies and insured a supply of air by being kept at the surface. A European species, very similar to our large black *Hydrophilus*, becomes fully grown as a larva in one hundred days, and leaves the water to burrow in the earth for pupation. The beetles hibernate in the mud and under rubbish.

*Hygrochus squamier*, Lec.

(LeConte, Proc. Acad. Nat. Sci. Phil., vii, 359, 1855.)

Found in Willow Slough August 15. Not common.

*Hydrophilus nimbatus*, Say.

(Say, Jour. Acad. Nat. Sci. Phil., 203, 1823; Compl. Writ. ii, 130.)

This is a shining black species, with yellow margin to the thorax and wing covers. It is evidently a scavenger. The digestive tube is long and coiled like that of a tadpole. It is commonly filled with a brown matter, largely granular and unrecognizable, among which are numerous diatoms, desmids, and fragments of filamentous algæ.

Moderately common in Willow Slough and Cedar Creek.

*Beorsus pantherinus*, Lec.

(LeConte, Proc. Acad. Nat. Sci. Phil., vii, 364, 1855; Horn, Proc. Am. Philos. Soc., 1873, 122.)

A common and widely distributed species. The long intestine is filled with matter like that found in *Hydrophilus nimbatus*,—probably largely decaying vegetable matter. Mixed with the granular matter are many diatoms and bits of filamentous algae.

Localities: Harkness Slough, Willow Slough, Cedar Creek, Long Lake, Wood Slough.

*Berosus striatus*, Say.

(*Hydrophilus striatus*, Say, Jour. Acad. Nat. Sci. Phil., N. Ser., v, 188, 1825; Compl. Writ., ii, 292.)

Food like that of the preceding species, the only recognizable objects in the alimentary canals being in this cases diatoms.

The species is abundant in Cedar Creek, and was found also in Ballard Slough.

*Hydrophilidæ*, larva (1).

A small larva with depressed and rather stout body, with a median brown band on the head and a pair of obscure dusky longitudinal stripes on the abdomen above. Pale below. Sides of thorax and abdomen tuberculate. The mandibles are unlike any we have seen. They are rather long, sickle-shaped, and bear at about the middle of their inner edge a strong tooth with bicuspid apex, minute denticles on its anterior edge, and one or two small teeth at its base. The largest example taken is a trifle more than a half inch long.

Locality, Cedar Creek.

*Hydrophilidæ*, larva (2).

A small larva about .25 inch long, common in Cedar Creek, is evidently the young of one of the above species of *Berosus*. The body is widest at the middle and tapers pretty uniformly to the extremities. Head small; ocelli superior; clypeus denticulate. Basal segment of maxillæ unusually long and strong. Segments of body coarsely wrinkled, the seven anterior divisions of the abdomen each with a pair of long naked respiratory filaments. Terminal segment nipple-shaped; no caudal appendages. Young examples are transparent in life, but grow more opaque when older.

FAMILY STAPHYLINIDÆ. (ROVE BEETLES.)

Small species of this family of beetles were always common in the mud and sand at the edges of sloughs, and many were noticed floating and struggling on the surface in the latter part of August, after the water had risen suddenly.

FAMILY PARNIDÆ.

These are small beetles with tarsi of five segments, of which the last one is as long as all the others together and carries two very long simple claws. The body is frequently elongated and subcylindrical.

not at all depressed, sometimes pubescent but in other cases naked. They creep about or burrow in the mud under water. From the structure of the jaws they have been supposed to be carnivorous. The larvæ are greatly flattened and live under rocks, sometimes in rapid currents.

*Stenelmis vittipennis*, Zimmermann.

(Trans. Am. Ent. Soc. ii, 259, 1869; Horn, *ibid.*, iii. 40, 1870-71.)

Taken in Willow and Wood Sloughs.

*Macronychus glabratus*, Say.

(Say, Jour. Acad. Nat. Sci. Phil., N. Ser., v, 187, 1827; Compl. Writ. ii, 292.)

Wood Slough, Aug. 4. Not common.

#### FAMILY HETERO CERIDÆ.

*Heterocerus mollinus*, Kies.

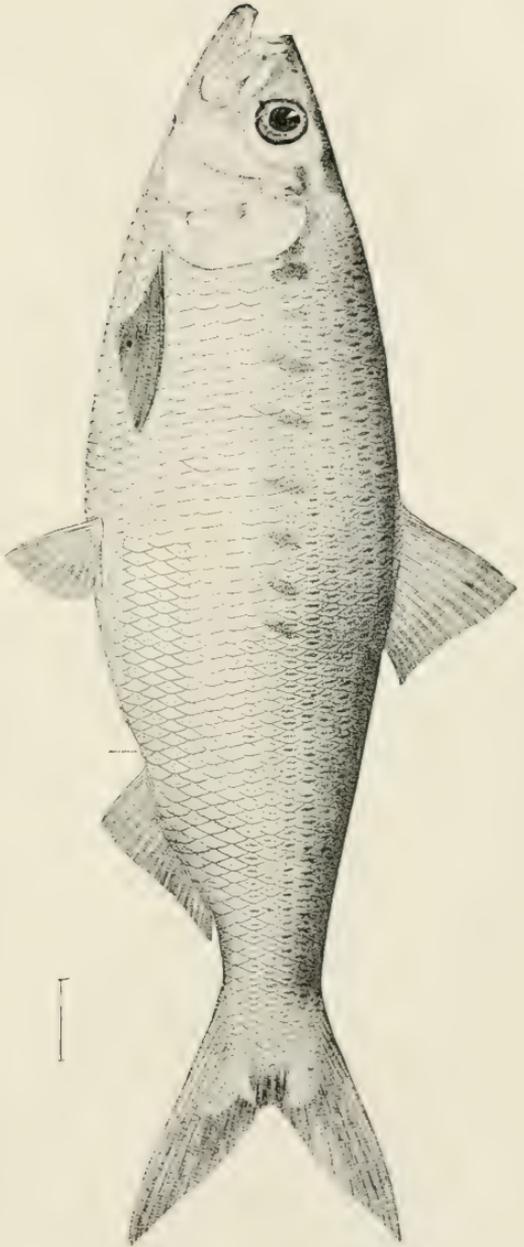
This is a small brown pubescent beetle about .20 inch long, with a few irregular yellow marks on the wing covers.

It occurred in very great numbers in the earth at the edges of the more isolated sloughs, in burrows resembling miniature mole hills. When the seines brought the water over the burrows the beetles at once appeared and took flight. The larvæ also were present in abundance, and were found at times exposed on the surface of the water.

My attention was especially drawn to the curious little mud cases which the larvæ construct when ready to pupate, and of which I have seen no published description. The cases are always made in the moist mud at the immediate edge of the water and are carefully detached from the adjacent soil, so that each stands in a little hollow. From one side arises a closed chimney often equal in height to the basal portion of the case. The beetles were emerging from the cases on the 11th of August, always making their way out by creeping up the chimney and breaking through its extremity. The beetles were seen along most of the sloughs and lakes. The mud cases were noted as especially abundant along Long and Broad Lakes and Harkness Slough. At the edge of the first-named lake eighteen of the cases were counted on an area about one foot square. The food of both adults and larvæ consists of brown granular matter containing numerous diatoms, and of small cells, isolated and in chaplets, of what Prof. Burrill thinks is a *Conferva*, one of the algae which grows on moist surfaces.

#### ORDER TRICHOPTERA. (CASE FLIES.)

Adults with four membranous wings, the hind ones of which are the broader and are often folded longitudinally when at rest. Mandibles rudimentary. Tarsi of five articles. Prothorax a small



THE HICKORY SHAD.

*Clupea mediocris.*



ring. Larvæ with three pairs of jointed legs, and a distinct head with biting mouth-parts. Pupa inactive, but able to creep out of the water, or to swim rapidly to the surface when ready to yield the winged adult.

Larvæ of this group usually construct movable or fixed cases with openings at the ends. These cases are sometimes of peculiar shape, and oftener attract attention than the winged insects. They may be cylindrical, cone shaped, spiral, like a flattened ink bottle, etc., and generally have bits of vegetation, or sand, fastened over the outer surface. The adults are small, obscurely-colored insects, which usually take no food, and after depositing their eggs soon die. The eggs, enclosed in a gelatinous material, are placed on aquatic plants, the females, it is thought, sometimes descending into the water for this purpose. The larvæ feed on vegetable matter, such as dead leaves, stems, and wood, but sometimes devour also small insects and crustaceans. Those I have examined are abundant in small streams in Central Illinois, and make large cylindrical cases, to the outside of which are fastened longitudinally, numerous small sticks. The alimentary canal of this larva has always been found filled with decayed woody vegetable matter. The pupæ are formed in the cases which are, if movable, fastened down by the larva previous to pupation.

#### *Trichoptera*, larva (1).

The common case-fly larva at Quincy was a somewhat unusual one as to habits. Most of our species creep slowly about on vegetation or on the bottom. This one is a free-swimming larva and one or two were always taken when the surface net was drawn over the deepest water of Quincy Bay. It was captured on one occasion in the swift current of the river in a net drawn after the steamer "Hannibal Eagle". The case is trumpet-shaped, gradually decreasing in caliber from the larger end (which has a diameter of about .07 inch) to the smaller extremity, where the diameter is about .03 inch. The outside of the case has scattered bits of dead vegetable matter fastened over it, and numerous minute particles of sand. Fastened to one side, sometimes to two sides, is a long rootlet or twig of a weed that may project at one or both extremities some distance beyond the case. The larva is plain white, with the head mottled with yellow and deep brown. Along the sides are attached fleshy respiratory filaments. The usual tubercles and hooks for adhering to the case are present. It swims by striking the water with the very long and heavily fringed hind legs, these being projected beyond the large opening for this purpose.

#### *Trichoptera*, larva (2).

A second larva lives in a short, conical case about .25 inch long, with a diameter of .125 inch at the larger end and of .06 inch at the smaller end. The outer surface is thickly covered with bits of dead vegetation, but lacks the long pieces which seem never to be absent from the other cases. The larva also is short and stout,

but is not otherwise very different from (1). The posterior legs are not so long and slender relatively and the fringe is less perfect. This form was taken from the bottom in Willow Slough.

*Trichoptera*, pupa.

A pupa of some species of this group was taken in Willow Slough sealed up in its cylindrical case of dead vegetable materials. At the end towards which the head laid, a narrow slit had been left for the passage of water for respiration. Judging by the cast larval skin with this pupa, it cannot belong to either of the two larvæ described.

## ORDER NEUROPTERA. (HELLGRAMMITES AND LACE-WING FLIES.)

With four ample membranous wings with numerous longitudinal and cross veins. Mouth with strong biting mandibles. Labial palpi 3-jointed. Antennæ filiform. Prothorax large and square. Larvæ with jointed legs, and a large head bearing free mouth parts. Pupa inactive, with mandibles.

The order contains two families, the larvæ of which are very different in habit. The lace-wing flies are throughout life terrestrial, and are well known to gardeners and fruit-growers for the good they do by devouring plant-lice. The hellgrammites or crawlers are aquatic during the larva stage and feed upon other water insects, such as case-fly and May-fly larvæ. They are themselves to some extent used by sportsmen as bait in catching fishes, their tough skin rendering them easily disposed and retained on the hook. They are furnished with seven or eight pairs of respiratory filaments along the sides of the body for use in the water, and have, besides, breathing pores (spiracles) which they use when they leave the water to pupate in the earth. The tarsi have two claws. The eggs are deposited in large, whitish discoidal masses on the leaves of trees and on the sides of boats and barges.

*Corydalis cornutus*, Linn. (Hellgrammite.)

(Walsh and Riley, Am. Ent., i, 61, 1868.)

The larvæ and adult of this large insect often attract the attention of those who live on our rivers. The species is not often seen in the interior of the State. Along the Mississippi River it is very common, though its abundance is not commonly apparent excepting during the egg-laying season. In August the wood barges and boats in the bay were resorted to by the females, and the masses of eggs were left in numbers upon the timbers.

## ORDER HEMIPTERA. (TRUE BUGS.)

Wings four, the front ones often thickened at the base. Mouth parts suited to taking liquid food, long, slender, and commonly enclosed by a jointed beak formed of the modified labial palpi. Prothorax free. Larvæ and pupæ active, differing from adults only in size and in the absence of wings.

It is one of the most important groups of aquatic insects, both on account of the food its members furnish to fishes, and also because of the serious injuries which some bugs do to fish eggs and fry. The genera *Ranatra* and *Belostoma* are especially to be remembered as containing some of the worst insect enemies to fishes of which we know. Most of them begin a predatory life as soon as hatched from the egg, and continue it without cessation throughout their existence. The common food is larvæ of other insects, mollusks, and the like. The eggs are generally deposited on aquatic plants, sometimes enclosed in gelatinous matter, but in many cases quite naked. *Corisa* sometimes places its eggs on the shells of crayfishes. Eight families of the order have common representatives in the waters of the State. Of these, five are represented in the collection made at Quincy.

#### FAMILY HYDROBATIDÆ. (CRAZY BUGS.)

*Limnotrechus marginatus*, Say.

(*Gerris marginatus*, Say, Heteropterous Hemiptera, 1-31, 807.)

A small slender-bodied insect about .40 inch long, with long slender legs by means of which it pushes itself along on the surface of the water. The whole under surface of the body is covered with a silvery coating which repels the water and so aids the insect in its singular method of locomotion. The eggs are attached to aquatic plants, and the young pupæ resemble the grown insect except for the wings and increased size. In winter the adults are found under rubbish in the shallow water at the edges of streams. The species was common in a number of the sloughs and was noted especially in Harkness Slough, Willow Slough, and Long Lake.

*Stephania picta*, H. Sch.

(Uhler, Stand. Nat. Hist., ii, 270.)

A small brightly colored insect taken only in Wood Slough and Long Lake.

#### FAMILY VELIIDÆ.

*Mesovelis bisignata*, Uhler.

(Uhler, Stand. Nat. Hist., ii, 274.)

A small greenish yellow insect about .12 inch long, which is frequently found on the surface of water. Frequent at edges of Willow Slough Aug. 15.

#### FAMILY BELOSTOMATIDÆ.

*Benacus griseus*, Say.

This is one of the large, flat, predaceous bugs that sometimes become destructive to young fishes. It is reported by Mr. C. A. Hart, of this Laboratory, as common at the electric lights in

Quincy. It was not seen in the water, but this was doubtless due to some peculiarity in its habits. For some reason it is never brought out in the seines and dredges in parts of the State in which the numbers taken at electric lights show it to be very common. Our small species of this family (*Zaitlia fluminea*) often comes out in the seines by dozens.

FAMILY NEPIDÆ. (WATER SCORPIONS.)

*Ranatra 4-dentata*, Stal.

(Stal, Ofv. Vetensk.-Akad., Förhandl., 1861, 204; Uhler, Stand. Nat. Hist., ii, 255.)

A long, slender, brown bug with two long caudal stylets. Length about 1.48 inch. Legs long and slender, the front pair suited to grasping. It is very slow of motion and creeps about on the bottom or on plants, depending on its resemblance to a piece of dead vegetation for securing the animals upon which it preys, and for avoiding its enemies. It is said to puncture and destroy the eggs of fishes. Its own eggs are elongated and are provided with two long filaments at one end.

FAMILY NOTONECTIDÆ. (WATER BOATMEN.)

*Notonecta undulata*, Say.

(Heteropterous Hemiptera, 1831, 39; Compl. Writ. i, 368.)

A small strongly convex insect about .40 inch long, which swims back downward by oar-like movement of its elongated and flattened hind legs. Eyes red-brown. Color pearly white, and black. An active predaceous insect, capable of inflicting a severe sting with its beak when handled incautiously. The eggs, which are elongated, cylindrical, and white, are attached to aquatic plants. The young have been observed to emerge in May.

Taken in Quincy on Cedar Creek.

*Plea striola*, Fieber.

(Uhler, Stand. Nat. Hist., ii, 253.)

A minute, brown, hard-bodied species which is quite common in many streams in Illinois.

Taken only in Willow Slough. Not common.

FAMILY CORISIDÆ.

*Corisa signata*, Fieber.

(Abhandl. Kön. Bohm. Gesell. Wiss., 1852, 233.)

This small species was extremely abundant in the temporary pools, especially so in Wood Slough.

*Corisa alternata*, Say.

(Jour. Acad. Nat. Sci. Phil., N. Ser., iv, 329, 1825; Compl. Writ., ii, 251.)

This is the commonest Illinois *Corisa*. It was less abundant in some of the Quincy pools than the preceding, but was more widely distributed. Noted especially in Cedar Creek and Long Lake. The eggs are oval and have a small prominence at the free extremity. They are attached generally to plants.

## ORDER ORTHOPTERA. (CRICKETS AND GRASSHOPPERS.)

This is a strictly terrestrial group, and calls for mention here only because of the constant presence, on the banks of streams and pools, of species belonging to it, which doubtless have an effect as fish-food, and otherwise, on aquatic life. At Quincy, a small cricket (*Tridactylus apicalis*) occurred in myriads among weeds which were springing up from the mud at the edges of sloughs, and individuals were sometimes found upon the water.

## ORDER PLECOPTERA.

Wings four, membranous, net-veined, sometimes folded longitudinally when at rest. Antennæ long and setiform. Tarsi 3-jointed. Prothorax wide. Abdomen frequently with two long, jointed caudal stylets. Larvæ and pupæ like the adults excepting as to size and wings.

Small insects, which, as nymphs, live under rocks and boards, often in swift-flowing water. The pupa takes food, and after attaining its growth leaves the water and transforms to the winged adult. In a number of points they are allied to the grasshoppers.

*Plecoptera*, nymph.

A flat nymph found in Willow Slough. It is about .52 inch long and bears at the end of the abdomen two long, jointed appendages. The antennæ are long and slender, the mouth parts much like those of a grasshopper or cockroach. Head very wide, and with a pair of compound and three simple eyes. Three divisions of the thorax large, with expanded terga, and bearing at each side cottony respiratory tufts. Legs with strong femora and three-jointed tarsi.

They were not common at Quincy, probably because the waters do not furnish them suitable shelter.

## ORDER ODONATA. (DRAGON FLIES, SNAKE FEEDERS.)

With four large membranous, net-veined wings. Mouth provided with strong biting mandibles. Antennæ minute. With compound eyes. Prothorax very small. Tarsi of three articles. Abdomen with caudal appendages. The pupæ are active and aquatic. The

larvæ are distinguished from other aquatic insects by the possession of a large protractile lower lip furnished with movable jaws (palpi) at its extremity. Respiration in the larva and pupa is effected by means of several caudal leaf-like gills, or by a branchial apparatus in the walls of the hind part of the digestive tube. They are predaceous when adult, feeding upon gnats, mosquitoes, flies, etc., which they capture while flitting rapidly about. The larvæ and pupæ also have the reputation of préying upon other insects, and as a rule this will probably be found true; but an examination of several larvæ shows them to be in some cases largely vegetable feeders, and possibly scavengers, the alimentary canal containing numbers of desmids, diatoms, fragments of moulds, and a good deal of material (probably slime) gathered from the bottom for the small organisms and the organic matter contained in it. The eggs are dropped into the water as the females fly over it, or may be attached to submerged plants. Members of one genus are said to go beneath the surface and insert the eggs in the stems of plants. The young are common objects in the stomachs of fishes. The adults were not common about the pools in which the Fish Commission work was done. An occasional large species with clear wings was seen, and a small, slender-bodied form was noted as common about Lily, Long, and Broad Lakes. These were the only winged dragon flies seen. In the water, on the contrary, the immature stages of a number of species were common. These latter fall into four groups, which, for the purposes of this paper may be characterized as follows:

Antennæ filiform, of seven articles. Legs slender, not suited to digging. Abdomen long, cylindrical, terminating in three large, flat, leaf-shaped respiratory appendages. Includes numbers 2 and 3.....Agrionina.

Antennæ stout, of four articles, the distal one rudimentary. Legs stout, suited to digging; tarsi of two anterior legs of two articles; tarsi of posterior legs of three articles. Labium not cleft. Includes numbers 4, 5, and 6.....Gomphina.

Antennæ filiform, of six or seven articles. Legs slender; all the tarsi of three articles. Labium with a narrow median cleft. Labial palpi not expanded and spoon-shaped. Includes only numbers 7 and 8.....Æschnina.

Antennæ filiform, of seven articles. Legs slender. Labium not cleft. Labial palpi expanded and spoon-shaped, meeting along the middle line. Includes numbers 9-12.....Libellulina.

### 1. *Agrion ramburii*, Selys.

(Hagen, Syn. Neur. N. A., 1861, 76.)

A small dragon fly with narrow transparent wings and slender body, with several of the hind divisions of the abdomen blue. Possibly the adult of one of the two following.

Common on the vegetation about Lily, Long, and Broad Lakes.

2. *Agrionina*, nymph.

A larva about .72 inch long; common in Long Lake. Chiefly brownish black. A pale, transverse band between the eyes, and a ring of minute, pale dashes at the hind margin of each abdominal segment. Legs chiefly white, a dusky band near the tip of each femur. Caudal respiratory appendages marked with broad, dusky cross bands; with a small spine at the apex of each, and with basal portion of edges spinose.

3. *Agrionina*, nymph.

A short larva, less than .25 inch long, with banded legs and antennae, and a median dorsal pale line extending from head to end of abdomen. Possibly the young of the preceding, but I think not.

From Wood Slough, Aug. 6.

4. *Gomphus*, nymph.

The larger examples of these young from Quincy are 1.10 inches long. The abdomen is greatly depressed, but is quite uniformly, though slightly, convex above. Palpus of labium with inner edge toothed to the base, distal tooth not longer than the others. Front edge of labium without median tooth. The wing-pads do not quite reach the hind margin of the second abdominal segment. This agrees with Dr. Hagen's No. 12 in his "Monograph of the Early Stages of Odonata." Common.

Localities: Quincy Bay, Willow Slough, Lily Lake, Broad Lake, Long Lake.

5. *Gomphus pallidus*, Ramb., nymph.

Dr. Hagen gives as the important characters of the young of this species, the presence of a median tooth on the front edge of the labium, the presence of teeth along the whole inner edge of the labial palpus, a median dorsal spine on the hind edge of the 9th abdominal segment, and the presence of lateral spines on abdominal segments 7-9. It may be distinguished from the two species here noted by the presence along the middle of the abdomen, above, of an obtuse ridge. Very common in some of the sloughs, and of large size, several measuring 1.20 inches in length. All those taken in August were apparently about ready to yield the winged form. Young of this species were taken in Cedar Lake in October, 1882. From the two observations it seems probable that the adults emerge in the latter part of summer, and that the young hatching from their eggs hibernate in the mud.

From Harkness and Ballard Sloughs.

6. *Gomphus notatus*, Ramb., nymph.

These young are like the two preceding in general appearance, but lack the median tooth of the labium of number 4 and the dorsal ridge of number 5. They differ from both of the preced-

ing in having only about three blunt teeth on the inner edge of the labial palpi. The commonest *Gomphus* at Quincy. Of various sizes, some apparently ready to yield adults.

This is the *Gomphus fluvialis* of Mr. Walsh. Of the adult dragon fly, Mr. W. says that it flies constantly over water, and he thinks feeds exclusively on aquatic insects. It does not, as he supposed, breed exclusively in running water. Common.

Localities: Willow Slough, Lily Lake, Broad Lake, Wood Slough.

#### 7. *Anax junius*, Drury.

The adult is one of our largest and commonest dragon flies. Its general color is obscure green, with some blue and black markings. Wings clear, with a yellow wash. The young are to be distinguished from all others taken at Quincy by the characters given at the beginning of this group. The very young are marked with wide transverse alternating bands of black and white.

Taken only in Long Lake, although the adults were seen now and then about several of the sloughs.

#### 8. *Epicleschna heros*, (Fab.) Hagen.

Two small nymphs, the largest one about .72 inch long, were taken in Wood Slough August 6. They were found clinging to dead sticks, depending apparently on their dark obscure colors for immunity from enemies. They agree in the main with Mr. Cabot's description of the young of this species. The antennæ are of six articles, the distal one being longest. The labium is cleft, but lacks the tooth at each side. There are lateral spines on the abdominal segments 5-9, and most of the segments have a median dorsal ridge terminating in a tooth behind.

#### 9. *Libellulina*, nymph.

A stout-bodied, pale brown nymph with scattered specks and spots of brown. Legs annulate with brown. Segments 8 and 9 of the abdomen with large lateral spines: no dorsal hooks or tubercles. The digestives tubes of several examples contained a good many microscopic plants and animals, together with a brown granular matter which I think had been gathered from the bottom. Extremely common in the upper part of Cedar Creek: the only young of this group taken there.

#### 10. *Libellulina*, nymph.

With a general resemblance to number 8, but rougher, and the markings very obscure. A pair of tubercles between the eyes. A series of erect cultriform hooks on the middle of the abdomen, above. From the alimentary canal of one specimen a small mite was taken. Others examined did not contain food. Common and widely distributed.

Localities: Harkness Slough, Ballard Slough, Willow Slough, Lily Lake, Long Lake, Broad Lake.

11. *Libellulina*, nymph.

Much like 9, but with smoother body, and lacks the cephalic tubercles. A distinct dusky bar between the eyes. Legs annulate with dusky. Dorsal spines not cultriform, and not elevated behind. Not as common as the two preceding.

Localities: Lily Lake, Long Lake.

12. *Libellulina*, nymph.

Similar to number 9, and possibly the young of the same species. Tubercles of head relatively much larger. Dorsal spines tuberculiform, erect. Body more slender, nearly uniform blackish brown.

Two small examples from Willow Slough.

## ORDER EPHEMERIDÆ. (MAY FLIES).

Wings four (sometimes two), net-veined, the posterior pair much the smaller. Mouth parts rudimentary. Antennæ minute, bristle-form. Prothorax very small. With two or three long caudal appendages. Larvæ with branchiæ attached to the sides of the abdomen, in the larger and commoner species overlying the back. Pupa active.

The adults of certain species of this group are familiar to any one who has visited our rivers in July. They blacken the willows at the water's edge and cause the limbs to droop, in such quantities do they collect upon them. In the evening, at times, they mount into the air, and may be seen in countless numbers moving for hours in one direction as if bent on migration. They are excellent food for fishes, as is attested by the avidity with which many of our fishes eat them, and were used as bait by sportsmen in the days of Isaac Walton. The winged insect takes no food, and lives only for procreation, but may, in confinement, live a week or more. The eggs are dropped into the water or are placed upon plants, the flies descending into the water for this purpose. The larvæ (nymphs) devour earth and sand containing dead and living animal and vegetable matter.

*Hexagenia bilineata*, Say.

This is the common brown May fly of Illinois rivers and lakes. It occurs throughout the length of the State, and often in such multitudes as to have acquired the name "mormon fly". It is commonly very abundant in the middle of July. In August, at Quincy, it was rare.

*Hexagenia*, nymph.

An elongated, whitish creature, to be distinguished from most other aquatic insects by the presence of seven pairs of branchiæ, six of them plumose, attached along the sides of the abdomen and carried turned over the back. Jaws long and curved; front

with an obtuse tubercle. Compound eyes, round, black; legs strong, suited to digging; abdomen terminating in three plumose stylets. Length of largest example taken at Quincy 1.20 inches. The food consists of earth richly charged with dead organic matter and with unicellular plants and animals. Such protozoans as *Euglena* are quite common in it. A large part of the contents of the digestive tube is sand, which seems to be taken incidentally. This is, in all probability, the young of *H. bilineata*.

It was common in Broad Lake; but elsewhere it was not often taken.

Localities: Willow Slough, Lily Lake, Long Lake, Broad Lake, Wood Slough.

#### *Cænis*, nymph (1).

A small brown form with three long, fringed caudal appendages, and with the respiratory appendages on segments 1-5 of the abdomen; those on segments 3-5 concealed by the plate-like pair of the second abdominal segment. First respiratory appendages small, erect, not concealed. Head without conical tubercles. Antennae, legs, and caudal appendages white, with brown annuli.

A few examples were taken in Willow and Wood Sloughs.

#### *Cænis*, nymph (2).

A second small nymph, from Willow Slough, has three prominent conical tubercles on the head which agree very closely with those of the European species *C. luctuosa*, as figured in Mr. Eaton's monograph of this group of insects. Our insect differs in having the prothorax narrowed towards the front; and in certain other characters does not quite agree with Mr. Eaton's description of the genus.

### ARACHNIDA. (SPIDERS AND MITES.)

#### *Tetragnatha grallator*, Hentz.

(Hentz, Bost. Jour. Nat. Hist., vi, 26, Pl. iv, figs. 1 and 2.)

A small, slender-bodied, long-legged spider, large examples of which are .50 inch in length. Extremely common about the sloughs and lakes, often living over the water, exposed on dead stems and branches. It was sometimes brought in by the small seines in situations such that it seemed it must have been in the water. Its food probably consists of small gnats.

#### *Arrenurus* sp.

A pale water mite with long ciliated legs was frequently taken by surface nets in the deep water of the bay. It is, I believe, a river species.

## VERMES. (WORMS.)

This group has not the same importance to fish culture as have the crustaceans and insects—unless it be as parasites—and we shall not give those observed at Quincy more than a passing notice.

One of the most interesting of those noted is a small cylindrical worm with a retractile caudal disc from which arise four ciliated tentacles. It lives in great numbers in tubes on the under side of lily pads in Lily Lake, and when undisturbed lies with the hind end of the body out of the tube and, with the disc and tentacles expanded, sways slowly about. It will probably prove to be *Dero intermedius*, Cragin, though it is questionable if this is more than a variety of *D. digitata*, Mull.

Leeches which I have provisionally separated as five species were taken from the sloughs. All appear to belong to the genus *Clepsine*. Several of them were very common, being brought in on the shells of turtles, and at other times apparently attached to fishes.

Quite a variety of rotifers were observed, but none of special interest except the large and beautiful *Conochilus volvox*, colonies of which, consisting of a dozen or more individuals, were common in the open water of the bay, where they could always be taken in surface nets drawn after a skiff.

*Plumatella arethusa*, Hyatt.

(Observations on Polyzoa, 95.)

One of the branching polyzoans was very common in most of the pools, sometimes on sticks, on the under side of stones, and, in Lily Lake, on the under side of the lily pads. The statoblasts were frequently noticed scattered among algæ and rubbish.

*Hyalinella vesicularis*, Leidy.

(*Plumatella vesicularis*, Leidy, Proc. Acad. Nat. Sci. Phil., vii, 192.)

A single example of a small colony from Libby Lake, is referred to this species with some doubt.

*Pectinatella magnifica*, Leidy.

(*Cristatella magnifica*, Leidy, Proc. Acad. Nat. Sci. Phil., v, 265.)

The large masses of gelatinous matter so common in "back water" in this region, are formed by the colonies of this polyzoan. The animals themselves are on the outside of the masses and constitute but a small part of the bulk of each mass. In the upper part of the bay, in the inlets and mouths of sloughs, this animal

was very abundant. As the water subsided the masses were often exposed, and were left in numbers to decompose in the air. One of the largest masses seen measured 16.50 inches in greater diameter by 12.50 inches in lesser diameter, with an average depth of about six inches. Small spindle-shaped colonies were common on the stems of dead weeds along the margin of the lakes. The shape of the colony seems to depend entirely on the character of the object upon which it is established. I could not see that fishes, or indeed anything else, fed upon the gelatinous material. Reproduction both by statoblasts and by eggs was in progress in August.

## CELEENTERATA.

### *Hydra fusca*, Trembley.

These small animals are the closest allies of the corals and sea anemones of salt water, which our streams and lakes furnish. They are, when extended, about .25 inch long, and consist of a tubular body with a circle of tentacles about the one opening, the mouth. They are commonly found attached by the end opposite the mouth to plants and other submerged objects. I was surprised to find them on one occasion in Wood Slough in considerable numbers, and took others with the surface net in the bay, where they must have been floating at the surface. Those taken in Wood Slough, Aug. 4, were multiplying very rapidly by budding. The food consists of small animals which are captured by the tentacles.

## PROTOZOA.

These are the lowest and simplest of animals. They are unicellular, and chiefly microscopic. Notwithstanding their minuteness, they are of considerable importance as fish food, and are probably still more useful indirectly, since they constitute a large share of the food of insects.

At Quincy the animals of this group varied with the vegetation in the water. Where the plants were common, a variety of species and an abundance of individuals might be expected. In the river they were very rare. In the deeper water of the bay they were not as common as at its edges, among the wood rafts and the barges. They were most common in the stagnant water of the lakes. Such genera as *Amœba*, *Disflugia*, *Centropyxis*, *Actinosphærium*, *Vorticella*, and *Euglena* were abundantly represented. In Lily Lake a species of *Pyxicola* attracted attention from its abundance. It was noticed in the alimentary canal of the singular *Dero* mentioned above.

Two protozoans are especially deserving of mention here. The elongated green *Euglena viridis* was always to be found in water dipped up at any place in the bay. When the wind blew toward

the west shore for a number of hours together a dense coherent green scum was observed to collect in the inlets and mouths of sloughs, and under the microscope this was found to consist largely of the contracted, spherical *Euglenæ*. When placed under the cover glass of the slide they soon become active again. Fishes and other animals could, and probably do, at such times collect them in quantities for food. The second protozoan is *Arcella discoides* which occurred in numbers with the *Euglenæ*.











