REPORT OF BOARD

OF

# ILLINOIS STATE FISH COMMISSIONERS,



TO THE

## GOVERNOR OF ILLINOIS.

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OCT. 1, 1892, TO SEPT. 30, 1894.

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SPRINGFIELD, ILL.
ED. F. HARTMANN, STATE PRINTER.
1895.


STEAMER "LOTUS," ILLINOIS FISH COMMISSION.

SPRING LAKE CLUB HOUSE. HEADQUARTERS STATE FISH COMMISSION.

STATE FISH COMMISSION OFFICE. SPRING LAKE CLUB-HOUSE.

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# REPORT OF THE COMMISSIONERS.

*To His Excellency,* JOHN P. ALTGELD, *Governor:*

We beg leave to submit herewith our report as Board of State Fish Commissioners for the two years ending September 30, 1894.

We assumed our duties July 14, 1893, succeeding Mr. N. K. Fairbank, of Chicago; S. P. Bartlett, of Quincy, and Major Geo. Breuning, of Centralia. In the appendix will be found their report from October 1, 1892, to July 1, 1893.

When we entered upon the duties of our office we found the Board responsible for an exhibit of live fish in the Illinois State Building at the World's Fair, and at once made the office in that building our headquarters. We gave the matter individual and personal attention, as far as possible, replacing the various species of fishes used in the live fish display, as they were needed. At the conclusion of the exposition, the fish were taken from the ponds and sent by messengers to Fox river and planted, under the supervision of Hon. O. D. Sickler, commissioner.

As the work was new to the Board, and the interest an extensive one, we availed ourselves of the provision of law authorizing the appointment of a fish culturist, and arranged to have the work conducted on the same general lines as had been the policy of the former Board.

The steamer "Lotus" was at once placed in commission, and the crew set to work cleaning out the ponds and sloughs along the rivers, saving the fish that were left stranded by the receding waters, the work being prosecuted as extensively as our appropriation would permit. The fish reserved for distribution, such as black bass, crappie, spotted cat-fish, war-mouth bass, etc., were planted in various sections of the State, distribution being made either by messenger or the cars of the U. S. Fish Commission, which were placed at our disposal in the work. In the proper place in this report will be found a list of plants made, with the number and variety of fishes.

In the spring of 1894 we placed the "Lotus" in commission on the Illinois river, with a view to preventing, if possible, the usual wholesale destruction of fish by means of unlawful appliances. The work was an extensive one, and covering, as it did, hundreds of miles of river and river frontage, it made it difficult in the extreme to give it the attention it required. Our policy was to

notify violators of the law of the penalties attached to such violation and warn them against the use of all illegal devices, and, so far as possible, we attempted to stop the use of nets.

We do not favor any discrimination as against any particular class of citizens in the enforcement of the laws for the protection of fish, and are inclined to believe that the fishermen have rights and should have an opportunity of making a living by their avocation, yet, at the same time, the general public, who depend upon natural resources for food, are entitled to the protection of the law in guarding against the total elimination of such food supplies from the waters of the State.

As a rule, the fishermen who operate the nets and seines are but employés of firms and companies who own the outfits, and are either paid by the day as laborers or have a percentage of the fish caught, giving their labor as an offset to the use of the seines and nets used in the business. The appliances most commonly used are the wing net, hoop net (with bait), hoop net set, with wings and leads; pound net, basket, seine and trammel net, and in order to give a fair idea of the nature and extent of their use, we will give a brief statement as to how and where each is used.

The wing net is commonly used in "winging off," or shutting off a slough to prevent fish from coming out of the lakes and sloughs into the river. The wing usually has an opening at or near its center, which leads into a large hoop net, arranged with a funnel-shaped contrivance so that all fish passing into it are secured.

The net is raised at stated intervals during the day, the fish taken out and the net dropped back to continue its work. The net shutting off the slough is usually an old seine, held in place by stakes driven into the muddy bottom, and forms a fence, as it were, across the mouth of the slough. These sloughs are usually the outlet to a lake, and frequently to a chain of lakes, into which the fish run when the river is rising and during high water, and as the water declines they run back into the river again. It can be readily seen that it is simply an impossibility for a single fish to re-enter the river while such obstructions are in place. Where more than one outlet exists, each is shut off in the same manner. Of all the devices used this is the most pernicious, and against it we have used every means in our power, removing such obstructions wherever found, and where owners could be found they were duly warned against replacing them. If, after such warning, they were again found in the waters, they were taken up by our wardens, and where ownership could be proven we followed by prosecution.

The set nets, with wings and leads, are made very much like the old-fashioned quail net, a series of hoops running from six feet in diameter to two or three feet, covered by a web, and a funnel inserted, making an entrance easy, but preventing entirely the escape of fish when once in the net. From each side of the hoops, at an angle of about forty-five degrees, is placed a wing, usually a piece of old seine, hung on stakes so as to guide fish

into the net. These wings are frequently hundreds of feet in length, and the result is that almost every fish coming into them follows them down until led into the net. Frequently two or more hoop nets are used at the end of wings, and from the center a "lead" is placed, running from the mouth of the hoop net straight ahead, equi-distant from the two wings, and forming another obstruction, against which the fish striking are guided into the net.

The pound net, while not used very extensively in smaller rivers, is used with deadly effect in the larger ones. It consists of a large, square, stationary net, so placed as to make an enclosure.

Hood net, baited—these nets are made, as before stated, like a quail net, but used with bait, as a lure. They do not have wings or lead, and form but slight obstruction to the passage of fish unless placed close together. They are baited and the fish are attracted to them by the bait only; attached to a float, they are raised and emptied of their catch, and then lowered again for further work.

Of all the devices used by the fishermen the basket is, perhaps, the most destructive to small fish. They are made of strips of oak, usually from three and one-half to five feet in length, and from one foot to eighteen inches in diameter, nailed on hoops, with openings between strips of not more than one-half to three-fourths of an inch. Inside is placed a funnel-shaped row of strips; these baskets are placed beside each other frequently by the hundred, and as the openings are small, fish of all sizes, and especially those which frequent the bottom of the stream, such as the spotted cat-fish, are readily taken. It has not been an unusual sight to see the small flat boats, used by fishermen as seine boats, full of small fish, the largest not weighing half a pound, brought to market.

All the devices mentioned above are stationary and depend on the run of fish for success in taking them. All, with the possible exception of the bait net, are decided obstructions to the free passage of fish, and should be the subject of such legislation as would leave no doubt regarding the right to use them.

The seine, commonly used, is a matter that is largely governed by locality and the flexibility of the conscience of the fishermen. The law says a lawful seine shall have a mesh two inches square. The average fisherman uses just as small a mesh as he can, governed mostly by conditions and surroundings.

On the Illinois river seines from 100 yards, one inch mesh, to 1,000 yards, one and one-fourth inch mesh, may be found, and to the extensive use of such appliances is due the decrease in the buffalo fish, once the principal commercial fish. In the early spring, when driven into bays and pockets by the movement of the ice, or during early spawning or rolling season, they are found congregated in great numbers and are easy victims to the seine. Frequently the fishermen club together, "splice their rigs," that is put their seines together, and then divide the catch. It is a

matter of record that in one such instance, a catch aggregating over two hundred thousand pounds was made, and at a season of the year when the destruction of one fish meant the loss of thousands of fry. The unfortunate part of such wholesale catches was the waste of a large part of the fish so taken, for the reason that the practice was not confined to the Illinois river only, but was universal on all rivers, and consequently the markets to which the fish were shipped, St. Louis receiving the greater part, were glutted and the shipments were either thrown away for lack of purchasers at their destination, or the fish were held in live boxes or seines at points near where they were caught, and the result in the latter case was that it was no uncommon thing to see thousands of dead fish floating down the river, thrown out of live boxes or seines. This means of fishing could have but one result, viz.: the rapid reduction of the supply, and this season's catch has demonstrated even to the fishermen the fact that the wholesale catching of buffalo during the spawning season has been "killing the goose that laid the golden egg." The responsible fishermen, those who have a large amount of money invested in the business, are now realizing the situation and are among the strongest advocates of legislation that will protect the fish, and of the enforcement of existing laws, but the true poacher, if such he may be called, who does not give a thought to to-morrow but relies solely on the products of each day's work, no matter how obtained, is the greatest obstacle to the successful protection of fish. He may be found in all rivers, in a cabin boat backed up in some bay or behind some island, with his rig, usually working at night and taking the product of his nets miles away to a market.

The trammel net consists of three parts. A net made as a seine, usually of four inch mesh, and made of small twine, with another net of one to two inch mesh, loosely suspended on each side, is placed around a tree top or across a stream, and the fishermen, by pounding the water, start the fish to running, and when they strike the outside or small mesh net they are carried through the large net and pocket themselves.

These nets are used as a rule, to fish lakes where it is difficult to draw a seine.

In addition to all these unlawful means of taking fish is the use of dynamite and other explosives, which cause the complete depletion of the lakes in which they are used. It is, of course, contrary to the law, in all places and at all times, but notwithstanding that fact is frequently used. While all these means of destruction exert a great influence on the supply of fish, they are of such a nature that they may be controlled, to some extent, by legislation, and will be in time upon a popular demand for such laws as will properly protect a food supply. There is another so-called legitimate practice, however, which does much harm and is a very important factor in reducing the supply. This is the indiscriminate taking of everything that will bite by hook and line. It is not an unusual thing to see strings of fish numbering from

one to two hundred being carried away from the water, the largest of which is scarcely more than a finger long, too small for any possible use. This is particularly true of the black bass, as they will readily take a minnow when but a few months old, and are voracious biters.

FISH LAWS.

While each successive session of the General Assembly has endeavored to improve the laws relative to the protection of fish, and each has been, in a measure, successful, as may be seen by a comparison of the laws now on the statutes with those in force in 1879, there yet remains much to be done before the laws cover the demands for protection.

One great obstacle which is frequently met in endeavoring to enforce the law is the widely varying constructions put upon it, which make it extremely difficult to secure conviction, even when the evidence is such as would be sufficient, in any other phase of criminal law, to convict. The law contemplates no merely circumstantial evidence, no matter how convincing, a fact that makes the successful prosecution of a case doubly difficult. For instance, parties may be arrested with a wagon or boat load of fish, with a wet seine in full view, yet, unless the prosecution can show proof of an eye witness to the taking and killing of the fish, the chances are that the case will fail.

Laws similar to those existing in many of our western states, making the possession of unlawful nets or seines *prima facie* evidence of violation, should take the place of the one now in force. It is difficult, at all times, to catch a gang of men using the seine, but when they must not only be detected using the seine, but must be seen catching and killing fish with the seine, it adds materially to the difficulty.

The work of the average fisherman who uses his nets and seines in an unlawful manner is mostly done either at night or in localities where the chances of being interrupted by any one liable to inform or prosecute are very slight. It is no uncommon occurrence to find, along the shores of our principal rivers, seines hung up in plain sight whose meshes are not only less than the legal size, but even run down as low as $\frac{3}{4}$ of an inch. No one doubts the purpose for which the seine is used, and it cannot be used anywhere without its being in violation of the law, yet its ownership is not denied, and the owner, taking all chance, uses it with such effect that the lake into which it is introduced is literally depleted of fish, as it takes not only those of marketable size, but with them many too small to be fit for food, which, too often, are left upon the bank to die.

The law prescribes that "no seine or device used as a seine, whose meshes are less than *two* inches square, shall be used," and anything less than that cannot be other than unlawful, and its possession would indicate the intention of using it, to say the least.

Another point upon which opinions differ, and which causes much trouble in the prosecution of such cases, relates to section 1, which says: "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 or running through this State, in such a manner as shall obstruct the free passage of fish up and down or through such water or water courses." The extent to which a net or other device may be considered an obstruction to the free passage of fish has been the subject of much controversy. It is contended on the part of the fishermen and their attorneys that so long as there is a possibility of a fish passing out or around such net or device, that no obstruction to the free passage of fish up and down or through the waters exists. On the other hand, we have taken the position, which we believe was the intent of the law when enacted, that any net, seine or other device placed in the water, which traps and takes fish, constitutes an obstruction to the free passage of fish; that the only possible construction to be placed upon the law which might constitute an exception would be the use of a bait fyke, or hoop net, which lure the fish by means of bait, while in all other instances the fish are led or forced into the net by meeting just such obstructions in their passage up, down or through the water as was shown in our description of the construction and use of such nets, etc., elsewhere in this report. As will readily be seen, the prosecution of any case meets with such a wide diversity of opinion as to the meaning and purport of the law, whether left to a jury or to a justice of a peace, as to render the application of the law peculiarly elastic, and, as a consequence, a large percentage of the cases fail.

For the reason that the difficulty of obtaining evidence of violation of the law is so great, we have, so far, found it impossible to enforce that part of section 6 which says that "it shall be unlawful for any person to knowingly buy, sell or have in his possession any fish, at any time, which shall have been caught, taken or killed contrary to the provisions of this act," as the burden of proof lies with the prosecution.

We have no doubt that a great many of the fishermen are guilty of violations of the law through ignorance, or from following the counsel of poor advisers.

A certain class of fishermen who own large and extensive rigs have been in the habit of fishing in open violation of the law, at seasons of the year when the catches are unusually large, that is, during the spawning season, with the expectation of being arrested and fined, but depending upon a merely nominal fine being imposed, the catch, as a rule, being so large that the fine would not amount to more than a small item of the expense incidental to the work, or taking the chances of escaping without a fine.

The fact that men must be taken in the act of catching or killing fish often results in great hardship to some, as, in the greater

number of instances, the men who do the actual work of drawing the same are simply employed by the day for the work, and, if arrested in the act, may or may not be indemnified by their employer. It is frequently the case that those who can least afford to pay a fine are caught, while those who profit by the work of illegal fishing escape.

A provision of the law which would give to a court or any proper official the authority to destroy such property as may be found in use or liable to be used unlawfully, would greatly simplify our work.

A number of the fishermen of the State have signified their willingness to assist in securing the passage of an amendment to our present laws which shall prohibit the use of the seine at all. Iowa has such a law and its workings, so far, have been greatly beneficial to the waters of the state. The use of the seine has done, and will do much toward the ultimate depletion of fish in our principal bodies of water, and should not be permitted at any season of the year. This would meet the approval of all fishermen except the owners of large rigs, whom we can never punish as individuals under our present laws.

## TAKING FISH FROM OVERFLOWS.

We will give a brief description of the methods used in taking the fish from overflows for the purpose of rescue and distribution, in order that our work may be properly understood. Nearly all the flat ponds along the Illinois river, which become filled with fish during the high water, or overflow of the river, are left full of fish when the water recedes. These ponds dry up and the fish die if left there during the summer. It is from such places that we get our supply. Our mode of work is, briefly, as follows: We first clean the pond of moss and obstructions, by means of a heavily leaded sea-line, drawn over the bottom of the pond, catching the moss and rubbish and dragging it to the shore. The seine, which is of small mesh, could not be used without cleaning the pond in this way. After the pond is so cleaned, the seine, which has previously been "laid in" evenly and regularly into the stern of a flat bottomed boat, so that it will "lay out" without tangling, is fastened to the shore by one of its brails; it is then allowed to go into the water for its whole length in a semi-circle. A long line is fasted to the outer brail, and it is drawn to the shore, describing as large an arc of a circle as possible. When the outer brail has reached the shore, the lead or bottom line and the top or cork line are gradually pulled in, working towards the starting point. When about one-half of the distance has been accomplished the other end of the seine is taken up and treated in the same way. The seine being eight feet deep, and the water ordinarily very shallow, quite a bag is thus formed. When the seine has been brought near enough to the shore so that a section of it can be handled by the men, the fish are worked into a pocket, as it were, and carried out into deeper water, where, by a vibratory

motion through the water, the mud is washed from the seine, and the fish are sorted out, such as are wanted for distribution are put into the live-box —which is a kind of cage made of slats, through which the water runs—and the residue taken to the river or nearest deep water and turned into it. After the live boxes have been filled the fish are carried in large cans to the river and placed in storage live-boxes, and in them are either floated or towed to the point of shipment, where they are loaded on cars and transported to place of deposit.

This mode, however, only applies to the ponds of large area, where more than one haul of the seine is necessary. Frequently, a pond is cleaned out by one haul, in which case what is called an "end-haul" is made, the pond having first been cleaned as before described.

DISTRIBUTION.

The fish used for purpose of distribution, selected from those saved from drying pools along the Illinois and Mississippi rivers, were of the best varieties, consisting chiefly of black bass, crappie, wall-eyed pike, war-mouth bass, white bass and spotted cat-fish. They were all of good size and a large proportion of them spawners.

In a number of instances the plants were made to restore a variety practically extinct in the stream thus planted; this was notably the case in Fox Lake, where the spotted cat-fish was planted, and we are pleased to report that a number of this variety have been taken this season (1894) from Fox river, at different points, which show a very satisfactory growth.

The earlier part of the season of 1894 was rather unsatisfactory, as regards our work, owing to the extreme heat and drouth. It was very difficult to retain fish for any length of time in live-boxes, the water in the Illinois river itself showing a temperature, several times, of 90 degrees, and the water from which the fish were taken being of a much higher temperature. Transportation of the fish was also a difficult matter during the warmest months. The demand for fish has been very large, and a great many private ponds and lakes have been supplied, while there still remains a large number of applicants to be supplied later.

The value of the distribution of native food fishes of the State, taken from the shallow ponds and sloughs, has been more forcibly demonstrated during the last season than ever before. From several causes, the supply of fish in inland waters has suffered greatly. A number of seasons of extremely low water has prevented the usual run of fish from main rivers, and the supply in smaller streams and inland lakes subject to overflow has been limited to what the waters produced locally, or what the Commission has been able to furnish. The drain on lakes and streams by use of rod and line, alone, is severe, but when the unlawful use of seines and nets is added, it results, in many instances, in the depletion of the waters.

We can only judge by comparison of the practical nature of the work performed by the Commission. We cannot tell just what has been accomplished by the plants made in public waters, but when in lakes free from overflow we can estimate the increase very closely, and watch the growth of the fish planted. Some remarkable results have followed the planting of bass and crappie in inland lakes. We note particularly the rapid growth and large increase in black bass which have been planted in inland ponds under conditions that would naturally seem adverse, the water still and fed only by surface drainage, and during the summer months attaining a high temperature. The same results have been obtained with the crappie and perch. If our game fish can thrive under such conditions we may reasonably expect even greater results when the same fish are planted in running streams, and with all the conditions favorable to a natural growth and increase. The varieties distributed comprised the following list:

Black bass.
Strawberry bass (black crappie or calico bass).
Crappie.
Ring perch.
Spotted cat-fish.
Carp.
Red-eye perch.
Sun fishes.
Pike perch.

From the angler's standpoint, the black bass is, perhaps, the best, followed closely by the pike perch, spotted cat-fish, etc., and will adapt themselves to any of the waters of the State.

In the appendix to this report will be found a list of plants made in public waters, also of private ponds supplied.

We regard this branch of our work as one of its most important features, and its results as among the most satisfactory. Since the organization of the Commission, the fish taken from the drying pools and put into the rivers and lakes of this State would represent an immense money value. The fish thus saved annually will aggregate millions of pounds, even at the age of two years, and each succeeding year multiplies their growth and increase.

Very few people not directly interested in such matters take into consideration the fact that fish form a very large proportion of the food supply of the people, and so do not realize the importance of making our rivers and lakes as productive as they once were.

The fish saved each year serve, also, to offset to a great extent, the immense drain upon the waters resulting from the universal use of seines and nets. Some idea of the extent of the annual loss from this cause may be had by an examination of the illustrations in this report, reproduced from photographs taken by Prof. Forbes' corps of biological students, on the Illinois river. From them can be drawn a fair conception of the condition of

most of the lakes along the Illinois river. The illustrations represent Phelps Lake, near Havana, and the photographs from which they were made were furnished us by Prof. Forbes.

The season of 1894 was one of the greatest drouth ever known in our State. Usually, the water in our principal rivers overflows the banks in the spring, to an extent sufficient to allow it to back into all the larger inland lakes and pockets in the bottoms, but this year has proved an exception, and the water, while over the banks, was so only to such a limited extent and for so short a time as to furnish but little opportunity for the general spawning of such fish as spawn in inland and shallow waters.

The intensely hot weather of spring and early summer, together with the rapid falling of the water through evaporation and seepage brought about a very unusual state of affairs; lakes and ponds which in ordinary seasons heretofore had retained sufficient water to sustain the life of fish through the entire year, became perfectly dry in early summer this year, and immense numbers of fish, left stranded by the diminishing waters, perished. As many of these bodies of water were remote from any river the labor of removing the fish to deeper water was greatly increased.

Never before has the value and necessity of this work of the Commission been so apparent as this season. In this work the steamer "Lotus" has proven a valuable auxiliary; in fact, without the boat our work would have to have been confined to a narrow compass, but by its use we have been able to cover long distances and move fish needed for distribution from point to point as required, quickly, and with safety.

To give some idea of the effect of the drouth this season as mentioned, the two large lakes opposite Meredosia crossed by the Wabash Railway and known as the first and second trestle lakes, may be cited. Two seasons ago fish were taken from them in November; this year they became dry early in April and a crop of turnips and corn was planted and matured in the bed of the lakes. In an examination of the entire Illinois river bottoms, from Havana to a point seventy miles down the river, less than half a dozen lakes were found containing water enough to keep fish alive through the winter, where ordinarily they would number hundreds, for fish are very apt to freeze to death in shallow water during a severe winter.

One lake, known as Chisel Lake, between Meredosia and Naples, on the west shore of the river, which at a good stage of water covered an area of 125 acres and represented the water-shed of perhaps 5,000 acres, we found not only perfectly dry, but the bed of the lake so dry that it had opened up in crevices at least twelve inches deep, from the extreme heat.

It would, of course, be impossible to save all the fish that perish in this way every year, as it would require a larger force at greater expense than we could command, but if it could be accomplished and the fish protected after placing them in the rivers, it would yield a greater amount of food than could be produced in any other way by the same amount of expenditure.

## CARP.

The question is asked of us a great many times during the season, "Is not the carp a failure ?" and in order that the situation may be thoroughly understood, we propose to give some of the facts regarding it. When introduced by the U. S. Fish Commission into the State of Illinois, carp were comparatively but little known. So much, however, had been said in their favor regarding their rapid growth, increase and ease of culture, that a great many people in the State made ponds, applied for and received carp, and started in with bright anticipations of success as fish culturists. The result was general disappointment, and, so far as the general effort was concerned, a failure. So much had been written regarding the fish, which at that time was hardly known at all to the generality of fish men, that the universal opinion seemed to be that all that was necessary to get large returns from a small investment was to dig a hole, let in the surface water, secure twenty or twenty-five carp, put them in and let them do the rest. It was not long before those interested realized that, so far as the rapidity of growth was concerned, all that had been said of them was true.

Early in the spring the fish began to show themselves on the surface of the water, and, as a natural consequence, some were taken out for food. Then followed general dissatisfaction and unfavorable criticisms by the press throughout the State, and carp became unpopular as a pond fish. Black bass or crappie, taken under the same conditions, would prove quite as unsatisfactory as table fish. In the first place, in almost every instance, the ponds used for the reception of the carp were simply holes, filled with surface water, and used by the stock the year round. Even under such adverse circumstances, the carp grew, and when the warm days of spring came, began to spawn. At this season the fish were found frequently upon the surface of the water, and were easily taken but, when prepared for the table, were found to be soft and unpalatable. As before stated, a bass or a crappie, under like conditions, would be unfit to eat. Thus, through ignorance of the proper methods, a large proportion of those interested pronounced carp culture a failure, and gave up their ponds. On the other hand, those who built fish ponds, gave the carp good water and good food, and used ordinary judgment as to the time to use them as food, found that the carp was, in every sense, a valuable food fish, and might become an important auxiliary to the food products of the farm.

We do not hesitate to say that the carp, which is now found in all the waters of the State, is the greatest source of revenue to those who fish as a business, and has paid larger dividends on the investment than any other fish ever introduced into our waters. So widely have they spread that they may now be considered among the indigenous fishes of the State, and take the place, to a great degree, of the native buffalo, once the most important fish of commerce. For years it had been the custom of fishermen to

take large numbers of the buffalo, during the spawning season, as before stated, one haul of over two hundred thousand pounds being on record as having been made on the Illinois river, and the traffic in this particular fish was a very large one. Each year, for the last ten, has shown a marked decrease in the supply, until this season the catch was almost an entire failure. Some years ago, carp were placed in every stream in the State, and each succeeding year has shown an increase in the number caught. At first, when they were taken occasionally among the catch of the fishermen, they were not considered at all valuable as a market fish, so, fortunately, were not sought. Thus they were permitted to grow and increase in numbers until now they are as much a part of our fish supply as any fish indigenous to the waters of the State, and every inland pond and lake, as well as the rivers, furnishes a supply of carp as a part of its product. The result of the introduction of carp has been that to-day more of this species of fish are taken and handled by the fishermen than all the other varieties combined, and all are sold at a price nearly double that usually obtained for buffalo. From one point on the Illinois river, last season, 250,000 pounds of carp found its way to Chicago and New York markets, and at about one-half greater price than could be realized for buffalo. Carp are, undoubtedly, the fish for the great mass of fish-eating people, those who eat fish as food, not as a luxury.

The work of the various fish commissions should be directed to such methods as will produce the largest quantity of food at the lowest possible cost. It is the man who must get the most possible for his money, in order that he may live, that the work of such interests should be made to benefit, chiefly, and this can only be done by the introduction of some such fish. Black bass, trout, and game fish generally, will never be plentiful enough to be considered market fish, only the few can afford to use them as food. Under the most advantageous circumstances, the waters would not produce these fish in quantities sufficiently large to bring their price within reach of the average working man. Carp can be raised in such quantities, and at the same time in no way interfere with other fish. Carp have not been a failure, but, on the contrary, have given to the people of our State a greater supply of food from the waters than could have been produced in any other way, from the same area.

### FISHWAYS.

The law relating to fishways has been generally observed, but few of the dams being unprovided and those that have been put in are kept in repair for the most part. There are still some dams unprovided, but all have been notified, and we hope to induce owners to put in the fishways without recourse to legal measures.

The necessity for a fishway over each dam must be apparent to any one who has any knowledge of the habits of fish, and the people generally who live in the vicinity of a dam that is unpro-

vided with a fishway, as directed by law, soon make themselves heard by a petition to the Board. So far, we have been able to accomplish a peaceful compliance with the law, except in two instances which are yet in abeyance. We have plans and specifications of fishways, ready to furnish all owners of dams upon their application. Our plans contemplate plain, simple and durable structures, easily and cheaply constructed, and as easily and cheaply kept in repair.

SUMMARY.

We think an amendment of the present laws which would prohibit the catching or killing of fish with any device other than hook and line, from the 15th day of March to the 1st day of July would meet with general favor and greatly assist in the preservation of the fish.

As stated in the body of this report, such amendments as would make the various sections of the law easier of enforcement would greatly aid the work. It is probable that recommendations will be made by the Statutory Revision Commission that will eliminate considerable in the present law, which is unnecessary, and revise the text so that an uniform interpretation will be placed upon the intent of the law.

The possession of illegal nets or seines should be prohibited and punished. To say the least, the possession of such appliances offers an inducement to use them, even though their use is prohibited by law.

To insure a strict enforcement of the laws a close patrol of the waters of the State is absolutely necessary, particularly of the principal rivers, during the spawning season when the laws are most openly violated because of the greater ease with which large quantities of fish are taken. Under our present warden system this has been done as far as practicable with the means at our command, but to comply with the numerous demands made upon the Commission for a wider range of work would necessitate the expenditure of a much larger amount of money than we have at our command. The amount of territory to be covered, taking into consideration the frontage of the Mississippi river, the length of the other boundary rivers together with the inland rivers and streams such as the Illinois, Fox, Rock and Kankakee rivers, makes it impossible to care for all sections with the steamer "Lotus" alone.

Our appropriation has been sufficient to do the work attempted by the Commission, but not sufficient to do the work that has presented itself. We have endeavored to keep within its limits, but had it been larger the amount of efficient work that could have been done would have been proportionately greater.

We shall be compelled to make some improvements on our steamboat before it can be put into commission next season. A new boiler is an absolute necessity, as the one in use is dangerous to the safety of the crew, and by a few hundred dollars

judiciously expended upon necessary improvements we hope to obtain not only greater security but greater speed, enabling us to cover a much larger territory with the same amount of expense. We should have the boat fitted with electrical appliances, such as lights in and about it, including a search light and signals, which would permit us to run the boat at night into shallow waters, which, under present conditions, is a hazardous undertaking.

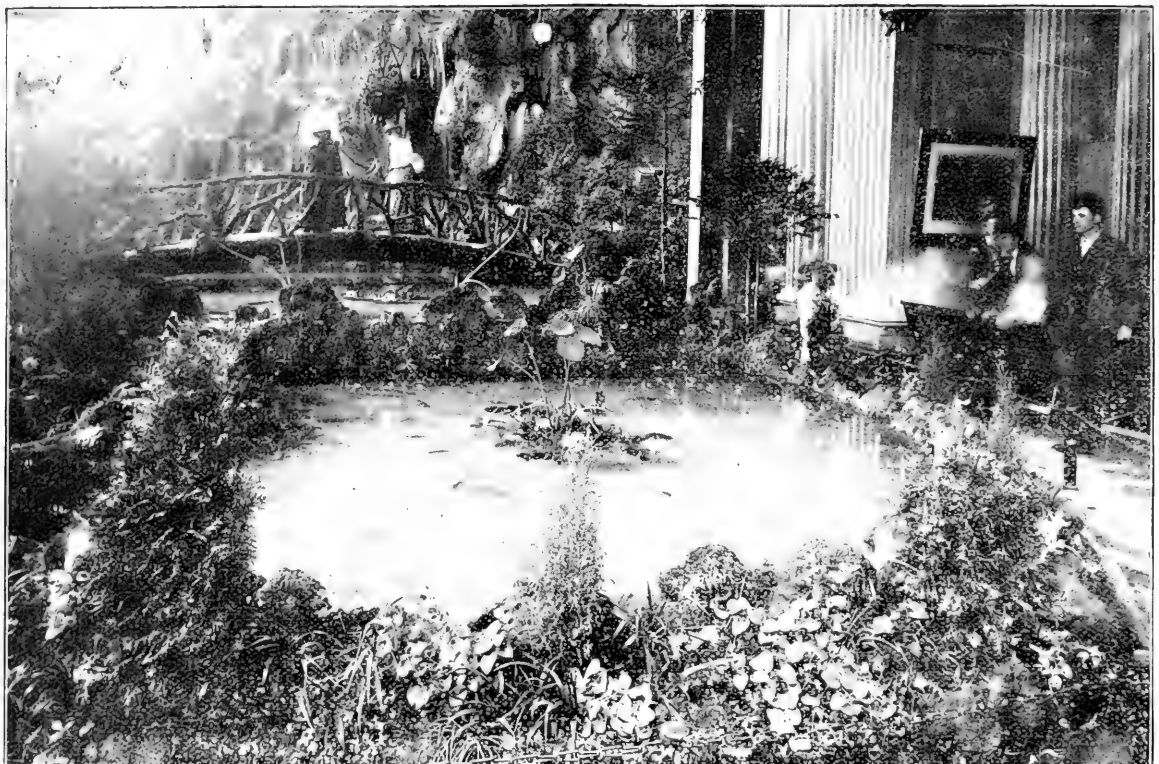
We are indebted to the press of the State for generous notice of our work and acknowledge their kindness.

To the railroads throughout the State we are greatly indebted for valuable assistance in our work in furnishing transportation, and to the employés of the road for assistance in handling our fish on trains.

To the people of the State generally who take an interest in fish protection and propagation, and have by their advice and encouragement made our duties easier, we owe much, for without the aid received from local authorities it would have been difficult to cope with the army of irresponsible poachers with which we have had to contend in our efforts to enforce the existing laws.

Respectfully submitted,

R. Roe,
Geo. W. Langford,
H. Schmidt.



STATE FISH COMMISSION EXHIBIT. World's Fair.

HAVANA LAKE.

ILLINOIS RIVER VIEW.

AN ILLINOIS RIVER VIEW.

QUIVER LAKE.

# APPENDIX.

## *Recapitulation of Expenditures by Illinois State Fish Commissioners from August 1, 1893, to September 31, 1894.*

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

| | | |
|---|---|---|
| Amount to credit of Commission August 1, 1893 | $7,487 37 | |
| By general expenditures for August, 1893 | | $713 08 |
| " " September, 1893 | | 1,052 77 |
| | 1,765 85 | $1,765 85 |
| Amount to credit of Commission October 1, 1893 | $5,721 52 | |
| " appropriation available October 1, 1893 | 7,500 00 | |
| | $13,221 52 | |
| By general expenditures for October, 1893 | | $704 55 |
| " " November, 1893 | | 397 10 |
| " " December, 1893 | | 89 25 |
| " " January, 1894 | | 154 31 |
| " " February, 1894 | | 50 00 |
| " " March, 1894 | | 83 95 |
| " " April, 1894 | | 253 60 |
| " " May, 1894 | | 614 27 |
| " " June, 1894 | | 1,051 70 |
| " " July, 1894 | | 745 46 |
| " " August, 1894 | | 874 44 |
| " " September, 1894 | | 887 67 |
| | 5,906 33 | $5,906 33 |
| Amount to credit of Commission October 1, 1894 | $6,315 19 | |

## *Appropriation for personal and traveling expenses of the Commissioners, or such persons as may be authorized by them, in enforcing Laws relative to Fishways over Dams and for Protection of Fish.*

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

| | | |
|---|---|---|
| Amount to credit of Commission August 1, 1893 | $2,578 87 | |
| By expenditures for month of August, 1893 | | $81 40 |
| " " September, 1892 | | 108 50 |
| | 189 90 | $189 90 |
| Amount to credit of Commission October 1, 1893 | $2,388 97 | |
| " appropriation available October 1, 1893 | 2,500 00 | |
| | $4,888 97 | |
| By expenditure for October, 1893 | | $256 27 |
| " " November, 1893 | | 245 93 |
| " " December, 1893 | | 214 09 |
| " " January, 1894 | | 218 71 |
| " " February, 1894 | | 260 11 |
| " " March, 1894 | | 113 19 |
| " " April, 1894 | | 399 35 |
| " " May, 1894 | | 93 80 |
| " " June, 1894 | | 75 38 |
| " " July, 1894 | | 208 08 |
| " " August, 1894 | | 120 22 |
| " " September, 1894 | | 167 41 |
| | 2,582 54 | $2,582 54 |
| Amount to credit of Commission on October 1, 1894 | $2,306 53 | |

# REPORT OF THE COMMISSIONERS.

*To His Excellency,* JOHN P. ALTGELD, *Governor:*

We beg leave to submit herewith our report as Board of State Fish Commissioners from October 1, 1892, to July 1, 1893.

In our work during the past season, we have followed the same general methods which have been in use by the Board for the past ten years. The rescue and distribution of native food fishes has formed the greater part of the work, and the distribution has been made as general as possible, special attention having been given to the stocking of public waters, and, at the same time, a very considerable number of individuals who desired to engage in the culture of fish for home consumption have been supplied.

The enforcement of the laws for the protection of fish has been attempted, and we think our efforts have resulted in diminishing to some extent, at least, the wholesale destruction of fish, though the character and construction of the laws themselves leave room for many serious complications, and this fact is a great hindrance to their successful enforcement. However, the interest in this branch of the work has greatly increased, and public sentiment is now largely in favor of it, many individuals, as well as clubs, having been actuated by their interest in these matters to take up the work locally on their own responsibility, or to give material assistance to the commissioners in their efforts to protect the waters.

Market fishing, as a commercial industry, has received quite an impetus from the addition of the carp to the indigenous supply. So rapid has been their increase since their introduction, that immense quantities are shipped from this State to outside markets every season, and during the past season the catch of carp in inland waters was greater than all other varieties combined.

## FISHWAYS.

The fishways put into dams in former seasons are generally in working order. Notices are out to owners of such dams as have been reported as without fishways, and the usual course will be pursued in each case to enforce the law regarding them.

WORLD'S FAIR EXHIBIT.

The General Assembly of 1889 and 1890 made it a part of the duties of the commission to arrange for a live fish exhibit in the State Building at the World's Fair, and to put it into place and care for it during the fair. Acting under these instructions, we had a series of artificial lakes and pools constructed, artistic in themselves and their surroundings, in which were placed and maintained specimens of the different varieties of the food fishes of the State. These were cared for by our Board until turned over to our successors, in July.

On July 14, 1893, the Board appointed by your Excellency, consisting of Richard Roe, of East St. Louis; George W. Langford, of Havana, and O. D. Sickler, of Geneva, assumed control of the work and property of the State Fish Commission, and to them we turned over such property as we had in charge.

We think we can speak of the work as having progressed; the increase of fish throughout the State is noticeable; the interest in the work almost universal, and the best of results have followed the distribution and protection of fish generally.

We desire to tender our thanks to you for courtesies shown us while a part of your administration, and express our sincere desire to see the work carried on to a successful issue by our successors, assuring them of our best wishes and of such assistance as we can give at any time.

List of distribution and financial statement herewith attached.

Respectfully submitted,

S. P. BARTLETT,

*Secretary.*

*Recapitulation of Expenditures by Illinois State Fish Commissioners from October 1, 1892, to August 1, 1893.*

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

| | | |
|---|---|---|
| Amount to credit Commission October 1, 1892 | $5,108 39 | |
| Appropriation available October 1, 1892 | 7,500 00 | |
| Earnings steamer Lotus | 60 00 | |
| | $12,668 39 | |
| By expenditures for month of October, 1892 | | $688 28 |
| " " November, 1892 | | 484 01 |
| " " December, " | | 425 13 |
| " " January, 1893 | | 448 33 |
| " " February, " | | 325 20 |
| " " March, " | | 368 27 |
| " " April, " | | 523 40 |
| " " May, " | | 582 85 |
| " " June, " | | 701 59 |
| " " July, " | | 633 96 |
| | 5,181 02 | $5,181 02 |
| Amount to credit Commission August 1, 1893 | $7,487 37 | |

*Appropriation for Personal and Traveling Expenses of the Commissioners, or such persons as may be authorized by them, in enforcement of the laws relating to Fishways over Dams, and for the protection of Fish, and for paying expenses of wardens not covered by legal fees.*

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

| | | |
|---|---|---|
| Amount to credit of Commission October 1, 1892 | $1,350 80 | |
| Appropriation available October 1, 1892 | 2,500 00 | |
| | $3,850 80 | |
| By expenditures for month of October, 1892 | | $142 75 |
| " " November, " | | 221 31 |
| " " December, " | | 101 90 |
| " " January, 1893 | | 54 93 |
| " " February, " | | 80 45 |
| " " March, " | | 129 95 |
| " " April, " | | 144 22 |
| " " May, " | | 79 10 |
| " " June, " | | 132 62 |
| " " July, " | | 84 70 |
| Paid Higbee & Williams, attorney fees | | 100 00 |
| | 1,271 93 | $1,271 93 |
| | $2,578 87 | |

## Distribution of Native Food Fishes—1892 and 1893.

| Name of Stream. | Near. | County. | Number. |
|---|---|---|---|
| Kaskaskia river | Venedy | Washington | 1,500 |
| Skillet Fork | Wayne City | Wayne | 1,300 |
| Little Wabash river | Beach | Wayne | 1,700 |
| Wabash river | Grayville | Edwards | 430 |
| North Fork Saline river | Texas | Gallatin | 600 |
| South Fork | Stone Fort | Saline | 500 |
| Cache river and lake | Ullin | Pulaski | 500 |
| Big Muddy river | Murphysboro | Jackson | 1,350 |
| Bureau Creek | Gower | Bureau | 300 |
| Rock river | Denrock | Whiteside | 390 |
| Green river | Walnut | Bureau | 300 |
| Rock river | Sterling | Whiteside | 500 |
| Rock river | Byron | Rock Island | 500 |
| Fox river | Elgin | Kane | 700 |
| Fox river | Geneva | Kane | 3,500 |
| Fox river | Aurora | Kane | 900 |
| Fox river | McHenry | McHenry | 600 |
| Sangamon river | Decatur | Macon | 500 |
| Sangamon river | Riverton | Sangamon | 600 |
| Embarras river | Newton | Jasper | 450 |
| Okaw river | Wheaton | Randolph | 800 |
| Vermilion river | Danville | Vermilion | 500 |
| Little Wabash river | Louisville | Clay | 950 |
| Kaskaskia river | Shelbyville | Shelby | 1,100 |
| Kaskaskia river | Carlyle | Clinton | 490 |
| Kaskaskia river | New Athens | St. Clair | 600 |
| Spoon river | Maquon | Knox | 1,200 |
| Kankakee river | Kankakee | Kankakee | 5,000 |

## List of Fish Wardens.

| Name. | Date. | Town. | Remarks. |
|---|---|---|---|
| Wm. C. Loomis | Oct. 4, 1889 | Richmond | |
| C. M. Partlow | " | Springfield | |
| John Elder | " | Carthage | |
| M. L. Kelley | Nov. 6, 1889 | Wilmington | |
| J. S. Juda | Jan. 28, 1890 | Collinsville | |
| H. H. Healey | " | Yorkville | |
| E. F. Derr | Mar. 19, 1890 | Beardstown | |
| F. L. Buck | April 2, 1890 | Elgin | |
| M. D. Green | " | Momence | |
| Thos. Wright | " | Lacon | |
| H. C. McClung | April 11, 1890 | Keithsburg | |
| Geo. W. Ayers | April 25, 1890 | Pekin | |
| Jas. Haines, Jr | " | Pekin | |
| Jas. Sampson | " | Calhoun county | |
| J. A. Amsley | May 9, 1890 | Peoria | |
| Jno. S. Trew | " | Colchester | |
| Geo. Kemper | " | Danville | |
| C. A. Woodruff | May 13, 1890 | Riverside | |
| W. D. Hodson | May 19, 1890 | New Boston | |
| Clark Blackwell | May 29, 1890 | Griggsville | |
| John Dickson | June 3, 1890 | Sterling | |
| J. H. Nuzworthy | June 5, 1890 | Sullivan | |
| Thos. Perry | June 6, 1890 | Terre Haute | |
| Thos. R. Mullens | July 8, 1890 | Anna | |
| Jas. P. Campbell | " | Browning | |
| F. M. Parker | July 15, 1890 | Chester | Res. June 10, 1891 |
| Richard Harkuess | Aug. 5, 1890 | Decatur | |
| L. C. Schwerdtfeger | " | Lincoln | Res. Nov. 14, 1894 |
| Chas. F. Bronson | Aug 30, 1890 | Pullman | Resigned |
| O. E. Easton | " | Beardstown | |
| H. H. Turner | Aug. 13, 1890 | Noble | |
| Jas. First | May 2, 1891 | Moline | |
| Alex. Brown | " | Quincy | Deceased |
| Dr. O. M. Fike | " | Waterloo | |
| Fred Schantin | " | Morris | |
| Jas. W. Moon | " | Ogle county | |
| G. M. Buckley | " | Lee county | |
| M. M. Benson | " | Maquon | |
| A. S. Hall | " | Newton | Res. May 3, 1894 |
| J. Zumwalt | " | Watseka | Res. May 27, 1891 |

## *List of Fish Wardens*—Concluded.

| Name. | Date. | Town. | Remarks. |
|---|---|---|---|
| D. H. Law | May 22, 1891 | Dixon | |
| Wm. Rivesmith | June 13, 1891 | Clinton county | |
| D. Harrah | " | Charleston | |
| J. H. Morse | " | DeWitt county | |
| E. H. Wescott | July 25, 1891 | Ottawa | |
| J. D. Hamilton | Aug. 25, 1891 | Morrison | |
| H. S. Pepoon | Oct. 15, 1891 | Lewistown | |
| T. J. Smith | Nov. 19, 1891 | Antioch | |
| Frank Andereon | July 23, 1892 | Pittsfield | |
| J. C. Parks | Mar. 18, 1892 | JoDaviess county | |
| Thos. R. Gale | Mar. 28, 1892 | Tazewell county | |
| Chas. Scluth | " | Pullman | Vice Bronson |
| John Kellar | Mar. 31, 1892 | York | |
| T. P. Hackney | May 10, 1892 | Whitehall | |
| G. W. Wood | May 24, 1892 | Macoupin county | |
| John P. Hook | May 27, 1892 | Fulton | |
| Jas. F. Rittenhouse | July 11, 1892 | Iroquois county | |
| C. Sterns | July 23, 1892 | Byron, Ogle county | |
| J. L. Howell | Oct. 4, 1893 | Batavia | |
| A. G. Barbean | " | McHenry | |
| James Morrisey | " | Beardstown | |
| Pope Allen | " | East St. Louis | |
| C. E. Beadle | " | " " | |
| Joseph Lavelle | Oct 4, 1894 | Cahokia | |
| F. Simmons | " | East Carondelet | |
| Edward Williams | " | Pekin | |
| Wm. Wilcox | " | " | |
| Edward Schermerhorn | " | Havana | |
| Frank Flanagan | Nov. 9, 1894 | Thornton township | |
| W. F. Preston | Nov. 20, 1894 | Freeport | |
| J. W. Bell | Dec. 4, 1894 | Pekin | |
| Thos. Gill | " | Belleview | |
| Geo. H. Westlake | Jan. 5, 1894 | Virden | |
| David Ely | Dec. 30, 1893 | Calhoun | |
| Chas. Koehler | July 9, 1894 | Cairo | |
| Wm. M. Wilkinson | Jan. 3, 1894 | Gilead | |
| S. G. Johnson | Feb. 10, 1894 | Chandlerville | |
| Jas. McNeal | " | Fox Lake | |
| Edward Jordan | Mar. 6, 1394 | Galena | Res. May 23, 1894 |
| Albert Leuk | Feb. 20, 1894 | Pullman | |
| M. R. Bortree | " | Chicago | |
| Robert Martman | May 3, 1894 | Newton | |
| W. A. Hall | " | Rock Falls | |
| A. C. Renss | May 18, 1894 | St. Clair county | |
| C. L. Schmidt | June 1, 1894 | Elgin | |
| Jas. Glines | " | Geneva | |
| John Linden | " | Aurora | |
| Wm. McRuley | " | Newton | |
| R. E. H. Westfall | " | Franklin | |
| Frank Cadan | June 4, 1894 | Wateeka | |
| L. D. C. Monteith | June 8, 1894 | Durand | |
| H. M. Bird | " | Taylorville | |
| P. C. Pell | June 16, 1894 | Joliet | |
| L. H. Fouche | Jan. 22, 1894 | Petersburg | |
| F. A. Snyder | July 11, 1894 | Albany | |
| L. L. Moeschler | July 20, 1894 | Lyons | |
| C. C Hembaugh | Aug. 28, 1894 | Momence | |
| P. M. Bledsoe | Oct. 2, 1894 | Mt. Vernon | |
| John Brewner | Oct. 26, 1894 | New Athens | |

## REPORT OF STATE FISH WARDENS.

THORNTON, COOK COUNTY, Oct. 18, 1894.

*Geo. W. Langford, Esq., Secretary State Fish Commission, Havana, Ill.:*

DEAR SIR:—The date of my appointment was November 9, 1893. I have notified twenty-one persons to obey the law. Have taken up sixteen nets. Have arrested twenty-nine offenders of the law. Have secured twenty-five convictions. Have served two fishway notices. Have had no fishways put in. There are two dams unprovided with fishways in this county. Violations are frequent, but not so bad as they were a year ago. The streams in this county are Thornton Creek and Calumet river.

Yours respectfully,

(Signed.) F. F. CANAGIN.

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EAST CARONDELET, ILL., Oct. 17, 1894.

*Mr. Geo. W. Langford, Secretary Illinois State Fish Commission, Havana, Ill.:*

DEAR SIR:—I was appointed October 5, 1893. Have notified twenty persons to obey the law. Have removed two small nets. Have made twenty-five arrests. Secured twelve convictions. There are no dams in my county, but five obstructions caused by drift wood. The streams in this county are Proidpont Creek, Fish Lake and Big Lake.

Respectfully,

(Signed.) JOHN F. SIMONS.

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BEARDSTOWN, CASS COUNTY, ILL., Oct. —, 1894.

*Mr. Geo. W. Langford, Secretary State Fish Commission, Havana, Ill.:*

DEAR SIR:—I was appointed State Fish Warden October 5, 1893. I have notified twelve persons to obey the law. Have taken up no nets. Have made no arrests. Have secured no convictions. Have served no fishway notices. Have had no dams put in. I think the status of fish matters in this county is good, no violations so far as I have been able to learn. I think having a warden in the immediate vicinity tends to make the fishermen more careful not to violate, and respectful of the law. The streams in this county are Illinois river, and the lakes, sloughs and bayous adjacent thereto.

Yours respectfully,

(Signed.) JAMES MORRISEY.

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WATAGA, ILL., Oct. 20, 1894.

*Mr. Geo. W. Langford, Havana, Ill.:*

DEAR SIR:—I have this day received sixty spotted cat-fish you sent me. They were fine ones, much larger than I was looking for. Much obliged to you for having them sent me.

Respectfully,

(Signed.) J. E. WILLIAMSON.

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MT. VERNON, ILL., Sept. 29, 1894.

*Geo. W. Langford, Esq., Havana, Ill.,*

DEAR SIR:—It is with pleasure that I inform you that Mr. J. P. Baur arrived here yesterday with fish for our reservoir.

Mr. Baur treated us to an agreeable surprise: instead of small fish, one or two inches in length, which we expected, he brought us magnificent fellows of spawning age. Instead of bass alone he brought us spotted cat, white and black bass and jack salmon.

You have our sincere thanks. If ever you come to Mt. Vernon, call on me. You shall be treated right. Mr. Baur was delighted with our reservoir.

Yours very truly,

(Signed.) WILLIAM T. SUMNER.

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ATHENS, ILL., Oct. 17, 1894.

*Hon. Geo. W. Langford, Manito, Ill.:*

DEAR SIR:—In regard to the fish sent, only one died, and he (or she) died on the train. Not one has died since they were put in the pond. Quite a record for your brand of fish. And now let me thank you for your kindness in sending them, and rest assured I feel under obligations to you.

Yours, etc.,

(Signed.) GEO. WILLIAMS.

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PETERSBURG, ILL., Aug. 4, 1894.

*Mr. George W. Langford, Secretary Illinois State Fish Commission, Havana, Ill.:*

DEAR SIR:—In reply to yours of July 21st, which was mailed to Greenview and received to-day, would report as follows: Have prosecuted one case for illegal fishing and gained it. Have lost no cases. Have seized no nets, seines or traps. Am after other cases which I hope to establish. In the case tried, parties plead guilty and paid $30.00 fine, $15.00 of which I paid to informer and the balance left with the justice to turn into the school fund.

Yours respectfully,

(Signed.) L. H. FOUCHE,
*Fish Warden.*

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CALHOUN, July 23, 1894.

*Mr. Geo. W. Langford, Secretary State Fish Commission, Havana, Ill.:*

DEAR SIR:—I have arrested six men: have lost no case. Please let me know if it is my duty to take their nets away from them, if they are contrary to law; also, how far my district extends, and whether I have a right to go anywhere where the law is violated, or not. If they build small dams across streams and put traps in them, have I a right to take them out?

Yours truly,

(Signed.) DANIEL ELY,
*Fish Warden.*

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CHANDLERVILLE, ILL., July 24, 1894.

*Hon. Geo. W. Langford, Secretary Illinois State Fish Commission, Havana, Ill.:*

DEAR SIR:—I have made arrests as follows: March 8, 1894; case lost. Proved waters navigable. May 23, 1894; case dismissed.

Warned all persons up and down the river to take up nets during April, May and June of this year, which was generally obeyed, so far as I could learn.

Yours respectfully,

(Signed.) S. G. JOHNSON,
*Fish Warden.*

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VIRGINIA, ILL., July 23, 1894.

*Hon. Geo. W. Langford, Secretary State Fish Commission, Havana, Ill.:*

DEAR SIR:—I have prosecuted four cases; successful in two, lost two. Abandoned suits against five parties because law would not sustain me. It seems to me it would be well to try for better legislation, as present law does not cover the ground.

Yours truly,

(Signed.) H. H. TURNER,
*Fish Warden.*

EAST CARONDELET, ILL., July 23, 1894.

*Mr. Geo. W. Langford, Secretary Illinois State Fish Commission, Havana, Ill.:*

DEAR SIR:—I report as follows: Number of arrests made, twelve; number of cases won, ten. I have taken three small nets used as seines with a mesh of one inch. Have taken no traps. Have warrants for the arrest of two parties who have left the State.

Yours respectfully,

(Signed.) JOHN F. SIMONS,
*Fish Warden.*

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THORNTON, COOK COUNTY, July 26, 1894.

*Mr. Geo. W. Langford, Secretary State Fish Commission, Havana, Ill.:*

DEAR SIR:—Yours of the 21st at hand. Will say in reply, I have made nine arrests, no cases lost as yet. I have captured four seines. Three of the arrests were made yesterday, and have had no trial yet. There seems to be a good deal of trouble over the Little Calumet river as to whether they have a right to seine there with a two inch mesh. It is navigable as far as Blue Island, but they cannot run boats any farther as there is not more than a foot of water in places.

Yours truly,

[Signed.] F. FLANAGAN.
*Fish Warden.*

---

BEARDSTOWN, ILL., July 28, 1894.

*Hon. Geo. W. Langford, Secretary Illinois State Fish Commission, Havana, Ill.:*

DEAR SIR:—Yours of the 21st at hand. In reply will say I have made no arrests and have captured no seines or nets.

Yours truly,

[Signed.] JAS. W. MORRISEY,
*Fish Warden.*

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July 25, 1894.

*Mr. Geo. W. Langford, Secretary State Fish Commission, Havana, Ill.:*

DEAR SIR:—You ask for my report, and I will give it to you as well as I can remember. I got two men who were fishing through the ice last winter, and had them fined $10 and costs each. I have not been able to detect any violations since. I spent four nights on Long Lake as I heard they were fishing there, but they did not spear any. I have been on the lookout on this lake also, and I have not got anything for it, and I am going to send in my resignation.

Yours truly,

[Signed.] JAMES O'NEIL. *Fish Warden.*

## NATIVE FOOD FISH DISTRIBUTED.

The distribution of native fish covers the State as nearly as possible, wherever a stream can be reached by passenger train. Below is given a list of plants. The number in each plant varies from 200 to 5,000, according to size and variety. In great majority of instances, breeding fish were planted. The list does not include the plants of fry, such as wall-eyed pike and perch, which were in most instances planted in the larger rivers and streams, aggregating about 19,000,000 in numbers, 12,000,000 of this number having been obtained from the U. S. Fish Commission and hatcheries outside of the State:

| | |
|---|---|
| Des Plaines river | Cook county |
| Salt Creek | Cook county |
| East Des Plaines river | Des Plaines county |
| Indian Creek | Des Plaines county |
| Fox river | Kane county |
| Somonauk Creek | De Kalb county |
| Bureau Creek | Bureau county |
| Henderson river | Henderson county |
| Fox | Kendall county |
| Illinois river | La Salle county |
| Indian Creek | La Salle county |
| DuPage river | DuPage county |
| Green river | Lee county |
| Rock river | Whiteside county |
| Rock Creek | Whiteside county |
| Coal Creek | Bureau county |
| Spoon river | Stark county |
| Spoon river | Knox county |
| Edwards river | Mercer county |
| Sny Ecarte | Pike county |
| Rock river | Rock Island county |
| Edwards river | Henry county |
| Illinois river | Cass county |
| Indian Creek | Cass county |
| Wood river | Madison county |
| Kankakee river | Will county |
| Mackinaw river | McLean county |
| Salt Creek | Logan county |
| Sangamon river | Sangamon county |
| Wood river | Madison county |
| Vermilion river | Livingston county |
| Little Wabash river | Wayne county |
| Lowe Cache river | Pulaski county |
| Upper Cache river | Pulaski county |
| Big Muddy river | Jackson county |
| East Fork Kankakee river | Marion county |
| Kankakee river | Fayette county |
| Sangamon river | Macon county |
| Sugar Creek | McLean county |
| Rock river | Lee county |
| Galena river | JoDaviess county |
| Menominee river | JoDaviess county |
| Vermilion river | JoDaviess county |
| Embarras river | Coles county |
| Little Wabash river | Jasper county |
| Wabash river | Clark county |
| Fox Lake | McHenry county |
| Lake | Gladstone |
| Lake | Galesburg |
| Lake | Belleville |
| Lake | Waterloo |
| Lake | Longbury |
| Lake | Lakeview |
| Lakes | Chicago parks |
| Lake | Pittsfield |
| Lake | Chester |

We give herewith a list of streams tributary to the Mississippi river, wholly or partly within the State of Illinois. The result of obstructing any one of these streams so as to prevent the free passage of fish from the Mississippi river, the great source of supply, can readily be seen; were it permanent, it would result in the total depletion of, not only the stream obstructed, but of all smaller streams tributary to that, in a comparatively short time, unless the fish were properly protected in their local habitations. Illinois is one of the best watered states in the Union, affording greater opportunities for the increase of the different varieties of native food fishes than many of the other states, and deserves that her fish products be not only increased, but properly protected.

## HEADQUARTERS ILLINOIS STATE FISH COMMISSION.

Our office and headquarters of State Fish Commission has been located at Spring Lake. Our reasons for doing so are that the water comprising the lake is perfectly clear, fed by thousands of springs that line the edge of the bluffs, offering one of the best fields for collecting in the State, and we were promised the free use of all the grounds needed to build ponds, in fact the ponds complete were assured if we located there. The only objection to present location lies in the fact that at low water access to the ponds from the river by boat is next to impossible, owing to filling up of channel dragged out for that purpose by the State several years ago, an appropriation of several thousands of dollars having been made by the legislature and turned over to the Canal Commissioners to make a channel for steamboats from Illinois river to the bluffs, which amount was only partly expended, the amount unused still on hand unexpended. We were promised that in case our ponds for breeding and rearing native food fishes were located there, that a channel sufficient to allow our State boat to get in and out would be made. Without such channel, it would be impossible to make practical use of our ponds, the product of which must be transported to some railroad point to be moved on passenger trains in order that best results may be obtained, and entire product not liberated at one point, but an equitable distribution to public waters throughout the State made instead.

The expense in making such channel is slight, and, in our opinion, should be made, if necessary, by the State itself, particularly as only about one-half the appropriation for that having been used, and less than one-half the remaining amount would be needed to complete it.

Spring Lake is unquestionably the best point for breeding ponds in the State, and the field for collecting both breeders and small fish larger here than at any other point in the State.

## ILLUSTRATIONS.

The illustrations used in this report were in the main loaned to us by Prof. S. A. Forbes, having been used in his biennial report as director of Illinois State Laboratory of Natural History, which we republish in part in this report by his permission, that part of it, at least, that treats of the work at or near Havana on Illinois river.

The frontispiece is a representation of our display of live fishes in Illinois Building at World's Fair. We insert, also, two illustrations of our office at Spring Lake, where headquarters of the Commission is located.

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

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*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.

TRIBUTARIES 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.
    Atchison's Fork.
    Ray's Creek.

Tributaries to Kaskaskia River:

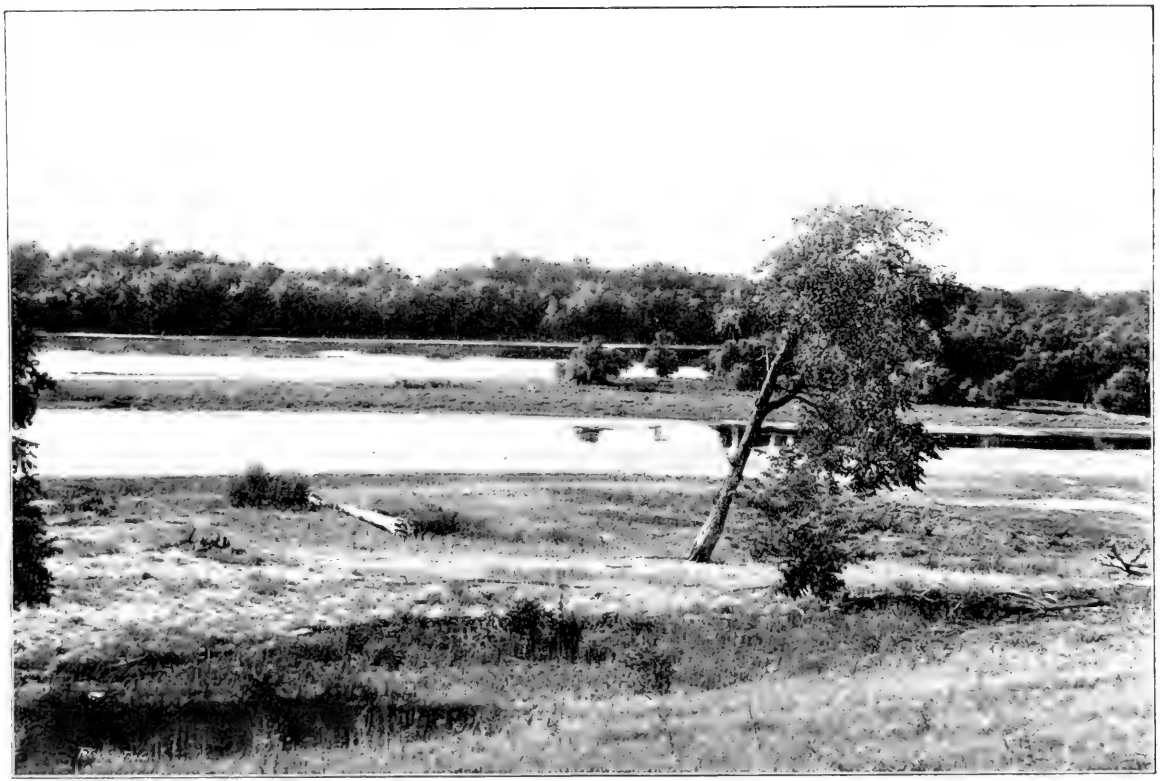
Nine Mile Creek.
Plumb Creek.
Silver Creek.
    East Fork.
Big Muddy Creek.
Elk Horn Creek.
Sugar Creek.
Shoal Creek.
Beaver Creek.
    Flat Branch.
East Fork of Shoal Creek.
    Dry Creek.
Middle Fork of Shoal Creek.
West Fork of Shoal Creek.
Crooked Creek.
Lost Creek.
Great Point Creek.
Prairie Creek.
Coles Creek.
Gibbs Creek.
East Fork of 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 Creek.
    Joe's Creek.
    Solomon's Creek.
    Otter Creek.
    Bear Creek.
    Honey Creek.
Apple Creek.
Big Grassy Creek.
Big Sandy Creek.
    Little Sandy Creek.
Walnut Slough.
Bay Creek.
Manvisterre Creek.

McKie's Creek.
Willow Creek.
Indian Creek.
    Prairie Creek.
Crooked Creek.
    Little Missouri Creek.
    Grindstone Creek.
        Carter's Creek.
    Camp Creek.
    Troublesome Creek.
    Panther Creek.
    Bronson's Creek.
    Middle Creek.
    Long Creek.
    North Branch of Crooked Creek.
    Spring Creek.
Sangamon River.
    Big Panther Creek.
    Clay's Creek.
    Crane Creek.
    Salt River.
        Prairie Creek.
        Sugar Creek.
        Kickapoo Creek.
        Deer Creek.
        Salt Creek.
        North Branch of 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 Creek.
    Goose Creek.
    Camp Creek.
    Madden Creek.
    Stevens Creek.
Otto Creek.
Spoon River.
    Big Creek.
    Putman Creek.
    Coal Creek.
    Cedar Creek.
        Swan Creek.
        French Creek.
        Sugar Creek.
        Walnut Creek.
Quiver Creek.
Bucklin Creek.
Mackinaw River.
    Mill Creek.
    Walnut Creek.
    Panther Creek.
    Northwestern Branch Mackinaw River.
    East Branch.
    Six Mile Creek.
    Honey Creek.
    Bray's Creek.
    Henline Creek.

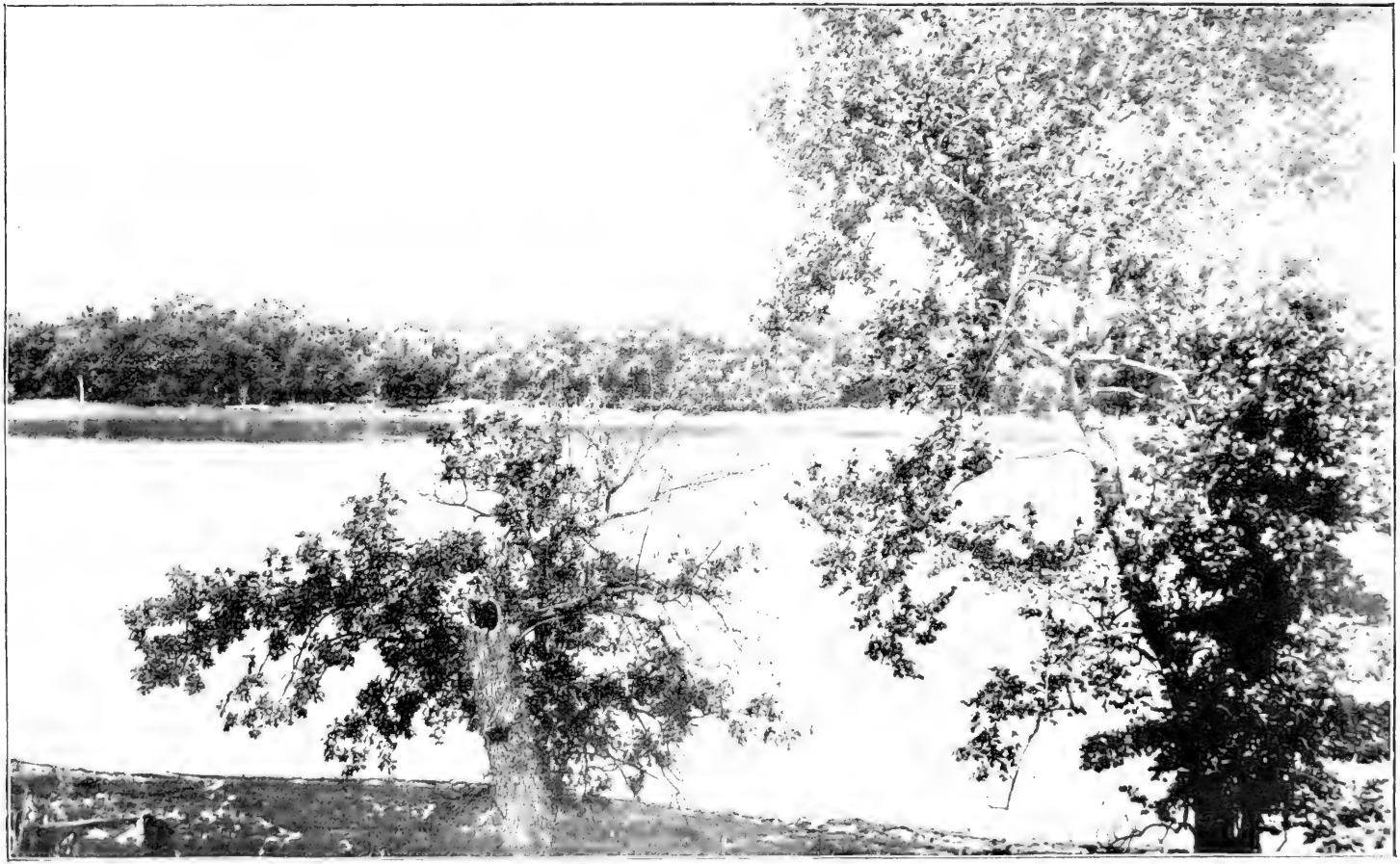
QUIVER LAKE. FIELD HEADQUARTERS, BIOLOGICAL STATION.



QUIVER LAKE AND ILLINOIS RIVER.

QUIVER LAKE, ILLINOIS RIVER. FROM EAST BLUFF.

QUIVER CREEK. NEAR ITS MOUTH.



MATANZAS LAKE.

Kickapoo Creek.
Richland Creek.
Crow Creek.
    North Branch of Crow Creek.
    South Branch of Crow Creek.
Strawn's Creek.
Crow Creek.
Sandy Creek.
Clear Creek.
Big Burian Creek.
West Indian Creek.
Negro Creek.
Vermilion Creek.
    Wolf Creek.
    Otter Creek.
    Scattering Point Creek.
    Rook's Creek.
    South Fork Vermilion River.
    North Fork Vermilion River.
Covel Creek.
Fox River.
    Big Indian Creek.
    Indian Creek.
    Mission Creek.
    Somonauk Creek.
    Battle Creek.
    Blackberry Creek.
    Fox Lake.
    Squaw Creek.
    Nippersink Lake and Creek.
Nettle Creek.
Waupean Creek.
Mazon River.
    West Fork of Mazon River.
    East Fork of Mazon River.
        Gooseberry Creek.
Au 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.
    Little Cache River.
        West Branch of DuPage River.
Jackson's Creek.
Des Plaines River.
    Calumet River.
        Little Calumet River.
    Salt Creek.
    Mill Creek.

Green 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 Creek.
Leaf River.
Kishwaukee River.
Piasa River.
Coon Creek.
Rush Creek.
North Branch of Kent's Creek.
Pecatonica River.
Rock Run.
Pillow Creek.
Sugar Creek.
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.

ILLINOIS

# STATE LABORATORY OF NATURAL HISTORY,

CHAMPAIGN, ILLINOIS.

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BIENNIAL REPORT OF THE DIRECTOR.

1893–1894.

## STATE LABORATORY OF NATURAL HISTORY.

### Laboratory Staff.

Professor Stephen Alfred Forbes, Ph. D., Director of Laboratory and State Entomologist.
John Marten, Field Entomologist.
Willis Grant Johnson, A. M., Assistant Entomologist.
Professor Henry Elijah Summers, B. S., Assistant Zoölogist.
Frank Smith, A. M., Assistant Zoölogist.
Charles Arthur Hart, Curator of Collections.
Henry Clinton Forbes, Librarian.
Lydia Moore Hart, Artist.
Mary Jane Snyder, Stenographer.

# REPORT OF THE DIRECTOR.

*To the Trustees of the University of Illinois:*

GENTLEMEN:—In accordance with your requirement as expressed in your action concerning the status of the State Laboratory of Natural History, taken June 8, 1892, I beg to submit the following report on the work of the Laboratory during the two years just passed.

The points of principal interest in our recent operations are (1) the Columbian Exposition exhibit of the zoölogy of Illinois, made by the Laboratory in 1893, under the auspices of the State Board of World's Fair Commissioners, and the accumulations of material coming into our possession at the close of the Exposition; (2) the establishment, conjointly with the University, in 1894, of a biological station for the continuous investigation of the aquatic life of the Illinois river and its dependent waters, near Havana; and (3) an elaborate experimental work done this year with measures for the destruction of the chinch bug, and especially for the dissemination of the contagious diseases of that insect, undertaken by the Laboratory staff, with the coöperation of the State Agricultural Experiment Station.

## COLUMBIAN EXPOSITION EXHIBIT.

Our zoölogical exhibit, occupying 3,000 square feet of floor space in the Illinois State building at Jackson Park, was so planned as to present the main and most attractive features of the native animal life of the State, and, at the same time, to illustrate the operations of the State Laboratory of Natural History, and of the State Entomologist's office associated with it. The exhibit was thus limited to specimens of the birds, fishes and insects of the State.

The relations of the Laboratory to the University of Illinois were shown by the position of this exhibit—immediately beside that of the University College of Science, and opposite the exhibits of the College of Agriculture and of Agricultural Experiment Station, with only an aisle intervening.

The leading features of our display were a most excellent collection of the birds of the State and of their eggs; a series of entomological collections, scientific, educational and economic; a model economic entomologists office and insectary, and a nearly complete display of the fishes of Illinois in alcohol.

The entomological collections were shown in connection with the model entomologist's office, which contained five hundred and forty square feet in one room, with an annex twenty feet long by eleven feet wide for an insectary. Into this room was put a select and carefully arranged equip-

ment for first-class work in all departments of technical and economic entomology, sufficient for the use of a chief entomologist, and two assistants, including furniture, a section of the Laboratory library, a part of the library catalogue, record books with examples of the records, specimens prepared and arranged in the various ways useful for reference, apparatus for collecting and experiment, microscopes, a drawing equipment, and the like, making of the whole a model establishment, which, it was believed, might be profitably studied by any economic entomologist, foreign or American. In the insectary was placed apparatus of various kinds for the breeding and rearing of insects of injurious habit, and for the cultivation of the plants subject to insect injuries upon which experimental methods might be demonstrated.

The special exhibits made in this entomological department included a collection of sixteen hundred species of common Illinois insects, so selected as to present a correct general idea of the insect life of the State; separate collections of insects, in their various stages injurious to corn, to wheat, to the apple, and to the strawberry in Illinois, together with characteristic examples of their injuries; a special exhibit of the food of one robin for one year, based upon studies made at the Laboratory and published in our Laboratory bulletins; a set of insects ascertained to have been eaten by birds; a similar series eaten by fishes; a set of butterflies arranged with a view of illustrating the geographical distribution of insect species in Illinois; a set of Illinois insects illustrating the work of the Laboratory in supplying entomological material to the high schools of the State.

The ornithological exhibit was made in four series: (1) a collection of the game birds of the State, mounted as dead game; (2) a series of biological groups mounted in various naturalistic attitudes, with natural accessories indicating habits, haunts and the like; (3) a general collection of all the birds of the State, grouped according to their distribution within the State at different seasons of the year; and (4) a set of the eggs of birds breeding in Illinois.

Our ichthyology was illustrated by one hundred and fifteen species of the fish from various parts of the State, collected by the Laboratory force and exhibited in alcohol.

To this general account the following detailed statement may be added:

ORNITHOLOGICAL EXHIBIT.

| | | |
|---|---|---|
| Winter residents of southern Illinois | 108 | specimens |
| Winter residents of northern Illinois | 44 | " |
| Winter residents throughout Illinois | 141 | " |
| Summer residents of southern Illinois | 38 | " |
| Summer residents of northern Illinois | 59 | " |
| Summer residents throughout Illinois | 207 | " |
| Migrants passing through Illinois | 77 | " |
| Stragglers in Illinois | 24 | " |
| Common game birds of Illinois mounted as dead game | 53 | " |
| A group of wild turkeys mounted with naturalistic accessories | 6 | " |
| A group of prairie chickens mounted with naturalistic accessories | 4 | " |
| A group of crossbills mounted with naturalistic accessories | 8 | " |
| A group of yellow-bellied sapsuckers, with nest and eggs | 4 | " |
| A pair of little green herons, with nest and eggs | 2 | " |
| Total number of birds exhibited | 775 | " |

One hundred and twenty-five clutches of birds' eggs, representing as many species of birds nesting in Illinois, were also shown, the total number of eggs in these clutches being five hundred and twenty-five.

ENTOMOLOGICAL EXHIBIT.

| | Pinned specimens. | Vials. | Drawings |
|---|---|---|---|
| Illinois insects injurious to the apple | 240 | 106 | 57 |
| Illinois insects injurious to corn | 150 | 85 | 22 |
| Illinois insects injurious to wheat | 53 | 43 | 9 |
| Illinois insects injurious to the strawberry | 52 | 20 | 13 |
| Insects in the food of birds | 195 | 24 | ..... |
| Insects in the food of fishes | 91 | 9 | ..... |
| Geographical distribution of Illinois butterflies | 184 | ..... | ..... |
| Illinois insects as furnished to high schools of Illinois | 459 | ..... | ..... |
| Common insects of Illinois— | | | |
| Dermaptera | 4 | ..... | ..... |
| Orthoptera | 215 | ..... | ..... |
| Platyptera | 12 | ..... | ..... |
| Odonata | 73 | ..... | ..... |
| Plectoptera | 8 | ..... | ..... |
| Hemiptera | 566 | ..... | ..... |
| Neuroptera | 20 | ..... | ..... |
| Mecoptera | 4 | ..... | ..... |
| Trichoptera | 3 | ..... | ..... |
| Coleoptera | 2,662 | ..... | ..... |
| Diptera | 541 | ..... | ..... |
| Lepidoptera | 1,058 | ..... | ..... |
| Hymenoptera | 1,016 | ..... | ..... |
| Totals | 7,606 | 287 | 101 |

In addition to the above, there were exhibited about 3,000 specimens of lepidoptera and coleoptera, twenty boxes each, from the standard collection of the State Laboratory, and twenty-four racks of vials (about 500) of alcoholic specimens.

The special exhibit of the food of one robin for one year consisted of 5,481 pinned specimens of insects, eighty tubes, each fifteen inches in length, containing alcoholic specimens, besides vials and tubes containing fruit and seeds.

The total number of separate objects shown in these collections was 18,550.

The furniture of the entomologist's office comprised two office desks, four plain work tables, three tables with specimen cases, a table for reference books and record books, two small cases for specimens, a large bookcase, two reagent cases, a type-writing machine and desk, a letter-press and stand, a small printing-press and case of type, a sink, and some chairs.

In the bookcase was placed a section of the library of the State Laboratory of Natural History, the books selected being mainly entomological, and including serial publications, periodicals, monographs, reference books, pamphlets, etc., to the number of about five hundred volumes. A complete set of the publications of the State entomological reports was also displayed on one of the office tables.

Under the head of working apparatus, there were shown in this room one compound microscope and accessories, two dissecting microscopes and accessories, two large microtomes, a complete outfit for collecting insects, sets of bottles, vials, and reagents for preserving insects, an apparatus for inflating larvæ, and that used in mounting and preserving insects.

In the insectary, adjoining the office room, were sixty large and small breeding cages with glass fronts and gauze sides; forty glass jars of various sizes and shapes, to be used as breeding cages; and two gauze-covered cages suitable for outdoor use. These were arranged on shelves and on a table covered with sand. There were also in this room a work table with an Arnold steam sterilizer, large culture jars and funnels, and other apparatus used in the culture of fungi causing insect disease.

The zoölogical display was made in accordance with detailed plans prepared by the director of the State Laboratory, the execution of which was confided to Mr. Charles F. Adams* for the birds, and to Prof. H. E. Summers for the insects.

The material for the ornithological exhibit was chiefly obtained by special collections made for this purpose during the winter of 1891 and the spring and summer of 1892 by parties sent out from the Laboratory, and mounted by Mr. Adams himself. As it was quite impossible to make a complete collection of the birds of the State within so short a time, the deficiencies remaining were supplied by selections made from the museums of the University of Illinois at Champaign, and of the State Board of Agriculture at Springfield, and by purchase of skins from taxidermists.

The entomological exhibit was likewise provided in part from special collections made by Laboratory employés and by assistants especially engaged for the purpose, and in still greater part from the cabinets of the State Laboratory and of the University of Illinois.

The beautiful colored drawings, one hundred and one in number, distributed through the entomological exhibit to illustrate species too small to be well seen by the naked eye, were made at the State Laboratory for the purpose by Miss Lydia M. Hart, the special artist of the establishment.

The ichthyological collections were all made during the season of 1893 by assistants sent from the Laboratory, Mr. J. E. Hallinen, a student of the University, doing the greater part of the field and Laboratory work.

It may be proper to place on record here some statement of the manner in which this exhibit was received by those best qualified to appreciate it. In the *Auk*† for October, 1893, Mr. Frank M. Chapman, of the American Museum of Natural History, at Central Park, New York, writes in an article on "Ornithology at the World's Fair," that "Illinois was easily the leader in the department of local collections representing the bird life of a state or province. Its collection," he says, "placed in the State building, is well mounted, and the method of arrangement is one which might well be followed in the display of similar collections." Elsewhere he says that it is by far the best state collection that he has ever seen. Mr. Robert Ridgway, Curator of Ornithology to the United States National Museum, writes of it also as "incomparably superior to any other state exhibit at the Fair, and a very close competitor with the Government exhibit." He says, "I do not see how, making due allowance for limited time and means, it could have been improved."

Equally flattering comments were made upon the entomological features of the exhibit by economic entomologists, both American and foreign, the collection of apple insects especially, and that exhibiting the food of a single robin for one year, attracting wide attention.

The entire mass of this material, excepting only a few birds borrowed from the museum of the university and seventy-one specimens from that of the State Department of Agriculture, was, at the close of the Exposition, transferred by the State World's Fair Commissioners to the Illinois State Laboratory of Natural History, and removed to Champaign.

The ornithological collection thus acquired I have placed in the museum of the university so far as the cases there will contain them, and the remaining material is now in the collection rooms of the State Laboratory, in the basement of Natural History Hall.

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*The sudden and wholly unexpected death of Mr. Adams at Chicago while engaged in the installation of this exhibit, to whose preparation he had devoted nearly two years of intense and unremitting labor, brought to a mournful and untimely end the promising career of an excellent naturalist and a most lovable man. Admirably equipped by his university education, by his very unusual artistic skill as a preparator of zoölogical material, and by his experiences of scientific travel in various parts of the world, he seemed merely at the beginning of a life of eminent usefulness to science and to the State.

†A quarterly journal, the organ of the American Ornithologists' Union.

## THE EXPOSITION AQUARIUM.

This is the proper place to mention also a very important gift made to the Laboratory by the United States Commissioner of Fish and Fisheries, Hon. Marshall McDonald, at the close of the Exposition.

As the attendant circumstances were imperfectly understood at the time by the public at large, it seems desirable to place on record here a correct account of this transaction.

Under your authorization, as recorded in your proceedings for November 16, 1892, I accepted an appointment as Director of the Aquarium Exhibit of the Commission at the Columbian Exposition, taking charge January 1, 1893, and continuing to serve in that capacity to the close of the Exposition, October 31. At this latter date, the living inmates of the Aquarium comprised representatives of fifty-two species of marine and sixty-two specimens of fresh water animals, about 2,500 specimens in all.

It was the earnest wish and hope of the Commissioner and myself that the maintenance of this live exhibit at the exposition—of which it was throughout one of the most attractive features—might result in the establishment at Chicago of a permanent aquarium and biological station, and to this end I was authorized in October to offer the contents of the tanks in the Aquarium building, with some unimportant exceptions, first to the trustees of the proposed Columbian Museum, and, second, to the South Park Commissioners of Chicago, under such conditions only as would secure the maintenance of the establishment and its development as a popular aquarium and a station for scientific research. This offer I made to the Trustees of the museum October 12th, and more fully October 23d, in the following letter addressed to the Secretary of the Board:

"I beg to add to the representations of my letter of October 12th this formal tender, to the trustees, of the present living contents of the aquarium tanks (together with the supply of sea water in circulation), with the exception of the sea anemones, the viviparous perch, and the specimens of the various species of trout, which are reserved by the Commissioner for use elsewhere. This offer is subject to the following conditions, intended only to enable me to assure the Commissioner that the purposes he has had in view in establishing and maintaining the aquarium exhibit will be substantially secured.

"It is, of course, to be presumed and understood that if these collections are accepted, it will be with the wish and intention of maintaining them as a live exhibit for the public benefit on at least their present scale of number and variety. Such specimens as die in the aquarium during the next six months are to be placed in alcohol and turned over to the Illinois State Laboratory of Natural History for distribution to the public high schools and State educational institutions, according to the law defining the duties of the Laboratory.

"We beg also that the trustees will formally express the intention, which we are satisfied that they entertain, of using their best endeavors for the development of the aquarium as a scientific institution—a biological station, in fact—with the expectation of affording to scientific men, in due season and according to the apparent demand therefor, facilities for the study and experimental investigation of the plant and animal life of the fresh waters of this country.

"To this end, we believe it indispensable that the aquarium should be at all times under the general supervision of an experienced scientific biologist, capable of rightly shaping its general policy, and competent by training and ability to utilize for the advancement of science the abundant opportunities for observation and experiment which such an establishment must afford.

"The very short time now available for the organization of an aquarium staff qualified and prepared to take charge of this highly perishable material, crowded as this time must be with an overwhelming multitude

of other equally urgent affairs, leads us further to request that we may be assured of the appointment, for a period of six months, of an expert superintendent and experienced assistants, who shall be acceptable to the Commissioner, or his representative, as in every way competent and sufficient for the care of this material under the circumstances existing and soon to ensue. The destructive consequences to our delicate and perishable collections which must follow upon even a temporary mistake in this matter, and the unfortunate complications likely to arise if a wrong beginning were made, lead us to ask that our judgment—greatly enlightened as it has been by the season's experience with the present aquarium plant—may thus be allowed due weight in the selection of the temporary aquarium staff upon whom the care of the material for the winter will fall. As this is perhaps the most difficult and important, and at the same time the most urgent, feature of the proposed arrangement, I have anticipated the action of the trustees so far as to get the consent of the Commissioner to the continuance—for some months if desired—of one of the present aquarium superintendents, a regular employé of the Fish Commission, to whom the Commissioner is willing to give leave of absence for a time, to enable him to help over the emergency. I have also ascertained that all the present aquarium assistants, who are now a body of picked and trained men, thoroughly acquainted with the situation and their duties, would be willing to continue, at least for a time, in their present employment. The existing organization can thus be carried over, without a break, in a way to secure the safety of our material for the winter, and to give the trustees ample time to mature a permanent organization and select a satisfactory staff.

"So far as a general zoölogical supervision of the aquarium is concerned, I beg to say that it will be a pleasure to me to serve the trustees temporarily in this matter, with the understanding that I shall be relieved as soon as a satisfactory selection of a permanent director can be made.

"The foregoing statement contains all the conditions precedent to a transfer. It will be seen that they are intended merely to find a basis of agreement between Commissioner McDonald and the Trustees of the Columbian Museum as to the general purposes and policy of the aquarium, and to secure the safety of the collections during the period of readjustment and reorganization.

"I should add, as an item of information which may be of interest to you, that it is now agreed that in case the arrangement here proposed is not made, the collections shall be placed in charge of the Illinois State Laboratory of Natural History (of which I am director) for distribution to the public high schools and educational institutions of the State of Illinois. I very much prefer, however, such disposition of them as may result in a permanent, living, active scientific institution of the first class, so related and supported as to give us a fair assurance of its development in accordance with the importance of its field and the greatness of the city which it will represent.

"I am further authorized by Commissioner McDonald to say that if such an institution be provided for in Chicago, he will be glad to undertake to establish in connection with it a first-class fishcultural station of the United States Fish Commission, on condition that grounds can be found for such an institution. If this idea was carried out, we should have, practically in one institution, a popular aquarium of the first class, a biological station maintained in the interests of science, and a fish commission station devoted to practical application of aquatic zoölogy. Such an association of kindred undertakings would greatly reduce the cost of maintaining each, as many of the facilities and much of the apparatus could be adapted to all three as readily as to one alone."

The museum trustees were eventually obliged to decline the proposed gift, owing to a lack of funds secured and available for either immediate or permanent maintenance, and owing also to the incompleteness of the museum plans and organization at that early date, and, I, therefore, made

an identical proposition to the South Park commissioners. In the meantime, in order to facilitate the final disposition of the aquarium material, and to make sure that it would be properly utilized in any event, an arrangement was made for its transfer, November 1, to the State Laboratory of Natural History, and I was so notified, October 25, by the following telegram from Commissioner McDonald:

"I have determined, with one exception, which I have indicated to you, to turn over all the aquarium material to the State Laboratory of Natural History for such disposition as the director in his discretion may find best."

This tender was formally accepted by me, October 30, in the following letter to the representative of the commission at Chicago:

"In reply to your favor of October 26th, notifying me that you are prepared, in accordance with the instructions of the commissioner, to turn over to the State Laboratory of Natural History the specimens now in the aquarium, with certain exceptions, reserved by the commissioner, I beg to say that I shall accept, with pleasure, on behalf of the Laboratory, all of this material which I find suitable for use or distribution by us.

"I need not say that I recognize most gratefully the very great obligation conferred by the commissioner upon the State Laboratory of Natural History, and upon the scientific and educational institutions dependent upon it in part for their supply of scientific material. Such specimens as I take possession of will be utilized to the very best of our opportunity for purposes of scientific study and instruction."

Being notified, October 31, by one of the commissioners of the South Park, that the commission would probably accept the aquarium on the conditions named, and would, at any rate, provide temporarily for its maintenance until formal action could be taken by them, I did not disturb it until November 7, at which time the park commissioners decided not to undertake to provide for its permanent support and development. I, consequently, then took charge of its contents for the State Laboratory; distributed such portion of them to the colleges and high schools of Chicago as they could utilize and care for; shipped the live marine material to Champaign for an experiment in aquarium maintenance; and placed the remainder in alcohol for subsequent distribution to scientific institutions and public high schools.

A most careful and persistent effort made at the University to maintain these marine animals in tanks of sea water, by the aid of a mechanical aerating apparatus, such as we used in Chicago, gradually failed through the unavoidable fouling of the water, due apparently to the lack of marine vegetation, which the exigencies of the time had made it impossible for me to provide in advance. The specimens dying were, however, preserved and added to the mass of material held for the supply of public schools and other educational institutions of the State.

My experiment here, and my much more valuable experience at the Exposition Aquarium in the thoroughly successful maintenance of marine animals under artificial conditions, have given me positive assurance that it would be quite practicable, within the limits of a reasonable expenditure, to maintain at this distance from the sea a salt-water aquarium continuously year after year, in which the more hardy and interesting forms of marine life could be exhibited for the benefit of a general public, and likewise for that of university students. I desire to commend this matter very earnestly to your attention, especially as no university in America not in the immediate vicinity of the sea is at present doing anything whatever in this direction.

The maintenance of a fresh-water aquarium, although more difficult than that of a marine exhibit, would be in many respects more convenient and in every way equally useful. The two sorts of collections could, of course, be readily combined in the same establishment. This enlargement of our facilities would be particularly helpful as an apparatus

for experimental investigation in connection with the biological station on the Illinois river, now maintained jointly by the State Laboratory and the University of Illinois. I suggest it to you for consideration in connection with plans for a university museum building, with which it might be best associated both in management and construction.

### THE BIOLOGICAL STATION.

I have next to report the establishment last spring, in leased quarters on the Illinois river, at Havana, of an aquatic Biological Station, jointly maintained throughout the season by the University of Illinois and the State Laboratory of Natural History.

This Station was opened April 1 under authority of the trustees of the University given in your action on a communication submitted by me to your committee on instruction March 2, 1894, and printed in part in the proceedings of the board for March 13 (p. 114). As the appropriation made by you to this end from the University funds was not immediately available, the Station work was carried by the State Laboratory until July 1, and the resources of the Laboratory will also be further drawn upon, as may be necessary, for its support until the Legislature may have had time to act upon our request for the means of future maintenance.

As this establishment is unique in this country, and is in some important respects the only one of its kind in the world, I shall feel obliged to enter into some detail concerning its purposes, organization and operations. Since it is now, and, in my judgment, should continue to be, supported jointly by the University and the Laboratory, I can best report upon it here from both these points of view.

The Station depends for its establishment, perpetuation and development on the acceptance of the following general ideas: That it is a part of the office of a university, properly so-called, to promote the progress of pure science; that an institution whose scientific work is closely limited to the economic field may be an industrial school, but cannot be a university; but that a state institution both educational and scientific in its character should stand in the closest possible relation to the general public welfare, and hence should work out in every direction the application of the results of its investigations to industrial and educational affairs; and that a state institution of this character should especially help to make the people of the state acquainted with the state itself.

The general objects of our Station are to provide additional facilities and resources for the natural history survey of the State, now being carried on, under legislative authorization, by the State Laboratory of Natural History; to contribute largely to a thoroughgoing scientific knowledge of the whole system of life existing in the waters of this State, with a view to economic as well as educational applications, and especially with reference to the improvement of fish culture and to the prevention of a progressive pollution of our streams and lakes: to occupy a rich and promising field of original biological investigation hitherto largely overlooked or neglected, not only in America, but throughout the world; and to increase the resources of the zoölogical and botanical departments of the University by providing means and facilities for special lines of both graduate and undergraduate work and study for those taking major courses in these departments.

The Station differs from most of the small number of similar stations thus far established in this country from the fact that its main object is investigation instead of instruction, the latter being a secondary, and at present an incidental object only. It has for its field the entire system of life in the Illinois river and connected lakes and other adjacent waters, and it is my intention to extend the work as rapidly as possible to the Mississippi river system, thus making a beginning on a comprehensive and very thoroughgoing work in the general field of the aquatic life of the Mississippi Valley, in all its relations, scientific and economic.

The special subject which I have fixed upon as the point of direction towards which all our studies shall tend is the effect on the aquatic plant and animal life of a region produced by the periodical overflow and gradual recession of the waters of great rivers, phenomena of which the Illinois and Mississippi rivers afford excellent and strongly marked examples. It is highly interesting and important, including in its scope nearly every topic concerning the life of our waters which in any way interests the biologist or the practical man, and it is one for whose investigation we are perhaps better prepared by experience, equipment, purposes and associations than any other institution or group of naturalists in the country.

As an incidental, but by no means unimportant, result of our work, we shall accumulate the material for a comparison of the chemical and biological conditions of the waters of the Illinois river at the present time and after the opening of the Chicago drainage canal.

The practical importance of our undertaking as affording the only sound basis for a scientific fish culture is fully recognized by the highest American authority in this field. In a recent letter on this subject, Hon. Marshall McDonald, U. S. Commissioner of Fish and Fisheries, says:

"I have carefully gone over the plans of the Biological Station proposed by you, and am particularly struck with the comprehensiveness of the plan of work to be undertaken. The knowledge to be obtained by such investigation as you contemplate is absolutely necessary as a foundation upon which to build an intelligent, rational administration of our fishery interests. A knowledge of life in its relation to environment is an important subject which biological investigators have not heretofore sufficiently dealt with, but which, it seems to me, is necessary in order to give practical value to special studies of the different species. After all, it is the relations and interdependence of life in the aggregate, and of the conditions influencing it adversely or otherwise, that mainly concern those who are seeking to apply scientific methods of investigation to economic problems.

"I need not tell you that you may count on the Commission for any coöperation and aid that we may be able to give you in this direction, which, looked at from a purely economic point, I consider of the utmost importance."

The Station will also serve as a center of interest and activity for University students engaged on zoölogical and botanical subjects, and will, in this way, supply a most serious deficiency in our equipment, the disadvantages of which I have long deplored. Not many years ago, biological instruction in American colleges was mostly derived from books. Of late, it has been largely obtained from laboratories instead, but several years' experience of the output of the zoölogical college laboratory has convinced me that the mere book-worm is hardly narrower and more mechanical than the mere laboratory grub. Both have suffered, and almost equally, from a lack of opportunity to study nature alive. One knows about as much as the other of the real aspect of living nature and of the ways in which living things limit and determine each others' activities and characters, or in which all are determined by the inorganic environment. I have been particularly struck with the insufficient preparation of the ordinary graduate from laboratory courses in zoölogy for the work of a special instructor in the public schools. He cannot be an intelligent guide and teacher in the field, and he commonly has no command of apparatus and methods of experiment calculated to make his pupils acquainted with the system of the living world.

The immediate and pressing problem of the biological instructor is to provide an equipment and to work out methods by means of which his students may be brought into helpful contact with this world of life while it still lives, and by which they may be enabled to investigate experimentally the problems of mutual influence and relationship which come under the general head of what is now known as biological oecol-

ogy. With the new Station at Havana put on a firm foundation and liberally maintained, the University of Illinois will be better equipped in this particular than any other institution in America.

The utility of the Station to the University summer school has already been mentioned. Possibly still more important is the opportunity which it will offer, when permanently established and fairly well developed, to the independent student and investigator, zoölogical or botanical, who may desire to pursue his studies in the field covered by our operations. It is a part of the plan of organization and equipment of our Illinois River Station to receive and assist in every practicable way advanced students and investigators of this description from whatever place they may come.

Havana was selected by me as the site of the Station because of several unique advantages offered by that locality. Streams and lakes illustrating practically all the typical Illinois river situations are to be found there, convenient of access from a central point and from each other. An extensive sandy bluff, commonly well shaded and oozing spring water at its foot, borders the river bottom on the east, and introduces several unusual features of interest to the oecologist, besides affording a clean and hard shore to work from, dry, shady and well-drained camping ground, and an abundance of very pure cold water at all times of the year. No other situation at all suited to our purpose could have been selected which was less likely to endanger the health of our field parties, necessarily exposed to malarial infection as they are in midsummer and early fall by the nature and surroundings of their work. The Havana division of the Illinois Central Railway affords ready means of communication between the Station and the University by trains running without change of cars, and thus makes possible the convenient transportation of live material to the University for study and experimental use, and also gives the students of the summer school a chance to avail themselves of the Station equipment for experience in the field. The absence of any extraordinary source of pollution to the river water nearer than Pekin, thirty miles above, and the neighborhood of the field operations of the United States Fish Commission at Meredosia, fifty miles below, were likewise points in favor of this location. The summer's experience there has satisfied me that no mistake was made in this respect, but that, on the contrary, the vast abundance and great variety of plant and animal life in the river at that point, and especially in the bottom-land lakes connected with the stream in all stages of water and completely submerged by it in times of overflow, makes this locality one of the very best possible for my purposes.

The work was provided for this year in three well-placed rooms in the town itself and in a "cabin boat" on the Illinois river, both furnished from the laboratories and libraries of the University and the State Laboratory of Natural History with everything necessary to first-class work in the collection, preservation, preparation and systematic study of our material, together with some special pieces of apparatus and other appliances manufactured to our order for this work.

The office and laboratory rooms were supplied with running water and electric light, and liberally provided with the usual equipment of a biological laboratory, consisting of compound and dissecting microscopes (Reichert and Zeiss), microtomes, biological reagents to the number of one hundred bottles, water and parrafine baths, laboratory glassware, tanks for alcohol, a coal stove, a kerosene stove, laboratory tables for five assistants, and a working library of about one hundred and twenty volumes.

The cabin-boat was used as a field headquarters, and stationed on Quiver lake, two and a half miles above the town. It carried the seines, sounding lines, aerial and aquatic thermometers, dredges, surface nets Birge nets, insect nets, plankton apparatus, and other collecting equipment, together with microscopes (Zeiss and Bausch & Lomb) reagents, a small working library, a large number of special breeding cages for

THOMPSON'S LAKE. Biological Field Party and Equipment.

THOMPSON'S LAKE. COLLECTING.

PHELPS LAKE. LAST POOLS REMAINING.

DRY BED PHELPS LAKE.

rearing aquatic insects, and a few small aquaria. This boat was provided with sleeping accommodations for four men, and with a well-furnished kitchen.

I have myself exercised a general supervision over the station work, planning and following its operations as closely as my other responsibilities would permit. Mr. Frank Smith, University Instructor in Zoölogy and Zoölogical Assistant of the State Laboratory, has been in immediate charge of the station since April 7th. He has been responsible for the execution of the details of the general plan, and for the technical work on aquatic worms. Mr. C. A. Hart, Curator of the collections of the State Laboratory, has done the entomological work of the station: Mr. Adolph Hempel has worked on protozoans and rotifers: Mrs. Dora Smith has served as our microscopic technologist, and has had charge of the rooms down town: and Mr. Newberry, of Havana, has kept the cabin boat with its equipments and done duty as a general assistant. I also had the services of Mr. Ernest Forbes as general collector for about six weeks of the vacation period. Extensive collections and studies illustrating the aquatic botany of the station have been made periodically at Havana by Prof. Burrill, Mr. Clinton, Mr. Yeakel and Miss Ayers, of the University Botanical Department. Chemical analysis of the waters from our principal collecting stations have been made by Prof. Palmer, and steps have been taken to secure a good map of the locality. Miss Lydia M. Hart, artist of the State Laboratory, has been at Havana for natural history drawing, and Assistant Professor Summers, of the University Department of Physiology, spent a part of his vacation making a large series of photographs of the station and its surroundings for use in illustrating its report.

The greater part of our field work was done on seven regular stations, visited periodically throughout the year: two on the Illinois river, three on Quiver lake, and one each on Phelp's and Thompson's lakes. The river, about five hundred feet wide at low water mark, and at the highest water not less than four or five miles across, flows rather sluggishly over a muddy bed, with banks usually of mud or clay, peculiar, however, in the vicinity of Havana and for several miles above and below that point, in the fact that the eastern and western shores are strongly contrasted in character. The former, as already said, is a bank of sand from twenty to sixty feet in height, with but a little mixture of soil, the western border of a sandy plateau which stretches back from the river from twelve to fifteen miles. The face and summit of this slope and a varying extent of country beyond are commonly covered with upland forest trees, largely oak and hickory. At high water mark this bluff forms the immediate bank of the river itself, but as the water recedes a sloping flat is uncovered, sometimes buried to a little depth in sand, but with clay beneath. This flat widens, here and there, into a boggy or somewhat swampy belt or patch, thickly overgrown with underbrush and course flowering plants.

The river runs, in the Havana district, much nearer this bank than the opposite one, so that few of the bottom land lakes lie between it and the sandy bluff. Where this sand rests on the clay, multitudes of springs ooze forth, forming trickling rivulets, which frequently unite before they reach the river in streams a few feet across. This water is of surface origin, being practically the leachings of the sand bed mentioned. It is remarkably pure, cool, and abundant, entirely free from organic matter, and scarcely at all liable to malarial contamination.

The opposite bank of the river is ordinarily a flat slope of black woodland soil, making, when moist, a treacherous mud, and springing up, when laid bare, with a dense growth of weeds and grass. This bank is subject to overflow commonly twice a year, in late winter or early spring and again in June. During these periods of high water all the bottom-land lakes are of course submerged, becoming distinguished again from the river itself only after the waters recede—perhaps after an interval of several weeks. Most of these lakes are either abandoned portions of old

beds of the river, more or less completely cut off from the present channel by silting up at either end, or they are similar portions of old beds of tributary streams.

Quiver lake, in which the headquarters boat was placed, is such a portion of the river bed. It varies in length (when the water is low enough to define it clearly) from one and a half to two and a half miles, and has a usual width of about five hundred feet at low water mark. It lies nearly parallel with the main river, into which it opens, even in the lowest stage of water, at its lower or southern end, by about half its greatest width. At its upper end it receives Quiver creek, a stream some twenty to thirty feet across, which comes down for several miles across the sandy plateau, receiving some distance above its mouth the drainage of a region formerly filled with swamps. This lake lies at the foot of the sandy bluff and is separated from the river on the west by a narrow tongue of low black land, either bare or covered with trees, according to its height above the usual water level.

Thompson's lake lies wholly within the bottom-lands of the main river and its banks are consequently everywhere low and flat. It is five miles in length by about half a mile in width at an average midsummer stage. When the water is moderately high, it can be entered by skiffs from either end, but as the river falls the lake is shut off below and connects with the stream only by a somewhat tortuous narrow channel about two miles in length at the northern end. Neither this nor Quiver lake ever goes dry, the water in the deepest places being not less than three and a half or four feet during the dryest seasons. Phelps lake, on the other hand, is a pond about half a mile long by a fourth as wide, having neither inlet nor outlet after the overflow has receded, rarely drying up entirely, but not infrequently being reduced to a few shallow pools. It is completely surrounded by a bottom-land forest, and its bed is a mere shallow depression in the mud.

Beside our regular station work, occasional collections were made from various other waters, including Spoon river, Matanzas lake—three and a half miles below Havana, on the eastern side of the river—Clear lake, Dogfish lake, Mud lake, Liverpool lake and Quiver creek.

At each of the above regular stations thoroughgoing collections and careful observations were made at intervals of from one to three weeks, the time varying according to the nature of the station and the teachings of our experience. The mid-stream and mid-lake collections were of two kinds, qualitative and quantitative: the former made at surface and bottom with towing net and dredge, and the latter with a plankton net of the finest bolting cloth (No. 20) hauled from top to bottom at a regular and uniform rate and over identical distances. As the waters in which we worked were much too shallow for profitable vertical hauls—often not more than five or six feet in depth—we tightly stretched a line one hundred feet long obliquely from bottom to surface and drew the quantitative net along this line, to which it was suspended in a horizontal position by a carriage running along the line on wheels. The contents of the dredge were assorted by the aid of a set of bag sieves of netting and of finer cloth, fitted closely together as one apparatus by pushing the ring of one net inside that of another, the longest and finest bag being, of course, at the botton, and the shortest and coarsest at the top of the set. In the long-shore work we used hand nets of various sorts, the cone dredge of Professor Birge (commonly called the "Birge net" by us), sieves, forceps, and fingers, and occasionally a small minnow seine.

Everything collected was bottled and labeled after such methodical preparation as the case required, with the exception of the common and constant sorts, like the more abundant mollusks and insect larvæ. Concerning these, full notes of abundance, etc., were kept for each station at each visit.

Besides these regular collecting operations, the water temperatures were taken daily, a great variety of notes were made on relative numbers, habitat, habits, life histories, food, and behavior of aquatic and

subaquatic animals of every description: special collections of fishes and other forms were accumulated for a study of the food of the species under varying conditions; aquarium and breeding-cage operations were carried on, especially with aquatic insects and insect larvæ, for a study of life histories and the determination of immature stages hitherto undescribed; and critical and final microscopic studies of perishable forms (chiefly protozoans and rotifers) were carried forward.

The force engaged worked from the beginning of April to October 1st under unusually difficult circumstances, with perfect fidelity and great, intelligence and with tireless energy and enthusiasm. At the latter date the cabin boat was brought in and all the station party returned to Champaign except Mr. Hart, who remained two weeks longer.

Most of the equipment remains at Havana in the laboratory rooms, and regular trips will be made to the station during the fall and winter at intervals of about three weeks, with parties large enough to work every station thoroughly by all the methods above described. It is our intention to ship a large part of these winter collections alive to the University for study on our return from these brief trips.

The results of this first season's work are, of course, but just beginning to appear. Indeed, the problems to be solved in such situations have scarcely more than dimly shown themselves as yet, but the promise is nevertheless already interesting. Notable contrasts in kind and number appear between animals of the springy shore of river or lake and those of the muddy bottom only a few rods away on the other side; between river and lake; between Quiver and Thompson's lakes; between each of these and Matanzas lake, and between all the other lakes and the temporary pond distinguished locally as Phelps lake—contrasts sometimes easily comprehensible, as in the first instance given, where the cool spring water flowing in abundantly is evidently favorable to the gammarids and aselli swarming there, and sometimes peculiarly puzzling, like that between Quiver lake on the one hand, whose waters were choked in midsummer with a dense growth of aquatic vegetation, but contained fewer of the smaller animal forms (entomostraca and the like) than the open current of the river itself, and Thompson's lake on the other hand, where the water was relatively clear of aquatic plants, but abounded in rotifers and entomostraca. Still more curious was the contrast between the similarly situated and very similar lakes, Quiver and Matanzas, the waters of one loaded and clogged with plants, and swarming with small mollusks and insect larvæ, and those of the other with scarcely a trace of even microscopic vegetation, and with a correspondingly insignificant quantity of animal life.

The course of events in a body of water like Phelps lake, with its terrific seasonal vicissitudes, ranging from complete overflow and loss of identity to absolute drying away in now and then an exceptional year, is extremely interesting to the oecologist. The extraordinary instability of the system, one predominant and excessively abundant form quickly following another almost to the suppression of its predecessor, and all finally overwhelmed in a common doom, gives to the student an impression of an unhealthy organism, caught in the trap of an unfavorable environment, and hurrying through the stages of a fatal disease.

One of the surprises of the season was the abundance of minute life in the main stream, which, as already intimated, sometimes contained a greater abundance of animal forms than most of the lakes connected with it; and another was the relatively small difference between the animals frequenting widely unlike situations in the same body of water. This is not the place, however, for a summary of our discoveries, and I must content myself with the statement that the freshness and fruitfulness of the field was well illustrated by the large number of new forms found, especially among rotifers, worms and insect larvæ.

The collections of the season, preserved for detailed study, are included under nine hundred and fifty-eight collection numbers, representing as many different lots of specimens. During the relatively quiet winter interval the Station force will be more or less continuously engaged upon determination work and other laboratory studies and the preparation of reports. Mr. Smith is studying now the oligochaete worms. Mr. Hart is determining and describing insect larvæ and other aquatic insect forms, and I have made myself responsible for the Crustacea of our collections (with the assistance of Mr. C. F. Hottes, a fellow in the University), and for a general discussion of methods and results. The papers and reports embodying these studies will be printed in the Bulletin of the Illinois State Laboratory of Natural History, with ample illustrations, now being made by Miss Lydia M. Hart. So far as possible, each general taxonomic paper will be preceded by a thoroughly practical synopsis of genera and species, illustrated by figures of typical forms, and intended to open up to the student and teacher of natural history in Illinois many most interesting and important parts of our local zoölogy which have hitherto been a sealed book to all except the expert with a special library at his command.

It will be seen that our season's work has fully opened up the field and shown us what is necessary to the continuance and development of our enterprise. I am entirely satisfied with the locality and wish to occupy it next year in a more permanent manner, with a view to continuous work there for several years, probably no less than five. The present arrangements, while fairly satisfactory for this preliminary year, and clearly the best that could have been made, were very inconvenient in some respects and wasteful of the time and strength of the Station force. The cabin-boat on Quiver lake was two and a half miles from town, and it was usually necessary for all but one or two to make this trip back and forth each day in skiffs.

We, consequently, urgently need a small temporary building on the lake sufficient to afford office and laboratory room and living accommodations for the whole force. This building could be made capable of removal elsewhere if desirable. The cabin-boat leased this summer, although the best within our reach, was too small for our purpose and extremely uncomfortable in hot weather, the temperature in the working room often rising considerably above 100 degrees Fah., and we should have a boat of this kind built especially for our purpose. This boat should be equipped with a larger experimental apparatus than we had this year, useful for a study of life histories, for a demonstration of the effects of changed conditions on various species kept in confinement, and for other similar work, by which alone clues may be found to the highly complicated and extremely difficult problems presenting themselves to the field observer. A great amount of time and strength has been consumed in rowing from station to station, where our regular collections were made, and we should have a small steam or naphtha launch or tug able to weather the summer storms.

It has fortunately happened this year that changes in the University courses in my department have released the equipment and the corps of instruction of the zoölogical laboratories for the spring and autumn terms, and I have thus been able to borrow for the Station a part of the University material, and to assign to the Station work a part of our force engaged for other purposes. This will usually be impossible hereafter, and considerable additions to the Station equipment and a larger salary list will, consequently, be required. An estimate, in detail, of the appropriations necessary to make these improvements and carry out these plans has already been submitted to your committee on legislative appropriations, and I will here only suggest that it seems to me desirable that the University and the State Laboratory should continue to share the labors and expenses of the Station, since its work is equally advantageous to the departments of instruction and to the natural history survey of the State.

S. A. Forbes,
*Director.*