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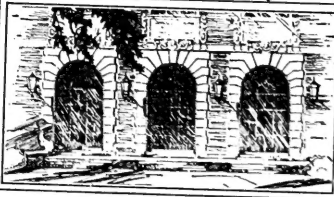
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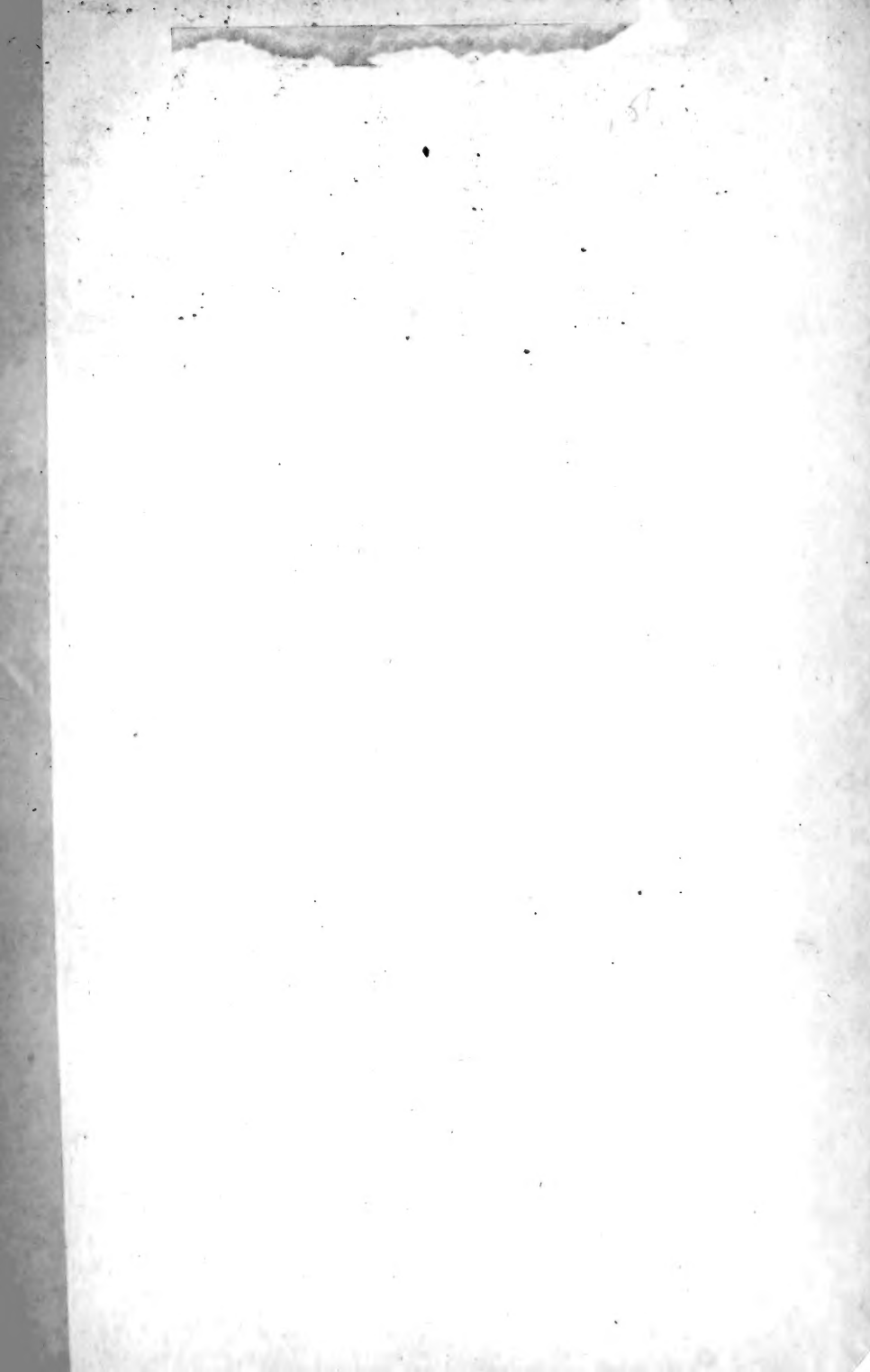
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N.H.S.



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BLACK BULLHEAD. *Ameiurus melas*, Rafinesque.

AS THE CONDITION OF THIS VOLUME
WOULD NOT PERMIT SEWING, IT WAS
TREATED WITH A STRONG, DURABLE
ADHESIVE ESPECIALLY APPLIED TO
ASSURE HARD WEAR AND USE.

REPORT

OF

STATE BOARD OF FISH COMMISSIONERS

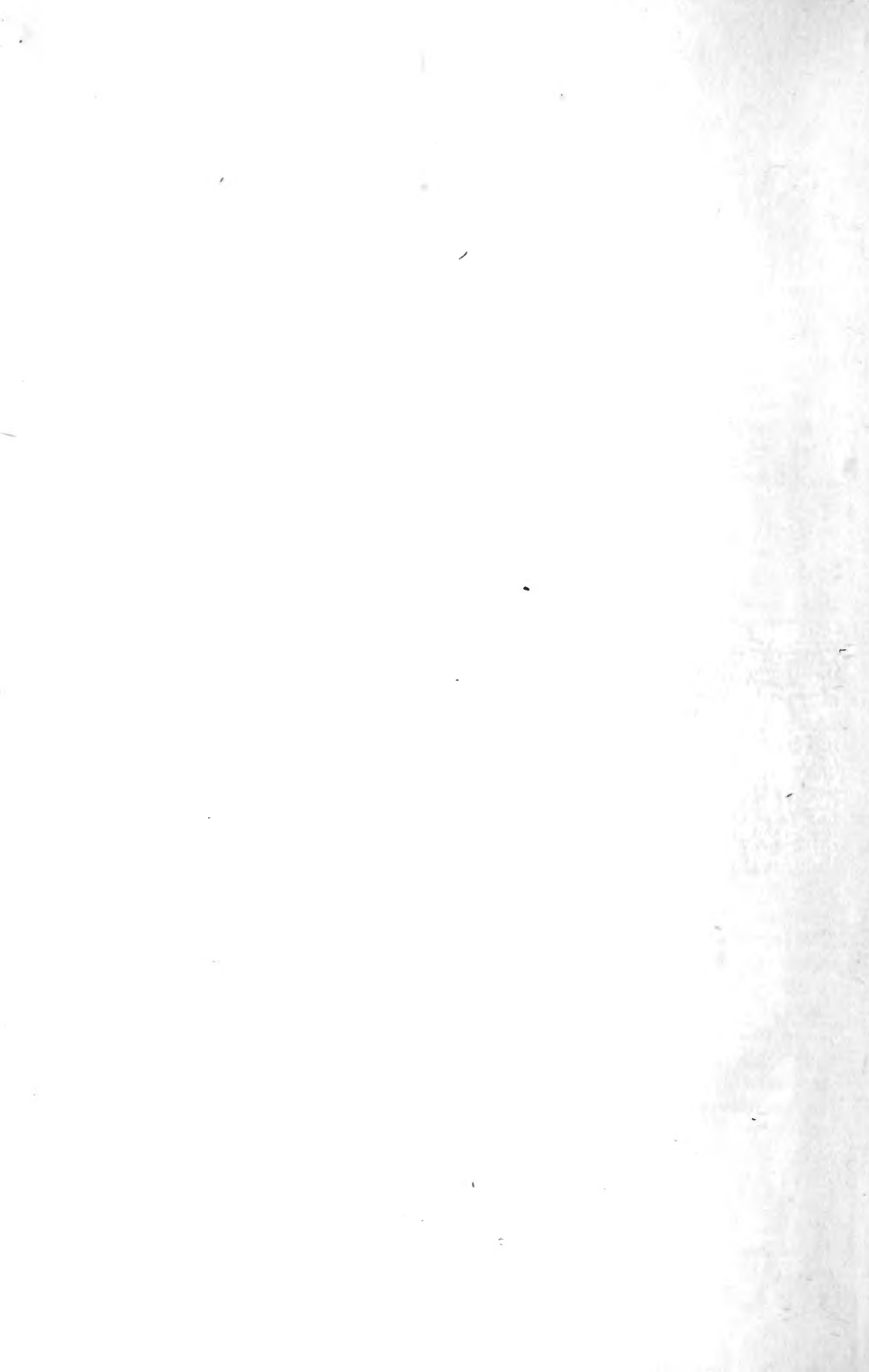
FROM

SEPTEMBER 30, 1900, TO OCTOBER 1, 1902.

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APPENDIX.



REPORT OF THE COMMISSION.

To His Excellency, Richard Yates, Governor:

We beg leave to submit herewith our report as Board of State Fish Commissioners for the two years ending September 30, 1902.

The two seasons covered by our report could scarcely have been more widely at variance with each other, and yet each was detrimental to a successful development of our work. The season of 1901 was the hottest and driest ever known in this State, while that of 1902 was said to be the extreme of wet and cold. In 1901, beginning in June, the thermometer showed a high temperature each day, the heat increasing until it culminated on July 21st and 22d in the hottest weather ever known along the Illinois river. The result of this extreme heat was the extermination of all the fry left in shallow ponds, which destroyed all possibility of a large collection and distribution for that season. The following season of 1902 was extremely wet, the rivers being high in June and daily increasing in volume, and the bottom lands were in a state of flood for the entire season. The early collections were fair but later ones amounted to but little, as the water was all through the timber and nature made the Commission's work of rescue unnecessary, as the fish had an opportunity of maturing before going back to the river, instead of being caught in drying ponds as is the case in ordinary seasons. While this prevented our usual collection the beneficial results will be realized in the season of 1903 in the greatest increase of native fishes that has been known for years, and should the river be at its normal stage the collection for distribution will be of sufficient magnitude to fully meet all of our requirements, and the market fishermen will have the greatest output known in many years. In making our distribution we endeavor, so far as possible, to supply public waters first and then give our attention to those applicants who have private ponds. The number of such applicants has been greatly augmented in the last few years, showing that there is a decided increase of interest in the cultivation of fish for home consumption. Much of our work in this direction, however, would be of little value if we complied strictly with the demands of applicants, as the requests are usually for black bass and kindred varieties, but we have advised against this, as experience has shown that such fish are not adapted to successful pond culture. Black bass have never been successfully reared in small ponds, as they will clean up every other fish in the water and when all other food is exhausted they will prey upon their

own young. A few instances to illustrate their nature and habits: A few years ago we made some very large collections of bass fry at Quincy for distribution, and having no convenient place for holding them until they could be distributed, we obtained permission from the city authorities to put them in the basin of a park fountain for a few weeks. When deposited there were 6,500 bass fry ranging in size from $1\frac{1}{2}$ to 2 inches up to the "fingerlings" from 4 to 5 inches. We had our men procure the small shiner minnows from the sand bars in the river for their food, and in the six weeks we held them several hundred thousand of these minnows were devoured; besides these we fed the fry twice a week with ground liver and fish. At the expiration of six weeks we drew down the basin to take the fish out for distribution and found but 2,600 left, all sleek and fat, not a dead fish in the basin, but the small fish had all been eaten by the larger ones. At another time, at Meredosia, we selected a spring pond, covering about an acre, for a storage pond, in which late in the preceding fall we had placed a few large breeders that we had held over. In the spring, after the spawning time, the pond was literally filled with bass fry, estimated at 50,000. As we expected to move the fry early we did not take out the adult fish, and as our collections were running heavy we added to the pond 40,000 more bass fry. There was a delay of several weeks in getting ready for distribution and when we seined the pond, instead of our 90,000 bass fry we took out less than 8,000. What made this decrease more extraordinary was the fact that the pond was well filled with moss and grass, and its inlet from a creek flowing over vegetation of all kinds, which must have furnished a large amount of food. This experience of our own, with the numerous failures of others throughout the State to successfully raise bass, to which our attention has been called, has convinced us that bass culture in small ponds is not practicable.

There are so many other fish that make good pond fish that we urge applicants to give the matter thought before insisting on having black bass. Large ponds, where vegetation has had a chance to grow for several years and well filled with small, soft-rayed fishes, may do well for bass culture, but sufficient area to produce plenty of such food is a necessity. Some of the best pond fishes we have are the rock bass, the bream and sun fishes, and crappie in limited quantities fill in well. Our public waters have been well supplied, and most gratifying reports reach us as to the increase.

The lack of proper enforcement of the laws for the protection of fish is felt, and elsewhere in this report we shall recommend such changes in this respect as will overcome this condition, in part, at least.

The commercial phase of the fishing industry is on a much better footing than ever before. The responsible wholesale dealers, recognizing the importance of taking care of the supply for the future, are coöperating with the commissioners in their efforts to prevent the sale of undersized fish, and when such fish are received in the regular course of business, they are often the first to insist on turning

them over to our wardens to dispose of to some charitable institution. As a rule, too, the market fishermen are backing up our efforts to enforce the law, and keep within the size limits when shipping fish.

The new steamer, Illinois, which has been such an important factor in the enforcement of the laws, has proved to be all we expected of her, and her great speed has enabled our river wardens to hold in check the irresponsible element that continually preys on the product of lakes and streams. These men, who have no thought for anything but the present need, destroy more than they take, and migrating from one point to another, their stay only limited by the accessible supply of fish, their depredations are the most serious with which we have to contend.

The output of the market fishermen for the season of 1902 has not been of a satisfactory nature, the high water of the river making the use of seines and nets impracticable.

In a former report we recommended the adoption of smaller meshed nets. We quote this paragraph on the subject herewith.

"We are inclined to believe from such experience as we have had after carefully noting the workings of the two-inch mesh all along the Illinois river, that an inch and one-half mesh should be allowed to be used during the season when it is lawful to use anything, and a vigorous prosecution made, or rather a vigorous enforcement of the law relative to size of fish which shall be offered for sale. The waters would be better for a greater reduction in the quantity of these fish, they are marketable and found everywhere in the State of Illinois. We believe there would be less illegal fishing with seines if the meshes were reduced to the size sufficient to take the bull pouts. The size limit of fish that can be legally offered for sale, has had a thorough test and has proven to be one of the most successful and practicable laws so far enacted."

We are inclined to repeat the recommendation for these reasons; the two-inch mesh is too large to take bull pouts, which abound in the lakes along the Illinois river and which are not classified in our list.

They increase rapidly and should be utilized for food. Then, the two-inch mesh will not hold the gar, which are also increasing fast and are the most destructive of all the varieties. Provided we can have such warden service as we recommend in this report, and can enforce an adherence to the limit in size of fish offered for sale, we would advocate a reduction in the size of mesh, but under no other conditions would we favor such a reduction.

The carp are proving very satisfactory in the large streams, and are now, as they have been for years, the main dependence of hundreds of men as a means of livelihood, and more than one town for a business existence. We will note briefly in another part of this report, under its proper head, some statistical information as to their characteristics and value.

The restriction in the taking of black bass to the hook and line only has proved a popular law with the anglers, and will do much to promote the increase of these desirable game fish. While the law is not so rigidly enforced as it should be yet it is more satisfactory than we expected. Bass are always marketable, and when found in the hands of dealers and of proper size it is not easy to prove how they have been caught, and for that reason they are handled more generally than they should be. We purpose giving this clause of the law closer attention next season, and perhaps a few merited convictions may make this practice appear too risky even for the more adventurous.

The prohibiting of fishing with any device during the closing season within 400 feet of any dam has met with vigorous opposition from some thoughtless anglers, but we consider its enactment one of the most humane protective features of our fish laws, and one which should strongly appeal to every one interested in the increase of game fish. To take them by the hundreds at the foot of a dam while the fish are using every effort to get above the dam to their spawning beds, is not only barbarous but wantonly destructive, for every female fish so taken means the loss of all the increase which would have resulted had she been allowed to spawn.

In reviewing the results of the past two seasons we feel that more and better work has been accomplished than for any like period since the organization of the Commission.

The relation of the Commission to the fish business as an industry and to the angler as well, is better understood, and the possibility of protecting and advancing the commercial interests without detriment to the rights of the angler is admitted.

Not that no fault has been found with your Commissioners, for we have had criticism and plenty of it. Personal attention to all the details of the work cannot be given by the Commissioners. President Cohen has given his time liberally to the work and has been untiring in his efforts to clear up every obstacle as fast as presented, but there is a limit to the time he can give. Serving, as the Commissioners do, without salary or compensation in any form, his only reason for this work is the interest he feels in the preservation and protection of the fish of the State, and it is hardly to be expected that he could, or should, give his personal attention to each of the thousands of complaints that reach his office, and for such work he must depend largely upon the wardens. All this is not taken into consideration by those interested in prosecutions throughout the State, and blame is frequently attached to the Commissioners for neglect of minor details that should be attended to by those locally interested.

On the whole, however, we have nothing of which to complain, for we have been well treated and met more than half way by the fishermen, the dealers, the transportation companies and the public, and we believe those who have made complaints need only a better knowledge of the intricate work assigned us to forgive and forget any seeming neglect on our part.

Under separate heads will be found our reports on the status of the various divisions of our work, and we would ask an examination and consideration of such recommendations as we have made.

WARDEN SERVICE.

The utility of unpaid warden service, that is, service depending wholly upon fines collected for violations of the law for remuneration for time and expense, has been fully tested, and we urge that such changes be made in the law as will enable us to employ three or four competent men to do warden service, and pay them a salary and expenses.

Under the present conditions a warden may occasionally be found who does his duty thoroughly, either from local interest or on account of local influence and backing, but in the majority of cases fish wardens have proved very unsatisfactory. And this is not without some good reasons. That "the laborer is worthy of his hire" was never truer than when applied to the fish warden who undertakes an honest and rigorous enforcement of the fish laws. In the first place, the duty is an unpleasant one at best, doubly so if he is called upon, as he often is, to prosecute his own neighbors and friends. This fact is a very great drawback to the successful enforcement of the law, and when the only possibility of his getting remuneration for his time and expense is dependent on the fines which may follow a conviction, the incentive is not in proportion to the work, especially when the collection of his part of the fines from the State's Attorney is as problematical as it is in some counties, where it often happens that when the fine is collected by the justice of the peace that part which should go to the complainant, under the law, is taken by the State's Attorney, who has a lien on all fines collected until his salary or compensation is made good. In such cases the warden is out not only his time, but also such expense as he may have incurred in the prosecution of the case, in many instances a considerable amount, and it is not to be wondered at if, when an opportunity is offered to recoup himself for some of his losses by the prosecution of a technical violation easily proven, even though it is plain no illegal act was intended, he does as most men do, looks after his own interest, and instead of showing the offender his mistake and warning him against such violation, he prosecutes and if possible convicts and collects his portion of the fine. This state of affairs existed for a long time in Chicago and threatened to do great injury to a large business interest. President Cohen, to whom this part of the work has been assigned, has shown remarkably good judgment in the handling of these matters, and much seeming injustice has been prevented by his care.

The wholesale dealers of Chicago, generally speaking, are opposed to the sale of small fish and freely turn them over to our wardens for disposition. The wardens give the fish to some of the charitable institutions of the city, as before stated, and take a receipt for them

from the county agent or warden of the institution, as the case may be, and the receipts are placed on file in the office of the secretary of this Commission.

One of our wardens, Mr. George W. Glynn, reports fifty barrels of fish so dispensed during the past 17 months.

What we need in the work is a warden service in which those employed shall receive a stated salary and necessary expenses, so that there need be no incentive to the prosecution of merely technical violations, such as cited before, but with a certainty of a proper remuneration for the work they can vigorously prosecute all intentional violations. In order to inaugurate this method the Commissioners would respectfully recommend the repeal of that portion of the fish laws which provides for the appointment of an indefinite number of men as wardens who are to be paid out of such fines as may be collected, and, instead provide for the appointment of four or five competent men by the Governor, on the recommendation of the Commissioners. These men to be paid a salary and such expenses as may be incurred in their work, on order of the Commissioner or Commissioners who may have that part of the work in charge. And we would also recommend that all fines resulting from convictions be disposed of by turning over one half to the school fund, and sending the other half, which now belongs to the complainant, directly to the State Treasurer to form a fund out of which can, eventually, be paid the salaries and expenses of these wardens, upon presentation of a bill of particulars, recommended by the Commissioner or Commissioners having charge of the work, and approved by the Governor.

For the first two years an appropriation to cover the cost of such work would be necessary, but after that time a sufficient sum will be recovered to make the work self-sustaining. This method has been tried and is now in force under the law enacted at the last General Assembly for the protection of game.

Without charging any one of our wardens with a desire to do more than strictly to enforce the law as it now stands, we cannot dismiss the subject without reiterating our opinion as to the vicious character of the law in the hands of an unscrupulous official, and the temptation that is offered to such to give protection to dishonest dealers for a remuneration. "Something for nothing" is, at best, a bad business proposition, and a man who is working for the benefit of the general public should be paid for his work, lest, failing to obtain legitimate compensation, he be tempted to get it by other means

Without any warden service the streams and lakes of the State, naturally prolific of a supply of good and wholesome food, would be at the mercy of thousands of poachers and the immense output of late seasons would soon be reduced to a small amount.

The practice of taking the buffalo fish along our rivers at spawning time caused such a vast reduction in the supply that in 1880 the statistics showed scarcely a million pounds sent to market. This is

not to be wondered at when one considers that for every female buffalo taken at the rolling or spawning season the waters are robbed of the increase which might have accrued from the 100,000 to 300,000 eggs destroyed with her.

The introduction of the carp, and the enactment and enforcement of protective laws have so increased the output that the commercial results of the fish business have assumed large proportions. From 16,000,000 to 17,000,000 pounds of coarse fish is not an unusual showing for a season's output.

The successful enforcement of the laws has not, however, been the work of the local wardens only, for the majority of the convictions have been due to the efforts of the paid wardens, specially directed by President Nat. H. Cohen, the Commissioner in charge of that branch of the work.

Referring again to work done in Chicago we give herewith a copy of a clipping from the American Field, illustrative of the practices along the lake front.

PARASITES OUSTED.

"At one time hook-and line fishing off the piers of Chicago's lake front was a favorite pastime for those residents who were piscatorially inclined, but as time went on the dipnet fishermen increased in number and gradually crowded off the piers the more gentle anglers. With the building of breakwaters, extending from the mouth of the river for several miles south exceptional opportunities were afforded for setting the apparatus for working the dipnets, and the owners of the latter soon monopolized the entire lake front and it was worth a hook-and-line fisherman's life almost, to intrude his presence among them. So bold did the dipnet fishermen become that they even defied the legal authorities.

"But there is a law on the statute books making it illegal to fish with nets inside a quarter of a mile from the shore. The Illinois Fish Commissioners concluded it was time to oust the brigands on the piers, and quietly set to work. A few weeks ago deputies were ordered to destroy the nets and rigging. The work has been done, and in a month over 800 outfits have been chopped down, and to-day the coast is again clear and a man can take his family out on the piers and angle to his heart's content without molestation or insult from the rowdies and parasites who formerly held sway from Twelfth street to Hyde Park.

"The Illinois Fish Commission has become quite active during the past year, and is doing good work, not alone on Lake Michigan, but all through the State, and the prospects now are that Illinois anglers will not have to go out of the State to get good bass and other fishing.

"This is as it should be and augurs well for the future."

All along the breakwaters for miles the large dip nets were placed as closely as possible, and hundreds of thousands of small fish were

taken and sold. Our attention was called to the rapid increase in this practice, which originated in the catching of bait to sell to anglers, but had grown into a regular traffic in small fish for market, and we directed our efforts to the abolishment of the nets. Warden Ratto, acting under our orders, first posted a notice on each standard holding up the hoisting apparatus, to the effect that the use of the dip net was contrary to law, and stating that unless the nets were removed by the owners by a stated time they would be taken down and turned over to the sheriff, as prescribed by law. He followed this by a personal warning whenever the owners could be found, but very little attention was paid to the warning by the owners. Warden Ratto, with the assistance of a squad of policeman kindly furnished by the Chief of Police of Chicago, then sawed off all the uprights, took down the nets and turned them over to the sheriff, clearing up the entire lake front. After the death of Warden Ratto this work was taken up by Warden George W. Glynn and the lake front has been kept practically clear of these nets.

A prominent railroad official who was interested in the work informed your Commissioners that the fatalities to men and boys crossing the tracks had been materially lessened since the abolition of this practice, as those engaged in the work would take chances from moving trains for a short cut to and from their nets, and the number killed in this way had been large, although every precaution had been taken by the management of his road to keep them off their right of way.

ENFORCEMENT OF THE LAW.

The problem as to how best to enforce the law for the preservation and protection of fish in a State covering as much territory as does Illinois is a difficult one to solve, with the methods and means at our command. When the present conditions are compared with those of the earlier days of protective legislation we find much cause for congratulation, but, when the vast area is critically considered, we find that much work still remains to be done before anything like a satisfactory state of affairs can exist.

The increase in the output of coarse fish on our principal rivers exemplifies what can be done, but there we can better control violations.

The small streams and lakes and the ponds of local fishermen are subject, at all times, to the poacher, and are soon depleted by unlawful methods. To those locally interested must of necessity be delegated very much of the work of enforcing the law. True, the law provides each county with a fish warden, and in some counties enough local pride is manifested to keep down violations, but in a majority of cases we have found that with wardens the law is very poorly enforced, if at all.

There are several reasons for this. As elsewhere stated, no man cares to incur the enmity of his neighbors by a rigorous prosecution

of violations, even when clothed with full power as an officer, and particularly when whatever of pecuniary compensation he obtains for his work and expense depends upon conviction and fines. Then, few care to appear as witnesses. The instances are not rare where men have stood on the bank, watching a seine haul and commenting on its illegality, yet when approached by an officer asking the names of the violators, they refused utterly to give them, although they freely criticised the officials for not better enforcing the law. The laws for the protection of fish in this State are not of the best, being for the greater part mere matters of compromise, and not dealing as directly as they should with the violators, but such as we have could be made to serve the purpose much better if the machinery for enforcing them could be handled.

We have found that our laws are not only faulty, but that, in some respects they have worked hardship to unwitting offenders. This is, particularly true where applied to the size limit, and we shall recommend some changes in the list. The ring or yellow perch, for instance, was limited to 8 inches as the legal size, but that is too large, for this reason, when the law was passed covering the legal size for market fish, the sizes were agreed upon by the Illinois Fishermen's Association, but the perch brought to the Chicago market from Wisconsin and Michigan, from which states the bulk of the perch are brought, were found to be quite mature at 6 inches in length, and this size largely predominated in the supply. The result has been that innumerable violations of the law have been noted, and the larger part of them without any such intent. We shall recommend a change in this respect in the present law, making 6 inches the size of perch legal to be offered for sale. Under the head of Warden Service we will note more fully our reasons for this change.

The great fish market of this country is Chicago, and, drawing as it does from almost every State in the Union for its supply, many of which have no laws regulating the size of marketable fish, it is only natural that a large amount of small fish, under the legal size, should find their way there. Such fish when in market and offered for sale, no matter where caught, are unlawful merchandise, and for several years we have had great difficulty in properly regulating the sale of such fish without working hardship to a great industry. As will readily be seen, a commission merchant may receive a large shipment of fish in barrels from Baltimore, for example, and among the number a good many undersized black bass. Without opening them up, he may sell to small dealers throughout the city or State, and they, in turn, expose for sale without noting the small fish. If complaint is made against any one of them there is no help for it, he will be found guilty of a violation of the law and probably fined, even though innocent of unlawful intent. Our plan has been to instruct our officers not to prosecute for such offenses, but to point out the necessity of separating the illegal fish from those of proper size, and not offering the former for sale, or returning them to the wholesale dealer who could refuse to pay the shipper for them. We hoped

by this means to break up the trade in small fish. Thousands of pounds of fish have been sent to the charitable institutions of Chicago as a result of this work, and it is but fair to state that, as a rule, the dealers have been very willing to so dispose of them. Under another head we give a list of fish disposed of in this way.

DISTRIBUTION.

The work of distribution to public waters from June, 1901, to Sept. 30, 1902, has been very satisfactory, in spite of the unpropitious conditions existing during both seasons noted in another part of this report. Unfortunately, it was impossible to give the same care to applicants for fish for private ponds, owing to our limited collections and the conditions of the appropriation.

Our method of collecting for distribution is now so well known it is not necessary to detail it again in this report. The fish we use for distribution are comprised in the following list, in the order mentioned: Black bass, crappie, sunfish, channel catfish, ring perch.

These range in size from one and one-half to eight inches in length. Black bass spawned in May will frequently be found in our collections eight inches long and weighing eight ounces.

The crappie are difficult to handle early in the season, and can only be successfully transported after the weather gets cool.

The increase following our plants can only be noticed in ponds or lakes which are not affected by the rise or fall of the rivers. In the appendix will be found letters from several parties who have had their lakes stocked by the Commission.

The people of the State are giving considerable attention to the propagation and care of fish, and the number of reservoirs and artificial lakes constructed for the purpose has been considerably augmented since our last report. Lake Rice, owned by the C., B. & Q. R. R. Co. at Galesburg, is a notable example, covering nearly 80 acres, quite deep, and is well laid out and practical. Others noted are the reservoir at Paris, Ill., a beautiful lake at Carlinville, Lake Whittemore at Lanesville, well built reservoirs at Whitehall, Belleville, East St. Louis, Joliet, Clinton, Monee, Decatur, Harrisburg, Chester and numerous places.

Fishing and hunting clubs are fast taking up and protecting the lakes along both rivers, and the interest generally manifested in fish protection and propagation is gratifying.

We give herewith a list of the public waters supplied with fish by your commission during the seasons of 1901 and 1902:

Fox river.....	Aurora	Green river.....	Lee
Fox river.....	McHenry	Edwards river.....	Mercer county
Fox river.....	Batavia	Sny ecarte.....	Adams county
Fox river.....	St. Charles	Sny ecarte.....	Pike county
Fox river.....	above Dayton dam	Little Wabash river.....	Clay county
Illinois and Michigan canal.....	Ottawa	Little Wabash river.....	Effingham county
DesPlaines river.....	Riverside	Lower Cache river.....	Pulaski county
DuPage river.....	DuPage county	Upper Cache river.....	Pulaski county
Bureau creek.....	Bureau county	Big Muddy river.....	Jackson county
Henderson river.....	Henderson county	Galena river.....	JoDavless county
Indian creek.....	LaSalle county	Menomonee river.....	JoDavless county
Rock river.....	Milan	Embarras river.....	Coles county
Rock river.....	Oregon	Spring lake.....	Cook county
Rock river.....	Denrock	Lake Maria.....	Cook county
Rock river.....	Dixon	Lake.....	DuPage county
Spoon river.....	Stark county	Bangs lake.....	Lake county
Spoon river.....	Knox county	Lake Villa.....	Lake county
Spoon river.....	Fulton county	Long lake.....	Madison county
Kankakee river.....	Kankakee county	Clear lake.....	Monroe county
Kankakee river.....	Waldron	Gilmore lake.....	Monroe county
Mackinaw river.....	Mas	Crystal lake.....	McHenry county
Sangamon river.....	Decatur	Siefert's lake.....	St. Clair county
Sangamon river.....	near Springfield	Lake Bartlett.....	St. Clair county
Sangamon river.....	Riverton	Scotts lake.....	St. Clair county
Sangamon river.....	Monticello	Reservoir.....	Shelby county
Vermillion river.....	Danville	Lake.....	Carlinville
Lake Fork.....	Logan county	Fox lake.....	Lake county
Sugar creek.....	Logan county	Fox lake.....	Henry county
Vermillion river.....	Livingston county	Nippersink lake.....	Lake county
Macoupin creek.....	Greene county	Round lake.....	Lake county
Salmi river.....	Saline county	Pistagua lake.....	McHenry county
Kaskaskia river.....	Moultrie county		

State institutions, Joliet, Jacksonville and Quincy, and Soldiers' Home, Danville.

The plants range in numbers from 150 to 5,000, according to size of fish and advance of season. Fish are generally carried in baggage cars in charge of a messenger, who attends to the plant, also. The United States Fish Commission has rendered us great assistance in giving us the use of their cars for purposes of distribution during both seasons. Without this aid we could not have covered the same amount of territory with the amount of money at our disposal for that purpose.

In addition to the above named distribution we have supplied 221 private applicants, and have given our attention more particularly to those who had provided proper ponds or lakes for the fish. To supply every applicant would be impossible with the means at our command, as they numbered nearly 1,600 during the two seasons, and as all fish are delivered free of expense to the applicants it would take a very large amount of money to supply all who apply, as no employé of the Fish Commission is allowed to make any charge or accept any money for service.

A great many applications are received from people whose ponds are unsuited to the culture of any kind of fish, and to stock such would be only time and money wasted. The culture of fish of any kind requires some knowledge of proper conditions, if any measure of success is expected, and they need proportionately as much care as any other economic feature of the farm. Your Commissioners

will take pleasure in furnishing such information as they can in regard to the building of ponds and the care of fish, and will also suggest the kind of fish suitable for the ponds to be stocked, upon the request of applicants and the necessary information as to location and size of pond, its capacity and the nature of the water supply.

PARIS, ILL., 1902.

Hon. N. H. Cohen, President Illinois Fish Commission.

DEAR SIR—In response to your request for a report as to the success of plants of game fish made at Reservoir Lake, by the Illinois Commission, I am pleased to say that they have been in every respect most gratifying. The lake is an artificial body of water, constructed for the purpose of obtaining a city water supply. It covers an area of 105 acres, when the water is level with the top of the dam and has a maximum depth of 17 feet, gradually shelving off into shallow water, a mile above the dam. The conditions are excellent for the propagation of fish, in that there is plenty of natural feeding ground and through careful surveillance, fishing has been strictly limited to hook and line.

Five plants have been made by your Commission, being for the most part of black bass, though a plant of crappie, made in the fall of 1901, has yielded slight returns. A few pickerel have been included in the shipments, but no one has caught any of them, so far as reported. The bass fishing, however, is excellent and grows better year by year. During the season of 1902 a number of very fine fish were taken ranging in weight from one pound up to six pounds. It is not thought to be an extravagant estimate, to say that an average of 50 pounds of fish per day, was yielded by the lake from May to October. Very large strings are not common, but nearly everybody is more or less successful, indicating that the fish are well distributed. Our people greatly appreciate the work of the Commission in providing this fine fishing resort, which is certainly not surpassed anywhere in this part of Illinois. It may interest you to know that the prize catch at the lake last season was made by a woman, Mrs. I. N. Sheppard, landing without assistance, a bass, weighing six pounds and two ounces.

Very respectfully yours,

H. DOLLARHIDE.

CLINTON, ILL., 1902.

Nat Cohen, Esq., State Fish Commissioner, Urbana, Illinois:

DEAR SIR:—The undersigned having been appointed a special committee by the Board of Directors of the Weldon Springs of Clinton, Illinois, to look after the fishing interests of said Springs, respectfully call your attention to the fact that we have not been supplied with any game fish by the State for Weldon Springs Lake for the past two years, and ask you to kindly furnish us with a supply of bass and crappie for the season of 1903. We would like a consignment of large bass and a consignment of fry. You will remember some four years ago, you furnished us with a nice supply of large bass, and no doubt will be interested in a report from our lake. Those bass we protected for a year by allowing no fishing and during the seasons of 1900 and 1901 the bass fishing was excellent, and Weldon Springs became a popular resort of the citizens of this community. One of the undersigned caught 19 bass in 30 minutes with a fly, returning 16 of them to the water, saving only three of the larger ones, one of which weighed four pounds. The wall eyed pike and crappie that you supplied us with, while not multiplying as rapidly as the bass, have done very well. Last season the crappie made their appearance in great numbers, and furnished excellent sport and the wall eyed pike made their appearance, and have attained a size of about six pounds. A great mistake was made last season in allowing fishing in the early spring before the fish had spawned, and our lake was nearly depleted of bass, hence we ask you for a consignment of large bass and one of fry. We are now adopting resolutions that no fishing is to be done until June 15, thereby obtaining all the natural increase in numbers. No bass is to be taken from the water

that weighs less than one-half pound, and the amount of one person's catch is limited to a certain number. By these safe guards, after our lake has been stocked, we will always have fair fishing. Considerable enthusiasm has been aroused in this community in regard to the fishing, and we would respectfully ask you to reply to this communication stating if you can furnish us with a few crappie and a consignment of both large and small bass.

Recognizing the success you have had as State Fish Commissioner, we will ask you to offer recommendations as to the best method of protecting the fish and to obtain the best possible results from these you may send us.

Thanking you in advance in behalf of the Weldon Springs, and the citizens of Clinton for anything you can do for us in this matter, we beg to remain,

Yours very truly,

(Signed)

JOHN D. ROGERS,
PERRY HUGHES,
FRANK ADKISSON,

Special Fish Commission Weldon Springs.

POLLUTION OF STREAMS.

One of the questions of the near future will be the disposition of the sewage and waste from manufacturing establishments which is now turned into our rivers and streams. Complaints come to us from almost every part of the State of the pollution of some streams from this cause, and our attention is very frequently called to the fact that great numbers of fish are being killed by such fouling of the waters.

As Commissioners, we are powerless to act in the premises, and can only recommend prosecution for maintaining a nuisance by the proper local authorities. Very many of the finest streams in the State are today only sewers. We have had our attention directed to the effect of such pollution on the Fox river several times, and fish have been found dead in large numbers for miles below some manufacturing plant, undoubtedly killed by the introduction into the river of the poisonous washes. A careful examination of the water and bottom of the river showed a very dirty condition, to say the least. The Fox river, once one of the best of inland streams, with clear, pure water and clean rock bottom, we found one of the dirtiest, with the bottom covered with a deposit of filth which could not help being a menace to health wherever the water was used. What is true of the Fox river is fast becoming a universal condition, so far as our rivers are concerned. If there were no alternative it might be considered mere fault finding to call attention to this matter, but as we now have a system of sewerage which effectually controls all waste and sewage, and renders the escaping effluence practically cleaner than the water of the river, there is no excuse for a continuance of this practice, and legislative action should be had to prevent the existence of the present conditions.

It is not of interest alone to those who desire the preservation of the fish, but the health of every one living along such stream is daily endangered. One instance which came under our special notice will serve to illustrate the reason for our objection. A few winters ago ice was cut from a stream at a point only 100 feet from the outlet of a sewer carrying the waste from a number of houses in which were

known to exist 65 cases of typhoid fever, and this ice was marketed. There is an easy, cheap and effective method of caring for such sewage, and the people should be protected from such unsanitary conditions by legislation that would prohibit the turning into our rivers, particularly the smaller ones, the sewage from towns and the waste from manufacturing or other commercial plants.

We herewith give a clipping which will bear on a subject matter of foregoing item. Copied from Engineering Record of Jan. 10, '03, page 66:

A successful Septic Tank Installation is that of Vancouver, British Columbia, the construction of which was described in the Engineering Record of Oct. 12, 1901. There are three tanks, designed to treat the sewage from districts having populations of 5,000, 3,000 and 2,000, respectively. They are built of concrete and are entirely covered over. In regard to the results accomplished, Mr. Thomas H. Tracy, the city engineer, states that the tanks have now been in operation for nearly two years and they have given the most decided satisfaction, the effluent having been at all times (after the first three months) clear and inoffensive. There is a deposit of sediment about 2 inches thick at the inlet end of the tanks, none at the outlet end. The scum is about 10 inches thick at the inlet end and very slight at the outlet end. This would seem to indicate that a much greater quantity of sewage could be treated in the tanks than is at present passing through. Where sewers are constructed on the separate system, Mr. Tracy does not consider the grit chambers necessary, and, in fact, a very decided septic action has been noticed in the grit chambers of the smaller tanks. A small manhole for convenient inspection would, it is thought, be better. The tanks have not cost a cent either for operation or repair in the two years. They have been inspected fairly often, as the installation has attracted much attention on account of its marked successfulness.

LAKE MICHIGAN.

This season we have undertaken the enforcement of the law relating to Lake Michigan. Since the opening of the drainage canal, we are informed that white fish and trout are again making their appearance in fair quantities in the lower part of Lake Michigan.

Mr. Cohen had several conferences with the Michigan commissioners relative to methods of enforcing the laws during close season on Lake Michigan, and they have been using our warden jointly in the work. This together with the removal of the dip nets, will do very much to increase fish supplies about Chicago. We will ask the Legislature to add white fish and lake trout to our list of fish, making a size limit for them.

STEAMER ILLINOIS.

The boat purchased for our use, the steamer Reindeer, was condemned in April, 1901, the hull being worn out, and the appropriation made for the purpose was used in building a new hull, which was designed and built under the supervision of Mr. E. J. Moritz.

The new hull was 12 feet longer and six feet wider than that in the old boat, making a total length of 137 feet long by a 29 foot beam.

The hull was constructed of the very best oak timber, three inch gunwale and four inch bottom. The old cabin and machinery were moved over on the new hull and a texas or upper cabin added. As completed she is the best boat of her size on either river, of great speed and very staunch. She went into commission in October, 1901, and a reference to the mileage report of Captain Williams will show that she had a busy season. The boat is now lighted by electricity throughout, and is admirably fitted for the work. The lower deck is fitted up with a complete circulating apparatus for handling young fish, and has a capacity for 10,000 fry early in season decreasing as season advance and size of fish increases.

In parole service she is unequalled, as with her speed she can overcome great distances in short time. The investment as a whole constitutes a valuable one for the State.

The boat was officered as follows: George T. Williams, master and pilot; Wm. E. Alford, engineer; F. Gussenmeyer, fireman, F. Keller, fireman; George Moritz, watchman; F. Ferguson, cook.

REMOVAL OF OBJECTIONABLE FISH.

Your commissioners have an abiding faith in the value of the carp as a money producer for the fishermen and a source of cheap food for the people, but there are conditions where they are unsuited to the waters into which they find their way. This is true of the spring lakes, such as Fox Lake, Spring Lake and some of the clear rivers. With a view to the best interests of such places and in response to requests of interested parties, the commissioners have given permits to take but the carp and objectionable fish with seines and nets, putting the work in charge of one of our wardens, who derives his remuneration from the percentage paid by the fishermen who do the work. Mr. Henry Kleine of Chicago, whose home is on Fox Lake, volunteered to take charge of the work and become responsible for it. We append herewith his report. Hoop nets were used, and a record was kept of all fish taken, so that an estimate could be made of the proportion of the coarse to the finer varieties. All fine fish were returned to the water, except the muskelonge, which was retained for mounting.

CHICAGO, ILL., Jan. 3, 1902.

Nat M. Cohen, Esq., President Illinois State Fish Commission, Urbana, Ill.:

DEAR SIR—I heroby beg to submit my report on the carp seining in the Fox Lake region during the months of October, November and December, 1901:

Amount of carp caught, 41,960 pounds, at 3 ⁴ / _c per pound.....	\$312 68
Amount paid to Henry Dayment, fish warden, 2 ¹ / ₂ months, at \$60 per month.....	150 00
Amount paid to W. G. Glyn, one month.....	60 00

Leaving balance on hand of \$102.68, which will secure the services of Mr. Glyn as fish and game warden for the Fox Lake region for about two months more.

I also enclose the fish warden's daily report of the amount of carp caught, and the amount of game fish caught but returned to the water. I am glad to say that I am able to report that the seining of carp was done as instructed

by you, and no possible complaints can be made in any shape, form or manner. It is only to be regretted that such a small amount of carp has been caught, which was due to the extreme low stage of the water in the different lakes—so much so that it was impossible for the carp to get into the Fox river, as it seems that the running water is their natural resting-place during the cold weather.

Should any further explanation be necessary I should be glad to hear from you.

Respectfully,

HENRY KLEINE.

RECORD OF CARP TAKEN FROM FOX LAKE UNDER THE SUPERVISION OF A
WARDEN.

October 15, carp secured.....	2,000 lbs
October 23, carp secured.....	750 lbs
October 24, carp secured.....	900 lbs
October 25, carp secured.....	750 lbs
October 28, carp secured.....	900 lbs
October 29, carp secured.....	750 lbs
October 30, carp secured.....	900 lbs
November 5, carp secured.....	900 lbs
November 6, carp secured.....	750 lbs
November 7, carp secured.....	900 lbs
November 12, carp secured.....	900 lbs
November 13, carp secured.....	900 lbs
November 14, carp secured.....	900 lbs
November 19, carp secured.....	750 lbs
December 3, carp secured.....	700 lbs
December 17, carp secured.....	4,025 lbs
December 18, carp secured.....	4,200 lbs
December 19, carp secured.....	4,025 lbs
December 20, carp secured.....	4,025 lbs
December 21, carp secured.....	5,005 lbs
December 23, carp secured.....	4,800 lbs
December 24, carp secured.....	800 lbs
Sold to farmers.....	950 lbs
Total carp secured.....	41,540 lbs

November 1—3 crappy.
 November 2—1 pickerel.
 November 4—5 crappy.
 November 5—1 pike.
 November 8—4 crappy.
 November 10—3 crappy, 6 pickerel.
 November 11—6 crappy, 1 pickerel.
 November 12—8 crappy, 2 pickerel.
 November 14—2 small-mouth bass.
 November 15—1 Muskelonge.
 November 17—12 crappy, 6 pickerel, 1 pike.
 November 19—7 crappy.
 November 21—2 crappy, 3 pickerel.
 November 22—7 crappy.
 November 23—1 muskelonge, 2 small-mouth bass.
 November 24—14 crappy.
 November 25—4 pickerel, 2 pike.
 November 26—2 crappy.
 November 29—2 crappy.
 November 30—6 pickerel.
 December 1—18 pickerel.
 December 13—4 crappy, 4 pike.

BURLINGTON, IA., Feb. 2, 1903.

S. P. Bartlett, Esq., Supt. Quincy, Ill.:

Following is a record of the seining done at Carthage Lake under special permit for 1902-1903, for removal of objectionable fish:

March 13—"West of the fill." Four hauls, about 1,500 pounds, mostly buffalo, balance carp. Fair showing of game fish, crappie and bass. One thousand pounds skipjacks.

March 22—"West fill." Four hauls, about 2,500 pounds, mostly carp, about 300 pounds game, about 800 pounds refuse.

March 25—"West fill." Four hauls, about 200 pounds carp and buffalo, about 300 pounds game, 500 pounds refuse.

April 9—"West fill." Three hauls, about 250 pounds buffalo, 300 pounds game, 400 pounds refuse.

Carthage Lake proper. Three hauls, about 1,200 pounds, nearly all carp, about 350 pounds game, some fine bass, 100 pounds refuse.

April 15.—Carthage Lake. Five hauls, about 1,500 pounds, mostly carp, 500 pounds game, 300 pounds refuse.

April 17—Carthage Lake. Seven hauls, about 600 pounds buffalo and perch, 500 pounds game, 100 pounds refuse.

April 22—Carthage Lake. Five hauls, about 300 pounds carp, 500 pounds game, (300 pounds one haul) bass, pike, crappie; 100 pounds refuse.

May 2—Carthage Lake. Four hauls on the flats, about 2,200 pounds carp, 500 pounds game, 200 pounds refuse.

May 5—Carthage Lake. Seven hauls, all over the lake, about 800 pounds carp, 300 pounds game, 300 pounds refuse.

May 7—"West fill." Four hauls, about 1,000 pounds, nearly all buffalo, game fish light, put about 200 pounds crappie in Carthage Lake; 250 pounds refuse.

May 12—"West fill." Four hauls, about 800 pounds carp, buffalo and spoons. Very fine game, 200 pounds refuse.

May 14—"West fill." River five feet three inches, raising rapidly for week or ten days. Five hauls, about 600 pounds carp, cat, spoons and buffalo. Very few game fish; 100 pounds refuse. Owing to excessively high water we were unable to do any work until July 1st.

July 1—"West fill," four hauls, about 500 pounds buffalo and spoons, 50 pounds goggle-eye, 100 pounds refuse. River about 6 feet.

July 2—"West fill," four hauls, about 400 pounds buffalo and spoons, 50 pounds goggle, 100 pounds refuse.

July 8—"West fill," four hauls, about 600 pounds buffalo and spoons, few carp and cat. Game fish fair showing, 150 pounds refuse.

July 9—Carthage Lake, five hauls, about 700 pounds, mostly carp; 100 pounds game, 200 pounds refuse. High water again shut us out.

August 6—"West fill," four hauls, about 1,000 pounds buffalo, spoons and cat, fair showing game, 200 pounds refuse.

August 8—"West fill," four hauls, about 250 pounds spoons and buffalo, fine lot crappie, few pike, 150 pounds refuse.

August 11—"West fill," three hauls, about 100 pounds buffalo, cat, carp, fine showing of goggle-eye, 100 pounds refuse.

Owing to heavy rains past few days fishermen unable to get into the lake. Water coming out over fishway at terrible speed. Lake 8 to 10 inches higher than the river.

August 15—Carthage Lake, four hauls, about 850 pounds carp and buffalo; fine showing bass, crappie, sunfish and pike, 200 pounds refuse.

August 17—Carthage Lake, four hauls. "West fill," two hauls, about 350 pounds buffalo and carp, fine showing game fish in Carthage Lake. Heavy rain Sunday evening and night raises the river 15 inches, also raises Carthage Lake considerably. Too high for good mark.

August 29—"West fill," four hauls, about 250 pounds buffalo and cat, few carp. Water fell so fast fish ran to river.

September 3—Carthage Lake, four hauls, about 1,000 pounds, mostly buffalo, balance carp, about 400 pounds game. 400 pounds refuse.

September 4—Carthage Lake, five hauls, about 600 pounds carp and buffalo, good game showing.

September 10—Carthage Lake, six hauls, about 600 pounds carp and buffalo, 400 pounds game.

September 16—Running Slough Lake, five hauls, about 700 pounds carp and buffalo, 300 pounds game, 300 pounds refuse.

Sept. 18—Carthage Lake. Five hauls, about 250 pounds carp and buffalo, 300 pounds game fish.

Sept. 25—Carthage Lake. Two hauls, about 1,600 pounds, all buffalo, 150 pounds game, 500 pounds refuse.

River rising fast, 6 to 10 inches a day. Fishgate under again (Sept. 27).

Sept. 30—Carthage Lake. Five hauls on the flats, about 1,500 pounds carp, 300 pounds game, 300 pounds refuse.

Oct. 1—Carthage Lake. Five hauls, about 350 pounds small buffalo, 500 pounds game fish, 300 pounds refuse.

Oct. 9—Rean Lake. One haul, few game fish only. Carthage Lake. Four hauls, about 350 pounds carp, 300 pounds game, 300 pounds refuse.

Oct. 15—Running Slough Lake. Three hauls, about 800 pounds carp and buffalo, 400 pounds game; 32 bass, one haul, weighing 1 to 4 pounds each; 500 pounds refuse.

Oct. 29—Carthage Lake. Five hauls on the flats, wind blowing a hurricane, about 275 pounds carp and buffalo, 300 pounds game fish.

"UNDER THE ICE."

Jan. 1—Carthage Lake. Two hauls—the first haul was over $\frac{1}{4}$ -mile long, took 12,000 pounds skipjacks, 150 pounds game, and only 3 or 4 buffalo.

Second haul up the lake toward the flats, no coarse fish worth mentioning, 350 pounds refuse, but a fine catch of game, estimated at 1,200 pounds.

The scarcity of coarse fish was astounding as these two hauls were in deep water, where it is reasonable to expect big catches in winter season. The fishermen say it might be possible the coarse fish went out on the last rise when the river reached nearly 6 feet before freezing, or they may have gone on to the flats.

Jan. 3—Running Slough Lake. One haul, about 50 pounds goggle-eye, no coarse fish; slime and mud something terrible. Fishermen think it possible the fish are up on the flats; they couldn't very well work out of this lake, connecting it to Carthage lake, frozen solid.

Jan. 5—Carthage Lake. One haul on the flats. Catch nothing. Mud and slime so bad couldn't work. Compelled take some up, impossible to make haul.

Jan. 31—"West fill." One haul, 2,000 pounds skips, about 500 pounds buffalo, 500 pounds game; the big end of the game were white bass from, 1 to 2½ pounds each; fine crappie and sunfish. These fish had worked in here since freezing up, as there has been good stage water all winter. The bass

will undoubtedly run to the river the first sign of breaking up, as they are strictly river fish, although we had a nice lot in the lake, right along, and I have evidence of their spawning there last year.

We see a few right along while seining. This season has been the most peculiar both as regards water and fish I ever experienced. No fish taken anywhere to what there usually is.

ILLEGAL SIZED FISH.

As before noted, our wardens in Chicago have taken large quantities of fish from the dealers which fell below the specified legal size, and to the credit of the dealers we can say that, as a rule, they have voluntarily surrendered such fish. These fish were turned over to the various charitable institutions of Cook county from whose officials the wardens take a proper receipt for them, and in turn the wardens give their receipts to the dealers.

Our warden, Mr. G. W. Glynn, reports 50 barrels thus disposed of, and Mr. G. R. Ratto probably collected and dispensed as many more, in a similar manner. This mode of procedure has had very much to do with the decrease of shipment of illegal sized fish to Chicago markets.

Our instructions to our wardens have always been to notify all dealers having small fish in their possession that they must not be offered for sale, and to make arrests only when efforts to sell were persistent.

ACKNOWLEDGEMENTS.

We desire to acknowledge our indebtedness to the various railroad managements of the State for their courtesy and liberality. The assistance they have rendered us in the transportation of our fish for distribution has enabled us to make the distribution as extensive as it was. Only courteous treatment has been accorded us by the management and officials with whom we have come in contact. We are under special obligations to the following roads: Chicago, Burlington & Quincy railroad, Wabash railroad, Illinois Central railroad, Chicago & Eastern Illinois railroad, Chicago, Peoria & St. Louis railroad, Chicago, Rock Island & Pacific railroad, Chicago, Elgin & Eastern railroad, Wabash, Chester & Western railroad, Toledo, Peoria & Western railway, Fulton County Narrow Gauge railway, Peoria & Eastern (Big Four) railroad.

During the past two seasons, as for many previous ones, the United States Fish Commission has placed us under obligations for the use of its cars and messengers, and for valuable assistance in other ways, and we desire to express our appreciation of their aid. The U. S. commissioner is doing great work and shows a wonderfully practical administration in the operation of his department.

To the press of the State are we also greatly indebted. They have always been ready to help us when publicity regarding our work would be of interest to the public.

We desire to acknowledge the ready assistance we have received from the Executive, Governor Yates, who has stood by us at all times, and has shown a lively interest in our work, and given it a great deal of personal attention.

To Prof. S. A. Forbes we are indebted for the very valuable paper in the appendix to this report. Having been in course of preparation for a number of years, at great expense, it could hardly have been expected that we should have been permitted to publish it first, but he has generously given it to us and we give it to the public as one of the most valuable contributions of the kind ever published. We are also indebted to Professor Forbes for the use of the colored plates found in this report.

CHANGE IN COMMISSION,

Mr. A. F. Gartz previous to close of Governor Tanner's administration tendered his resignation.

Governor Yates appointed to succeed him the Hon. August Lenke, of Chicago, Ill. Mr. Lenke was connected with the commission for three years during Governor Tanner's administration.

SUMMARY,

The increase of public interest in the protection and distribution of fish warrants the belief that satisfactory results of the work must have been noted in the increase of fish throughout the State and in the volume of fish taken for commercial purposes. Of the value of fish as a food supply there can be no question, and the necessity for using such measures as will insure the greatest possible increase of the supply needs no argument. Among the various articles of food the supply of fish has been so plentiful that it alone has escaped the exaggerated rise in price commanded by other commodities, and in many sections of the State it is the chief dependence for the poor. The attention given and money spent in this work by the U. S. Fish Commission should convince any one of its importance and value to the people.

Quite \$600,000 is annually appropriated by Congress for the U. S. Fish Commission for its work, which shows that great results must have been achieved in its work. Every state in the Union receives its share of the benefit of this work, and Illinois has been given aid which enabled us to reap the fullest benefits of the naturally productive waters of the State. The national commission has loaned us the use of its cars and messengers to aid in our distribution, and has given us an equitable share of the products of its work for our waters.

The enforcement of the laws has been greatly improved, and although violations are still frequent no such wholesale slaughter as was prevalent a few years ago exists now. The markets of the State are clear of small fish and the knowledge that their sale will not be

permitted has done much to prevent the catch of illegal sized fish. Chicago's lake front is no longer covered with the great dip nets that two years ago lined the docks. In brief, your commissioners have endeavored to make the laws respected and obeyed.

For the first time in the history of the commission the State authorities have taken part in the enforcement of the laws relating to the protection of fish in Lake Michigan, and white fish and trout are again being seen in the lower end of the lake where they were once so plentiful, but of late years nearly extinct.

The lakes along the Illinois river which for years have been regarded as worthless, are being taken up and cared for, either for the production of fish for commercial use or as preserves for club purposes.

On the whole, we have nothing but improvement to note, and we feel sure that with proper laws, rigorously enforced, the waters of the State will do much toward the furnishing of food for the people and with the natural increase in the population will come greater necessity for bringing about such conditions as will make the supply equal the demand.

CARP.

First now among our fish as a money and food producer, stands the carp. Every year adds to its popularity as such, and the prejudice so long existing is fast disappearing as the facts are brought out regarding this wonderful fish.

The carp, from its marvelous growth and reproductive powers, gives back to our almost depleted streams, a substitute for the coarse fish, depended upon so universally for food, *i. e.*, the buffalo.

The catch of carp was considerably reduced during last season, owing to very high stage of water, but while this has been a great loss to the commercial fishing industry, it has been the means of giving a greater increase in fish than usual.

The rivers at a flood stage all season enabled fish to spawn, mature and escape into the river without the great loss following the decline in the river, when so many thousands of fish perish, being caught in the shallow ponds and retained there until the water evaporates and all life in them perishes.

It is not generally known, and it is in the nature of a surprise to us, that so few are aware that the carp are easily taken on hook and line, and when hooked make a vigorous fight. We have a great many inquiries from all parts of the State asking if carp can be taken with hook, and if so, what bait is used.

Carp not only take the hook, but are the best of all our fishes to bite to hook and line. They make a great fight and are second to the black bass alone in that respect. The mouth, closing on line, prevents the usual "drowning" of the fish, and they fight until tired out before giving up.

Ordinary ship stuff, boiled so as to make a paste of the consistency of putty, is the best bait. Dough (corn meal), well worked in with

ordinary cotton batting, so that it will not so quickly dissolve, is also a good bait. Raw potatoes, fried so as to be tough (not crisp) is a good bait. Use ordinary hook and line; attach sinker about a foot above hook, so it will be on bottom of river or lake and bait float up, and will produce results.

At all points along the Mississippi river, great quantities are taken with hook and line. On the Illinois river they are constantly fished for. The writer counted one day over one thousand people with hook and line in a distance of three miles, along the river front at Peoria, and nearly all were taking carp. Nearly all so caught are used for food, and with a knowledge how to cook them properly, they constitute a very valuable addition to the table.


Carp should be killed as soon as caught, bled thoroughly, laid in salt water for several hours, par boiled and baked or broiled. We find them on a large majority of the hotel tables under some other name than carp, it is found on menu as "blue fish," "bass," "pike," "white fish." They are eaten every day by hotel patrons and enjoyed.

The president of the commission, Mr. Cohen, had occasion to go to New York to attend a meeting of the fish commissioners, and while there happened into the "Waldorf Astoria" hotel, and found on menu, carp quoted at the same price per portion as fresh mackerel, etc. He told the story on his return, and found a number of doubters in his audience. He wrote the chef asking for a copy of menu, which was sent him with an autograph letter. This has been reproduced in electrotype and we publish it herewith. We take the liberty of giving herewith a copy of a receipt sent us by Doctor Weiss of Ottawa. He says, "I have found the perfected product equal to the imported article."


CARP OMELET OR CARP JELLY. (SWEDISH.)

"Take a six or eight pound carp; scale and skin. Leave head and skin. Cut into small pieces and place in boiling water just sufficient to cover and add salt, coarsely ground pepper, alspice and a bay leaf or two. Boil about 20 minutes or until perfectly soft. Remove from fire, remove pieces of fish from the water. Break the pieces so as to be able to remove all of the bones thoroughly. Skin fins and head pieces. Strain liquid through a colander and if necessary add a cupfull of gelatine, previously dissolved, to this liquid. At the same time add such other spices as may be desired. Add the original pieces of fish to the liquid or gelatinized liquid. Stir and place on ice until solidified."

Owing to the very rapid increase of carp in the small rivers and inland lakes, when no provision of law allows the use of the seine or net, we have given permits to have them caught by use of the seine, under the supervision of one of our wardens, paying the expense of the work and warden from the product. This applies to Fox lake, Fox river, Calumet lake and river, Rock river and a number of lakes throughout the State.



The Waldorf-Astoria,
Fifth Avenue, 550 and 570 Streets
and Water Court.



New York April 12, 1902

Mr. - Nat. F. Cohen,
Pres. Ill. Fish Commission.

Dear Sir,

In answer to your esteemed of
the 5th April, I gladly send you
to oblige 2 menus containing the fish
that was the object of your remarks.

Hoping that they will be of some use
to you

Yours truly,
C. C. C.

Cafe Luncheon

CAPE CODS 25		LYNNHAVENS 35		BLUEPOINTS 25	
Radishes 20	Bialiga Caviare 1 50	Spiced Cantaloupe 30	Sardines 35	Stuffed Olives 35	
Lyon Sausage 50	Celery 50 30	Pickled Beets 30	Thon Mariee 40	Anchovy Salad 50	
Nine California Olives 25	Pearl Onions 25	Spring Onions 25	Pin-Money Pickles 20		
Cream Parmentier 50 30				Sagou 35 20	
Petit Marmite 50	Chicken Broth per cup 30	Croûte au pot 40	Tomato Soup 40 25		
Chicken Broth, Bellevue 60 per cup 30	Clam Broth per cup 25		Pea Soup 35 25		
Strained Gumbo 75	Chicken Okra 60 35	Mock Turtle 50	Julienne 40		
Green Turtle 1 00			Mongol 40		
Oyster Crabs 1 00 60	Shad Roe 40	Soft Shell Crabs 1 00	Shad 50		
English Sole 1 00			Brook Trout 1 00		
X Carp, Rhine Wine sauce 65 40	Smelts, Melba 75 40	Kingfish, Bonne-femme 85 50			
Bluefish, Italian sauce 70 40		Baked Halibut with cream 70			
Fresh Mackerel, Maître d'Hôtel 65		Weakfish sauté with butter 65 40			
Eggs Monseigneur 50					
Broiled Mushrooms 1 00				Terrapin 3 00	
Lamb Chops, Fremeuse 70 40			Fried Calf's Brains, Tomato sauce 65 40		
Ham with spinach 65 40			Aiguillettes of Filet, Poivrade sauce 85 30		
Navarin of Mutton, Parisienne 65 40			Croquettes Panachées with green peas 65 40		
Roast Lamb 65 40	Roast Squab Chicken 1 25	Roast Chicken 2 00 1 00			
Roast Turkey 1 00 60	Roast Mutton 60 35	Roast Beef 60 40			
Broiled Turkey 3-00 half 1 50	Broiled Chicken 2 00 half 1 00	Squab Chicken 1 25 75			
Broiled Pullet 3 00 half 1 50	Squab 80	Duckling 2 00 half 1 00			
	Squab Guinea Hen 1 75 1 00				
Canvas Back 4 00	Rail Birds 1 00	Red Head 3 50	Ruddy 2 00	Plover 75	
Mallard 1 50		Brant Duck 1 50		Snipe 75	
New Asparagus 1 00					
Potatoes Pont-Neuf 30 20	Beets 30 Spinach 40	Sweet Potatoes 30	Cauliflower 60	Boiled Potatoes 25 15	Okra, German style 50
Fried Egg Plant 40 25	Succotash 40	Squash 40	Fresh Artichoke 60		
French Asparagus 1 25	Onions 40 25	Plain Rice 20	Stuffed Tomatoes 60		
Braised Lettuce 60	Bermuda Potatoes 30 20	Lima Beans 50			
Mashed Turnips 40	Fresh String Beans 75	Sweet Red Peppers 50			
Stewed Tomatoes 30	Oyster Bay Asparagus 75	Cépes 60			
COLD					
Game Pie 1 00 60	Brook Trout in jelly 1 00	Chaudfroid de volaille 1 25			
Lamb 65 40	Tenderloin of Beef 1 25 75	Squab Chicken 1 25 75	Chicken 2 00 1 00		
Pickled Pig's Feet 40	Pickled Lamb's Tongue 50 30	Boned Turkey 1 00 60			
Orab, Ravigotte 50	Ham 50 30	Virginia Ham 75	Westphalia Ham 75 40		
Spring Lamb 1 00		Squab 80	Duckling 2 00 1 00		
Watercress 40 25	Lettuce and Grapefruit 60 35	Waldorf 60 40	Lobster 1 00 60		
Chicken 1 00 60	Russian 1 00	Romaine 60 35	Dandelion 40	Monk's Beard 40 25	
Celery 50 30	Cold Slaw, Egg dressing 40	Cucumber 60 35	Tomato 60 35		
Celery Knobs 40 25	Lettuce 50 30	Fetticus 40 25	Chicory 50 30	Escarole 50 30	
Gorgonzola 30 20	Gruyère 25 15	Edam 30 20	Brie 30 20	Neufchatel 35	
Cream Gervais 25	Roquefort 30 20	Philadelphia Cream 25 15	Port Salut 30 20		
English Dairy 25 15	Camembert 30 20	American 20 15			
Cheddar 30 20	Stilton 40 25	Canadian 25	Pont l'Evêque 30 20		
Strawberries 50 30	King Tangerines 25		Oranges 25 15		
Bananas 20	Apples 25	Malaga Grapes 50 30	Pears 60 35	Grapefruit 50 30	
Cassava Pudding 40 25	Kuennel Omelette Soufflée 50			Peach Pie 20	
Lemon Custard Pie 20				Chocolate Baba 30	
Assorted Eclairs 25	Savarin 35	Baba 25	Charlotte Russe 25	Caramel Custard 30	
Waldorf Jelly 25	Bar-le-duc Strawberries 40	Fruit Cake 25	Astoria Jelly 25		
Assorted Cakes 25		Strawberry Short Cake 50			
Bar-le-duc Jelly 40	Apple Pie 20	Found Cake 25			
Apricot, Pineapple, Raspberry, Lemon or Orange Water Ice 25					
Strawberry, Vanilla, Coffee, Chocolate or Pistache Ice Cream 25				Mixed 30	
Ice Coffee 20	After Dinner Coffee Cup 15	Café Parfait 25	Butter Milk 10		
	Half Portions are served in Café and to one Person only.				
	IOHANNIS-LITHIA 40 20				

THE WALDORF-ASTORIA

Wednesday, April 16, 1902

MENU, WALDORF-ASTORIA, NEW YORK.

STEAMER "ILLINOIS,"



REPORT OF CAPTAIN GEO. T. WILLIAMS, STEAMER ILLINOIS.

To S. P. Bartlett, Secretary State Fish Commission:

Steamer Illinois.—Mileage from Oct. 1 to Nov. 5, 1901, was 1,613 miles, collecting 18,000 young fish for distribution, covering territory from Keokuk, Ia., on the Mississippi river, to Peru, Ill., on the Illinois river; laid up at Quincy, Ill., on Nov. 5, 1901; boat went in commission April 1, 1902; leaving winter anchorage at 10:30 a. m. April 5, and, coaling up, left Quincy on April 3 for Illinois river; from that date until July 1 patrolled the Illinois river, making a mileage of 2,955 miles. The log shows the work of season of 1902 as follows: 3d, run from Quincy to Grafton; 4th, Grafton to Beardstown; 6th, Beardstown to Peoria, waiting orders; 8th, Peoria to Peru; 9th, Peru to Chillicothe; 10th, Chillicothe to Peoria, taking up four nets, warning ten fishermen; 11th, Peoria to Beardstown, taking up 41 nets, warning 14 fishermen; 13th, Beardstown to Meredosia, taking up 31 nets; 14th, Meredosia to Kampsville, removed 61 nets; 16th Kampsville to Grafton, removed 31 nets, warning all fishermen to remove nets or would take them on return trip; laid up at Grafton 17th and 18th; left Grafton 19th for Kampsville; 20th, Kampsville to up creek and removed 14 nets; same at Barlow ditch, removing four nets; laid up at Beardstown; 21st, Beardstown to Peoria, stopped at Sugar creek and removed ten nets, awaiting orders at Peoria; April 23, left Peoria, stopping at Chillicothe, Lacon and Henry, returning to Peoria; 26th, ran to Kingston, river free from nets; 28th, returned to Peoria; May 1, Peoria to Havana, taking down 64 nets; 4th, Havana to Valley City, removed 31 nets, seven baskets; 6th, left Valley City, run to Beardstown and went up to Sangamon bay, removing eight nets; 8th, returned to Peoria, waiting orders; 9th to 18th, made short trips in and out Peoria, removing 136 nets; 18th, Peoria to Meredosia; 19th, Meredosia to Clarksville, Mo.; 20th, Clarksville, Mo., to Quincy, Ill.; 22d, Hannibal to Quincy; 23d, Quincy to Keokuk, Ia.; 24th, Keokuk to Quincy; 25th and 26th, laid over at Quincy; 27th, left Quincy for Illinois river, arriving at Grafton at 12:00 p. m., 120 miles, Beardstown at 10:00 p. m., day's run 240 miles; May 28, Beardstown to Peoria, river high, practically free from nets; May 29, Peoria to Henry; 30th, Henry to Peoria; June 1 to 4, laid at Peoria; 5th, Peoria to Kingston and return; 6th, Peoria to Valley City; 7th, Valley City to Beardstown; 8th, Beardstown to Havana; 9th, Havana to Peoria; 11th, Peoria to Chillicothe; 13th, Chillicothe to Peoria; 15th, Peoria to Kingston; 17th, Kingston to Beardstown; 18th, Beardstown to Kingston; 19th, Kingston to Naples; 20th, Naples to St. Louis; 23d, St. Louis to Grafton; 24th, Grafton to Meredosia; 26th, Meredosia to Peoria; 27th to July 3, laid at Peoria; July 3, Peoria to Beardstown; 4th, Beardstown; 5th, Beardstown to Meredosia and return to Beardstown; 6th to 10th, worked about Beardstown, Sangamon bay and creek, river very high and but four nets; 11th, run to Peoria; 12th, Peoria to Peru; 13th, Peru to Peoria; 14th, Peoria to Chillicothe and return to Peoria; 17th, Peoria to Pekin and return to Peoria; 20th, commenced working or collecting fish, taking 6,000 small black bass; 22d, worked about Peoria, 5,500 black bass; 23d, worked back to Peoria and down to Havana Park, 1,500 bass; 24th, Havana to Copperas creek dam, river rising fast, no nets, water out into the woods; 25th, Copperas creek to Peoria; 25th to 30th, laid at Peoria, water too high for work; 30th, Peoria to Peoria lake, back to Peoria; 31st, Peoria lake, 600 bass; Aug. 1 to 5, laid at Peoria; 5th, Peoria to Naples; 6th, Naples to Peoria; 7th, Peoria to Henry; 8th, Henry to Peoria; 9th and 10th, laid at Peoria; 11th, Peoria to Pekin; 12th, Pekin to Peoria; 13th, laid at Peoria; 14th, Peoria to Pekin; 15th, Pekin to Peoria; 16th, Peoria to Meredosia; 17th, Meredosia to Beardstown; 18th to 23d, working from Beardstown to Kingston; 24th, Kingston to Pekin; 26th, Pekin to Peoria; 27th, run to Kingston; 29th, Kingston to Beardstown; Aug. 30, Beardstown to Meredosia; Aug. 31 to Sept. 3, worked from Meredosia to Beardstown; Sept. 4, Beardstown, Browning, Frederick and return to Beardstown; 5th to 10th, working Beardstown to Meredosia; 11th, 12th and 13th, working Beardstown to Clear lake; 14th, Clear lake to Peoria; 15th, Peoria to Chillicothe; 16th, Chillicothe to Pekin; 17th-20th, Pekin to Kingston and return to Pekin; 21st, Pekin to Meredosia, where I delivered my

load of fish; 22d, Meredosia to Stay Island, Mo.; 23d, Stay Island to Quincy; 26b, Quincy to St. Louis, 165 miles; 27th, St. Louis to Valley City; 28th, Valley City to Pekin; Sept. 29 to Oct. 1, working at Pekin and below to Beardstown; 2d, Beardstown to Meredosia; 3d, Meredosia to Valley City; 4th, Valley City to Meredosia; 5th to 8th, working Meredosia and Havana; 9th, Havana to Peoria; 10th, Peoria to Pekin; 13th, Pekin to Peoria; 15th, Peoria to Meredosia; 16th to 22d, Meredosia to Havana; 23d, Havana to Peoria; 26th, Peoria to Meredosia; 27th, Meredosia to Clarksville, Mo.; 28th, Clarksville to Quincy; Oct. 29 to Nov 15, working sloughs about Quincy. Total miles during season, 6,133.

The Illinois river has been very high, and the use of seines and nets since July 15 has not been general. The water in the woods most of the time has made collection difficult. I have avoided, as far as possible, any litigation, and have, as instructed by Mr. Cohen, undertaken the milder methods of warning all fishermen and removing nets without destroying same. The season for the market fishermen has been unprofitable. The better class of fishermen and dealers are in sympathy with the enforcement of the law, and have aided me very greatly in my work. The crew have worked hard, and discipline has been good. The boat goes to bank in good condition. I take the liberty of recommending more steam capacity, with new heaters. The boat will then, I think, fill all requirements as to speed and economy in use of coal. Agreeable to your instructions, I did what I could to aid the families of residents of overflowed bottoms, and held the boat in radius for rescue services for several days.

Respectfully submitted,

GEO. T. WILLIAMS,

Master Steamer Illinois and Chief Warden Steamer Illinois.

LIST OF FISH WARDENS.

G. R. Ratto, deceased.....	June 12, 1901	June 19, 1901	Chicago, 3827 Indiana av.....
A. Sites.....	do	do	Homer, Champaign Co.....
Max Gallagher.....	do	June 18, 1901	Lincoln, Logan county.....
Charles D. Mulford.....	June 19, 1901	June 22, 1901	Belvidere, Boone county.....
James W. Hunter.....	do	do	Ramsey, Fayette county.....
Charles F. Hixson.....	do	do	Peoria, Peoria county.....
F. E. Scottford.....	do	June 24, 1901	Hinsdale, DuPage county.....
Thos. McDermott.....	do	do	Ottawa, LaSalle county.....
W. H. Moore, deceased.....	do	do	Danville, Vermillion county.....
Thos. Williams.....	do	do	Quincy, Adams county.....
Thomas Berry.....	July 9, 1901	July 9, 1901	Havana, Mason county.....
Louis Bernero.....	June 19, 1901	July 16, 1901	Somonauk, DeKalb county.....
L. E. Benard.....	July 23, 1901	July 25, 1901	Hammond, Platt county.....
Charles Keith.....	Aug. 3, 1901	Aug. 9, 1901	Shawneetown, Gallatin county.....
Adolph O. Schreiber.....	do	Aug. 9, 1901	Chicago, 3455 Grand av.....
William D. Milner.....	do	Aug. 15, 1901	Orchardville, Wayne county.....
William Hart.....	do	Aug. 9, 1901	Charleston, Coles county.....
G. W. Glynn.....	Aug. 14, 1901	Aug. 19, 1901	Rockford, Winnebago.....
Leonard Wilmoth.....	Sept. 11, 1901	Sept. 20, 1901	Millford, Iroquois county.....
I. C. Milton.....	Sept. 20, 1901	Sept. 23, 1901	Belle Rive, St. Clair county.....
Henry Dayment.....	Oct. 3, 1901	Oct. 14, 1901	Chicago, 200 Lake st.....
A. P. White.....	do	Oct. 24, 1901	Manito, Mason county.....
Charles A. Nichols.....	Oct. 18, 1901	Oct. 22, 1901	Urbana, Champaign county.....
W. G. Lightfoot.....	Mar. 7, 1902	Apr. 2, 1902	Iola, Clay county.....
John Jungles.....	do	Apr. 9, 1902	Joliet, Will county.....
L. A. Greenleaf.....	Mar. 25, 1902	Apr. 11, 1902	Jacksonville, Morgan county.....
Greant Dewey.....	Apr. 4, 1902	*	..... Calhoun county.....
George W. Sweatman.....	do	Apr. 12, 1902	Belvidere, Boone county.....
J. R. Balliet.....	do	Apr. 9, 1902	Belvidere, Boone county.....
Otto Falh.....	do	Apr. 11, 1902	Gross Point, Cook county.....
George B. Kleinman.....	do	Apr. 15, 1902	Chicago, Cook county.....
E. E. Caldwell.....	Apr. 11, 1902	Apr. 11, 1902	Havana, Mason county.....
Peter McCoy.....	May 7, 1902	May 14, 1902	Dixon, Lee county.....

List of Fish Wardens—Concluded.

John Scott	Feb. 24, 1902	Feb. 24, 1902	Berlin, Sangamon county
William Curran	June 5, 1902	Aug. 22, 1902	641 S. Center av., Chicago, for Cook, Lake and McHenry counties.....
Martin A. Howell, Jr .....	.. do	July 12, 1902	McHenry, McHenry county, for Lake and McHenry counties.....
J. E. McHenry	July 7, 1902	.. do	Carmi, White county.....
Holmes Linsing .....	.. do	July 9, 1902	White Hall, Green county.....
Milo L. Tompkins.....	.. do	July 12, 1902	Colchester, McDonough county
Jas. L. Wise	Aug. 15, 1902	†	Summer, Lawrence county
Edward K. Freeland.....	.. do	Aug. 18, 1902	Sandwich DeKalb county.....
Charles B. Raymond.....	.. do .....	.. do	Williamsfield, Knox county.....
E. J. Eastman.....	Sept. 8, 1902	Nov. 14, 1902	Moline, Rock Island county.....

* No commission; no oath filed. † No commission issued; no oaths filed.

REPORT OF FISH WARDEN, J. W. SCOTT, JR., BERLIN, ILL.

No arrests. No convictions.

We have the Sangamon river partly in county.

REPORT OF FISH WARDEN, LOUIS RERNERO, DEKALB COUNTY.

Number of arrests, four.

Number of convictions, four.

Amount of fees collected, \$100.

We have the following streams, Indian creek, Big rock, Kishwaukee river.

There are no dams on above streams.

REPORT OF FISH WARDEN, W. H. MOORE, DANVILLE, VERMILION COUNTY, ILL.

Number of arrests, four.

Number of convictions, four.

Amount of fees collected, \$50.

We have the following streams partly in our county, Vermilion, North Fork, Middle Fork and South Fork.

Three dams in county all on North Fork.

All unprovided with fish ways.

The dams, however, are opened to suit the runs of fish.

REPORT OF FISH WARDEN, THOS. McDERMOTT, OTTAWA, ILL.

No arrests. No convictions.

The following streams are partly in this county, Illinois river, Fox river, Illinois and Michigan canal.

The dams at Dayton and Marseilles are both unprovided with fish ways.

I have erected warning signs at the half mile point, above and below dam as instructed.

REPORT OF FISH WARDEN, C. H. STOWARD, PAXTON, ILL.

Number of arrests, 12.

Number of convictions, 18.

Amount of fees collected, \$200.

Amount not collected, \$100.

OFFICE OF GEORGE W. GLYNN, STATE FISH WARDEN.

Oct. 1, 1902.

Hon. N. H. Cohen, President Illinois Fish Commission:

DEAR SIR:—Enclosed please find my report for the last 17 months, at which time I was appointed and in fall of Oct. 1, 1902:

Total number of arrests, 37.

At Chicago, 25.

Total amount of fines collected, \$400.

Total at Chicago, \$50.

Illegal and undersized fish taken, 50 barrels.

Total number of nets confiscated, 420.

Total confiscated at Chicago since April 15, 1902, 404.

Delivered to different sheriffs, destroyed and on hand, 404.

Fishing derricks captured and destroyed, and removed on Lake Michigan front since April 15, 1902, 782.

Value of derricks destroyed, \$7,810.

Value of seines captured, \$10,425.

Largest seine captured 712 feet long.

Largest gil net, 572 feet long.

Total amount of fish given to the different hospitals at Chicago, and to the poor, 50 barrels.

Respectfully submitted,

GEORGE W. GLYNN.

State Fish Warden for Chicago and Fox Lake Region.

REPORT OF FISH WARDEN J. C. MILTON, BELLE RIVE, ILL.

No arrest. No convictions.

No dams in county.

REPORT OF FISH WARDEN W. E. HART, CHARLESTON, ILL.

Number of arrest, 4.

Number of convictions, 2.

Amount of fees collected, not reported.

We have the following streams in our county: Embarras river, Kickapoo creek and Riley creek.

We have one dam in our county. which is provided with a fish way and which is in good order.

For the two years ending Sept. 30, show 33 fish traps destroyed. I have served subpoenas to report to grand jury this fall.

REPORT OF FISH WARDEN, WILLIAM D. MILNER, ORCHARDVILLE, ILL.

No arrest.

No convictions.

No fees collected.

REPORT OF FISH WARDEN A. SITES, HOMER, ILL.

Number of arrests, 110.

Number of convictions, 67.

Number of ———, 43.

Amount of fees collected, \$200.

Unlawful seines and nets seized, 62.

The above service performed in Champaign, Tazewell, Marshall, Pekin and Adams county.

REPORT OF FISH WARDEN A. O. SCHRIBER, CHICAGO, ILL.

Number of arrests, 5.

Number of convictions, 4.

Amount of fees collected, \$100.

We have three dams in county.

REPORT OF FISH WARDEN LOUIS E. RENARD, HAMMOND, ILL.

No arrests.

No convictions.

No fees collected.

Streams in county: Sangamon river, Lake Fork of Okaw, Camp Creek, Willow Branch and Wolf run, Goose Creek, Mudhen run and Friends Creek.

No dams in the county.

REPORT OF FISH WARDEN LEONARD WILMATH, MILFORD, ILL.

Number of arrests, 1.

Number of convictions, 1.

Amount of fees collected, \$25.

Dams in county—Sugar Creek, Iroquois Creek and Mud Creek.

No dams in county.

REPORT OF FISH WARDEN A. G. LIGHTFOOT, IOLA, ILL.—(Clay Co.)

Number of arrests, 1.

Number of convictions, none. Evidence defective.

No fees collected.

Streams in county: Little Wabash river, Dismal Creek and Crooked Creek.

No dams in county.

It is very difficult to catch violators at work. I don't believe there is a legal seine in the county.

REPORT OF FISH WARDEN GEORGE KLEINMAN, CHICAGO, ILL.

Number of arrests, 9.

Number of convictions, 5.

Amount of fees collected, \$50.00.

Calumet river and lake and part of Wolf lake in my district.

I also submit my report for special work assigned me.

Nat Cohen, Esq., President Fish Commission, Urbana, Ill.:

DEAR SIR—I make a report of what I have done along the lake and at Oregon. In June Glynn and myself cleaned up the lake front from Fifty-fifth street to Randolph street. We cut down and destroyed about 275 nets and derricks and made six (6) arrests. Beside this I have taken thirty (30) nets along the river. On August 17th I went to Oregon. I was there twelve days and made eight (8) arrests. They were tried by jury, the jury disagreeing. The cases were continued for ten (10) days, and when they were called again the State's attorney thought the best way was to dismiss them and have them come up before the grand jury. When the grand jury met they were indicted, but when the court was called it held that it had no jurisdiction; so in that case they will have to come before the Supreme Court. My expenses for the three trips to Oregon were about \$88.00. I went to Wankegan and located the fishermen there, and went there again in company with Palmer. We waited until they came in with their nets. Captain Smith of the fishing tug Elcie Nell was the first to arrive. We examined his nets and found them all small mesh, and the same with Captain Nelson of the tug Hannah Sullivan. We then told them what we were there for. They said they had taken up all their trout nets and were fishing for nothing but perch and herring. I went down again on the 15th and examined their boats and fish, but found no trout or white fish. On the 17th Palmer and I went there again and found the fishing tug Ewig, from Port Washington, Captain Ewig in command. We examined his boat and fish, but found nothing but herring. On the 18th I went to Kenosha, but found nothing there. All the fishermen along the lake seemed to be glad to have the law enforced, and also to have the law the same as in the other two states. Total expenses for those trips were \$28.05.

Yours truly,

GEO. KLEINMAN.

REPORT OF FISH WARDEN GEORGE R. RATTO, CHICAGO, ILL.

The report herewith is only partial. Mr. Ratto died on ———.

Number of arrests, 21.

Number of convictions, 17.

Amount of fees collected, \$210.00.

Jail sentences, 7.

I have taken and delivered to the various charitable institutions of Chicago 17,000 of small fish, and enclose herewith receipt for the same.

To the Hon. N. H. Cohen, President Illinois Fish Commission, Urbana, Ill.:

I herewith submit my annual report as fish warden as follows: I received my commission as fish warden on the 11th day of April, 1902. On the 15th day of April, 1902, I began special work in the enforcement of the net law, commonly known as the closed season. I found the fishermen as a rule willing to abide by the law and removed their nets until June 1, 1902. Owing to a large territory and the law being new, it was near the 1st of May before all the nets were out, after which I confiscated ten nets and turned them over to George Hoff, sheriff of Mason county.

There has been no seining here in the Illinois river owing to high water, the stage of the water breaking all records, consequently I have had but very little trouble from that point. The most trouble I have had is from the shipment from small or under sized fish and the use of dynamite. I have now in my possession evidence of the above which I believe will result in the arrest and conviction of the violators. There has been some complaint of open violations of all law in the extreme south end of Mason county, and it seems to me nearly impossible to reach the violators without a warden at Browning, where the fish are sold. With a good man at that point, I think the laws could be well enforced.

The above report I most respectfully submit.

E. E. CALDWELL,
Warden,

REPORT OF E. E. CALDWELL, FISH WARDEN.

April 15, nets thrown down, 100; April 16, 17, 250; April 17, 115; April 18, 6, 75; April 19, 45, 325; April 21, 75; April 22, 33, 50; April 23, 6, 50; April 24, —; April 25, 4; April 26, —; April 28, —; April 29, 35; April 30, —; May 1, 3; May 2, 3; May 3, —; May 5, —; May 6, —; May 7, —; May 8, —; May 9, —; May 10, 5; May 12, 3; May 13, 7; May 14, 6; May 15, 5; May 16, 2; May 17, —.

BOARD OF FISH COMMISSIONERS.

An act entitled, "An act to establish a Board of Commissioners to increase the product of the fisheries, by artificial propagation and cultivation." Approved May 13, 1879. In force July 1, L. 1879, p. 171.

¶ 1. Board of Commissioners Created.] Sect on 1. Be it enacted by the People of the State of Illinois, represented in the General Assembly, That it shall be the duty of the Governor, with the advice and consent of the Senate, to appoint three persons residents of this State, who shall constitute a Board of Fish Commissioners. The persons so appointed shall hold their offices for the respective terms of one, two and three years, the Governor designating the term each member shall serve as said commissioner from the time of their first appointment, and their successors to be appointed at the expiration of the several terms of office, and shall each hold their terms of office for three years.

¶ 2. Duties.] § 2. It shall be the duty of the persons so appointed to select suitable locations for State hatching and breeding establishments, take all measures within their means for propagation and increase of the native food fishes, and also for the introduction of new varieties of food fishes into the public waters of the State, upon the best terms possible; to employ a practical and competent fish culturist as a superintendent who shall have general charge and care of such establishments, and perform all such duties as the commissioners shall direct. Said board shall not receive any compensation for their services, but shall be reimbursed their actual expenditures for traveling and hotel expenses, not to exceed in any event the sum of \$300 per annum for the entire board. *Provided*, That if no appropriation be made no expenses shall be incurred.

¶ 3. Expenses—How Paid. § 3. The said commissioners or any two of them shall have authority to draw upon the State Treasurer from any appropriation made in pursuance of the purpose of this bill, as the same may be required, to defray expenses incurred, and shall report to the Governor of the State, all and singular, the items of such expenditures together with the business transacted under their commission, such report to be made on or before the commencement of each fiscal year.

FIFTH ANNUAL REPORT OF THE ILLINOIS FISHERMEN'S ASSOCIATION.

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

Compiled from reports received from various shipping points, located mostly on the Illinois River, giving the estimated amount and kinds of fish caught and value of same for the year, ending Dec. 31, 1900.

Shipping Point.	Carp. Pounds.	Buffalo. Pounds.	W. Perch. Pounds.	Cat Fish Pounds.	Shovel Cat. Pounds.	Str Bass Pounds.	Sun-fish and R. Perch. Pounds.	Bull Pouts. Pounds.	Crappie. Pounds.	Black Bass. Pounds.	Doren Turtles.	Snappers. Pounds.	Dog-fish Pounds.
DePue.....	145,000	86,000	3,000	1,500	.....	4,000	5,000	20,000	1,850	650	300	.....	20,000
Bluff City.....	205,000	109,000	13,500	15,900	.....	980	20,000	29,300	5,300	810	.....	.....	8,700
Naples.....	180,000	75,000	30,000	15,000	500	2,000	20,000	20,000	4,000	2,000	300	.....	15,000
Havana.....	682,865	358,580	46,060	9,460	.....	8,860	156,300	12,350	12,350	10,450	1,600	.....	35,000
Pekin.....	361,835	198,520	4,140	9,800	.....	4,130	23,550	66,760	10,085	3,780	1,690	.....	80,000
Browning.....	400,000	200,000	35,000	35,000	.....	5,000	19,000	18,000	3,350	1,500	.....	11,050	125,000
Harris Landing.....	109,000	50,000	10,000	7,000	.....	5,500	2,000	3,000	508	1,500	100	.....	125,000
Valley City.....	80,000	60,000	9,000	7,000	300	3,000	2,500	4,000	3,000	700	100	.....	10,000
Montezuma.....	60,000	20,000	1,880	1,800	100	.....	2,200	3,500	1,500	1,100	625	.....	3,000
Columbiana.....	10,000	20,000	1,000	1,500	200	2,500	100	3,500	1,000	1,100	.....	.....	3,000
Kempsville.....	364,000	80,000	97,000	25,000	2,000	4,360	1,560	4,500	1,020	990	100	.....	15,000
Chillicothe.....	450,000	170,000	26,000	5,600	9,000	5,000	15,000	45,000	9,800	3,500	250	.....	25,000
Henry.....	218,000	98,280	19,000	1,200	.....	4,400	12,600	23,000	3,600	650	1,020	2,000	10,000
Peoria.....	812,000	274,000	45,000	800	100	5,000	14,100	65,800	4,300	680	.....	.....	18,000
Pearl.....	150,000	200,000	15,000	15,000	.....	950	1,300	3,500	1,500	1,050	1,000	.....	4,000
Bath.....	150,000	95,000	20,000	9,500	.....	6,000	17,500	35,000	10,000	3,300	1,100	15,000	7,500
Lacon.....	75,000	35,000	3,000	2,000	.....	1,000	1,000	5,000	3,000	2,000	.....	.....	3,500
Nauvoo.....	13,000	15,000	1,500	5,000	60,000	.....	.....	.....	5,000	2,500	.....	.....	3,600
Florence.....	150,000	75,000	10,000	20,000	.....	.....	10,000	20,000	.....	.....	100	.....	.....
Blue Island.....	12,000	1,000	2,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Boston.....	175,000	150,000	12,000	6,000	10,000	1,500	1,800	1,000	1,200	550	160	.....	2,500
Spring Valley.....	40,000	25,000	4,000	4,000	.....	580	1,250	2,000	350	300	150	.....	3,000
Hennepin.....	75,000	53,000	4,000	1,200	.....	630	2,000	6,000	1,000	300	600	.....	4,500
Liverpool.....	60,000	42,000	13,000	7,000	.....	1,400	6,000	17,000	1,500	580	550	.....	1,500
Hardin.....	69,000	56,000	13,200	15,000	.....	1,000	1,400	5,200	1,600	310	350	.....	1,500
Grafton.....	35,000	39,000	19,000	34,000	.....	5,200	7,600	6,000	1,800	1,200	550	.....	1,800
Beardstown.....	850,000	335,000	39,450	18,500	.....	9,500	19,000	49,860	7,500	3,600	900	7,000	45,000
Meredosia.....	325,000	185,000	5,630	9,000	.....	5,200	14,000	13,800	3,500	2,800	900	.....	18,000
Pounds of each species.....	6,317,700	3,154,350	601,390	314,220	87,200	82,720	256,340	624,320	98,575	46,470	15,695	55,050	461,600
Value by species.....	\$189,531.00	\$94,631.40	\$15,041.70	\$12,568.80	\$2,616.00	\$4,136.00	\$7,690.20	\$24,972.80	\$5,914.50	\$4,547.00	\$15,695.00	\$2,202.00	\$9,230.00

RECAPITULATION.

	Pounds.	Value.
Carp.....	6,317,700	\$189,531 00
Buffalo.....	3,154,380	94,631 40
White perch.....	501,390	15,041 70
Cat-fish.....	314,220	12,568 80
Shovel cat.....	87,200	2,616 00
Striped bass.....	82,720	4,136 00
Sun-fish.....	} 256,340	7,690 20
Ring perch.....		
Bull pouch.....	624,320	24,972 80
Crapple.....	98,575	5,914 50
Black bass.....	46,470	4,647 00
Turtles—15,695 doz.....		15,695 00
Snappers.....	55,050	2,202 00
Dog-fish.....	461,500	9,230 00
Total.....	11,899,865	\$338,876 40

M. D. HURLEY, *President.*

JOHN A. SCHULTE, *Treasurer.*

L. W. GOODELL, *Secretary, Beardstown, Ill.*

LIST OF FISH AND GAME COMMISSIONERS OF THE UNITED STATES AND
CANADA.

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Alaska—Hon. James M. Shoup, Juneau.

Dominion of Canada—A. T. Dunn, St. John, New Brunswick; L. B. Knight, St. John, New Brunswick; D. G. Smith, Chatham, New Brunswick; Charles Barber, Winnipeg, Manitoba.

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Colorado—Charles W. Harris, Denver; T. J. Holland, Denver.

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Maine—L. T. Carleton, Winthrop; Henry O. Stanley, Dixfield; E. E. Ring, Orono.

Maryland—John W. Avirett, Cumberland; C. L. Vivcent, Snow Hill; Jessie W. Downey, Newmarket.

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Oregon—T. T. Greer, Salem; F. I. Dunbar, Salem; Charles S. Moore, Salem; H. G. Van Dusen, Astoria; H. A. Webster, Clackamas; L. W. P. Quimby, Portland.

Pennsylvania—Fish Commissioners: S. B. Stillwell, Scranton; John Hamburger, Erie; Henry C. Demuth, Lancaster; James W. Correll, Easton; William E. Meehan, Philadelphia; Henry C. Cox, Wellsboro. Game Commissioners: Colman K. Sober, Lewisburg; William M. Kennedy, Allegheny; Charles B. Penrose, Philadelphia; J. O. H. Denny, Ligonier; James H. Worden, Harrisburg; William Heywood Meyers, Williamsport.

Rhode Island—Fish Commissioners: Henry T. Root, Providence; William P. Morton, Johnston; J. M. K. Southwick, Newport; Charles W. Willard, Westerly; Adelbert Roberts, Woonsocket; Albert David Mead, Providence; William H. Boardman, Central Falls. Game Commissioners: Fenner H. Peckham, Jr., Providence; Walter R. Stiness, Warwick; Edwin R. Lewis, Westerly; William H. Thayer, Bristol; Alexander O. D. Taylor, Newport; John H. Flanagan, secretary, Providence.

Texas—J. P. Kibbe, Port Lavaca.

Utah—John Sharp, Salt Lake City.

Vermont—Henry G. Thomas, Stowe; Edward A. Davis, Bethel; Charles C. Gilmore, Swanton.

Virginia—John W. Boudin, Bloxom; George B. Keezell, Keezleton; Henry M. Tyler, Richmond; Robert J. Camp, Franklin; Seth F. Miller, Riverside.

Washington—Timothy Kershaw, Whatcom.

West Virginia—E. F. Smith, Hinton.

Wisconsin—Edwin E. Bryant, Madison; E. A. Birge, Madison; Calvert Spensley, Mineral Point; James G. Hogan, La Crosse; Henry D. Smith, Appleton; Currie G. Bell, Bayfield; William J. Starr, Eau Claire; James Nevin, Madison.

Wyoming—D. C. Nowlin, Big Piney.

Recapitulation of Expenditures by Illinois State Fish Commission for General Expenditures, Collection and Distribution of Fish, etc., from Oct. 1, 1900, to Sept. 30, 1902. Bills of Particulars and Subvouchers on file with State Auditor.

To balance on hand Oct. 1, 1900		\$5,879 84
To appropriation available July 1, 1901		7,500 00
		\$13,379 84
<i>Cr.</i>		
By expenditures (vouchers) for month of		
October, 1900	\$536 14	
November, 1900	557 43	
December, 1900	586 08	
January, 1901	412 54	
February, 1901	399 60	
March, 1901	327 79	
April, 1901	364 51	
May, 1901	491 84	
June, 1901	480 66	
July, 1901	394 44	
August, 1901	552 20	
September, 1901	542 68	
		5,625 91
To balance Oct. 1, 1901		\$7,753 93
To appropriation available July 1, 1902		7,500 00
		\$15,253 93
<i>Cr.</i>		
By expenditures (vouchers) for month of		
October, 1901	\$1,298 56	
November, 1901	731 44	
December, 1901	545 89	
January, 1902	319 45	
February, 1902	455 36	
March, 1902	521 11	
April, 1902	611 92	
May, 1902	1,017 46	
June, 1902	1,096 31	
July, 1902	675 32	
August, 1902	644 47	
September, 1902	767 81	
		8,685 10
Balance on hand Oct. 1, 1902		\$6,568 83

Recapitulation of Expenditures by the Illinois State Fish Commission for Maintenance of Steamer Reindeer from Oct. 1, 1900, to Sept. 30, 1902. Bills of Particulars and Vouchers on file with the State Auditor.

To balance in appropriation of 1899, Oct. 1, 1900		\$ 841 36
To appropriation available July 1, 1901		2,500 00
		\$3,341 36
<i>Cr.</i>		
By expenditures (vouchers) for month of		
October, 1900	\$504 26	
November, 1900	337 10	
July, 1901	185 35	
August, 1901	284 70	
September, 1901	487 17	
		1,798 58
To amount on hand Oct. 1, 1901		\$1,542 78
To appropriation available July 1, 1902		2,500 00
		\$4,042 78

Recapitulation of Expenditures—Continued.

<i>Cr.</i>		
By expenditures (vouchers) for month of	October, 1901.....	\$396 75
	November, 1901.....	354 48
	December, 1901.....	178 67
	January, 1902.....	130 50
	February, 1902.....	130 05
	March, 1902.....	245 50
	April, 1902.....	107 03
	July, 1902.....	363 93
	August, 1902.....	568 15
	September, 1902.....	476 68
		2,949 74
Amount on hand Oct. 1, 1902		\$1,093 04

Recapitulation of Expenditures by Illinois State Fish Commission for repairing Hull of Steamer Reindeer. Bills of Particulars and vouchers on file with State Auditor.

To appropriation available July 1, 1901.....		\$5,000 00
<i>Cr.</i>		
By expenditures (vouchers) for month of	June, 1901.....	\$1,437 91
	July, 1901.....	1,479 72
	August, 1901.....	1,385 58
	September, 1901.....	467 01
	October, 1901.....	228 39
		4,998 61
Balance on hand.....		\$1 39

Recapitulation of Expenditures by Illinois State Fish Commission for Personal Expenses enforcing Fish Law, etc. Bill of Particulars on file with State Auditor.

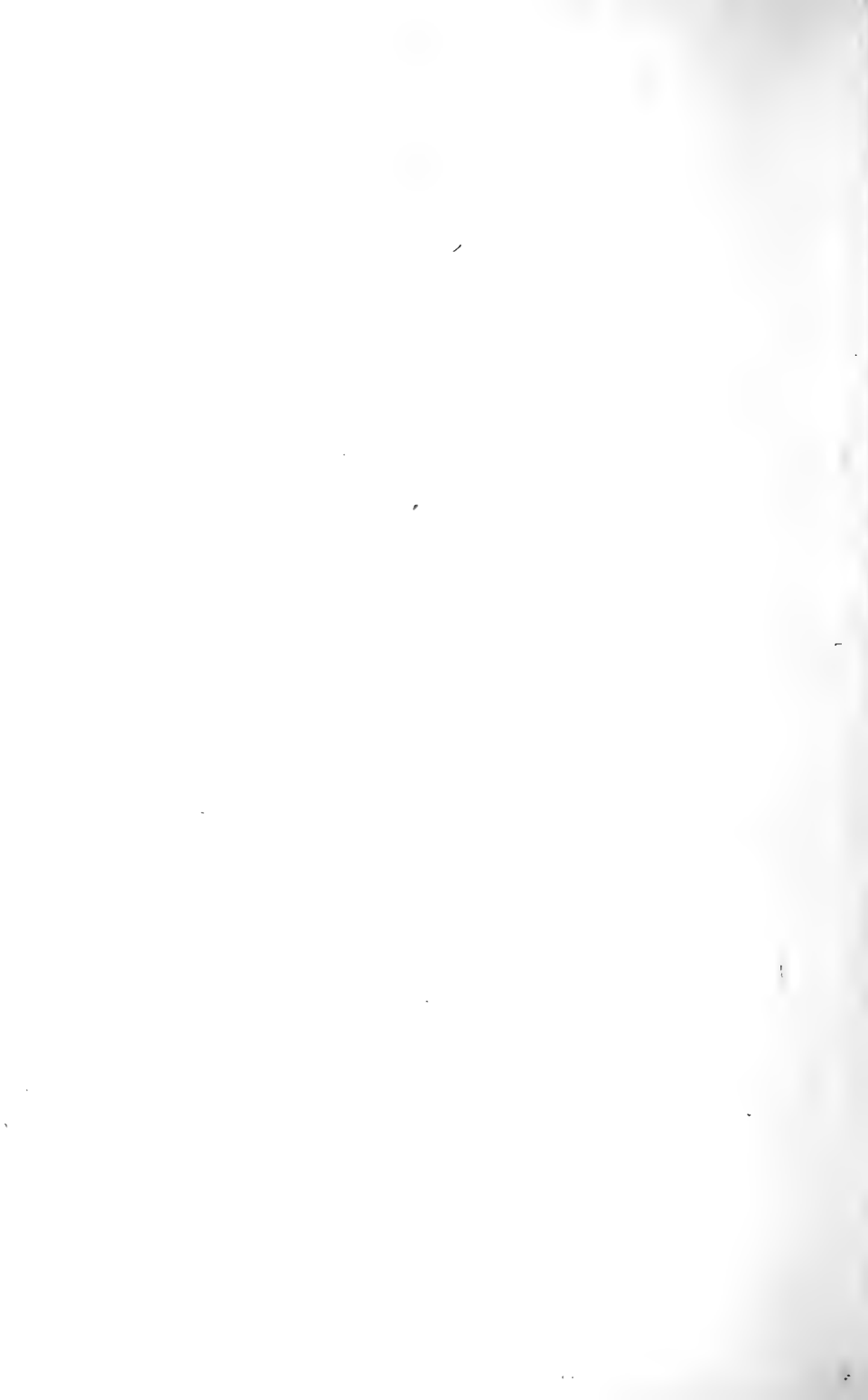
To balance of appropriation of 1899, Oct. 1, 1900.....		\$4,584 44
To appropriation available July 1, 1901.....		5,000 00
		\$9,584 44
<i>Cr.</i>		
By expenditures (vouchers) for month of	October, 1900.....	\$392 51
	November, 1900.....	258 33
	December, 1900.....	314 25
	January, 1901.....	209 87
	February, 1901.....	284 50
	March, 1901.....	282 58
	April, 1901.....	493 56
	May, 1901.....	336 88
	June, 1901.....	385 66
	July, 1901.....	364 04
	August, 1901.....	458 24
	September, 1901.....	314 80
		4,095 22
To amount on hand Oct. 1, 1901.....		\$5,489 22
To appropriation available July 1, 1902.....		5,000 00
		\$10,489 22

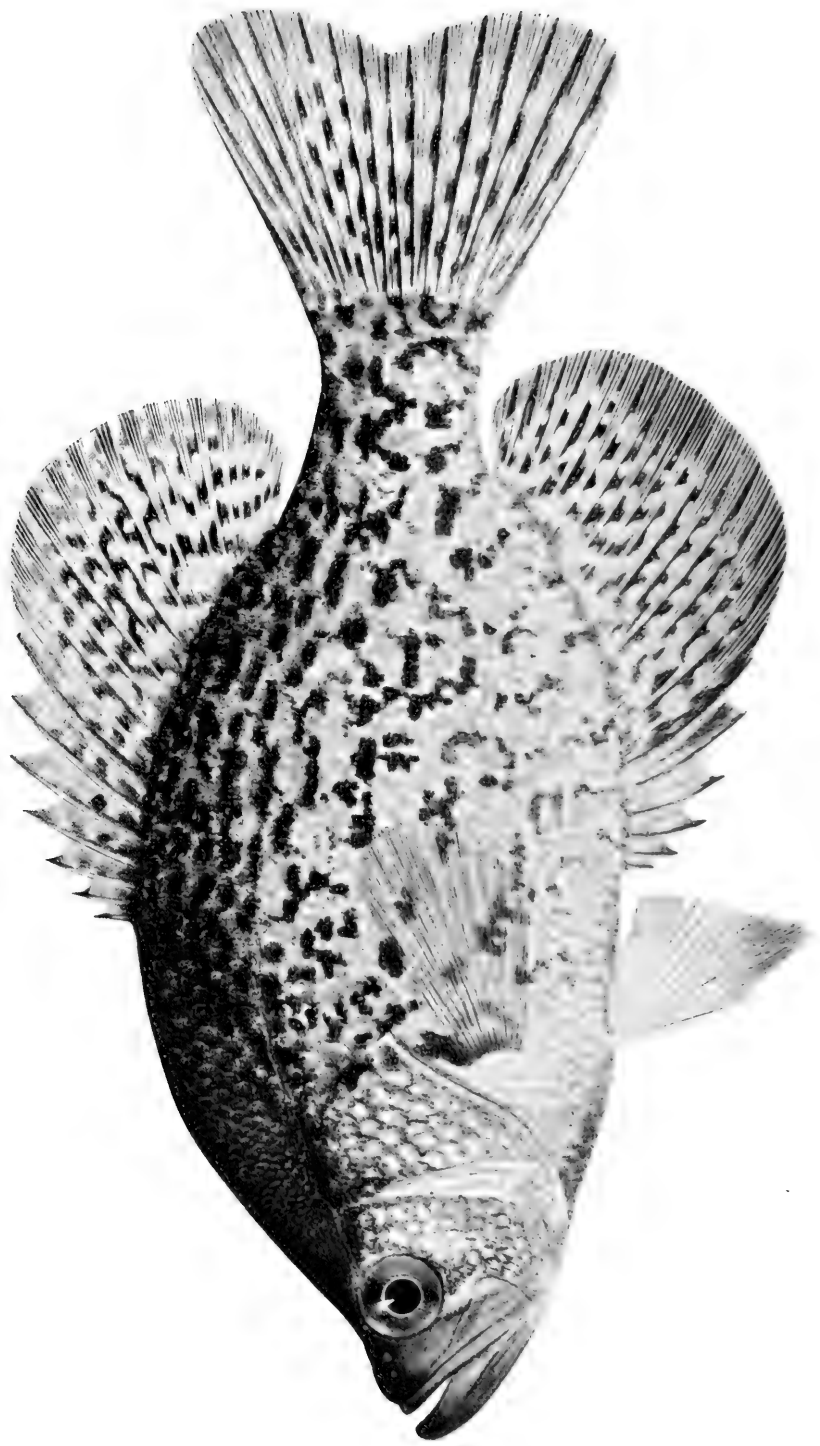
Recapitulation of Expenditures—Concluded.

<i>Or.</i>		
By expenditures (vouchers) for month of	October, 1901.....	\$742 33
	November, 1901.....	278 32
	December, 1901.....	363 79
	January, 1902.....	267 70
	February, 1902.....	290 08
	March, 1902.....	368 66
	April, 1902.....	322 29
	May, 1902.....	458 52
	June, 1903.....	482 37
	July, 1902.....	573 17
	August, 1902.....	297 09
	September, 1902.....	388 73
		\$4,833 05
To balance on hand Oct. 1, 1902.....		\$5,656 17

Respectfully submitted,

NAT. H. COHEN, *President.*S. P. BARTLETT, *Secretary.*

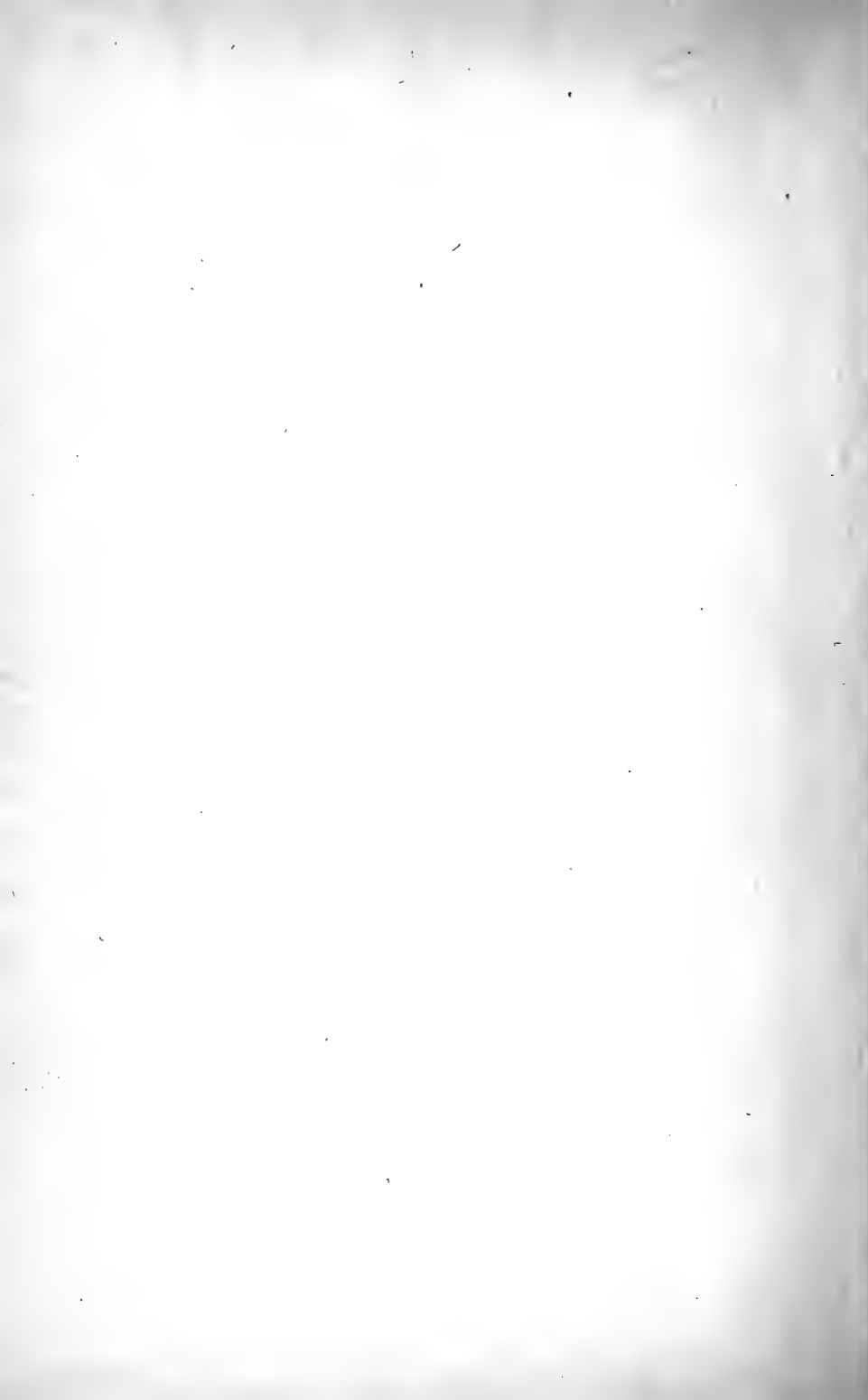




BLACK CRAPPIE. *Pomoxis stratioides*. Lacépède.

A LIST
OF THE
Native Fishes of Illinois
WITH KEYS

THOMAS LARGE

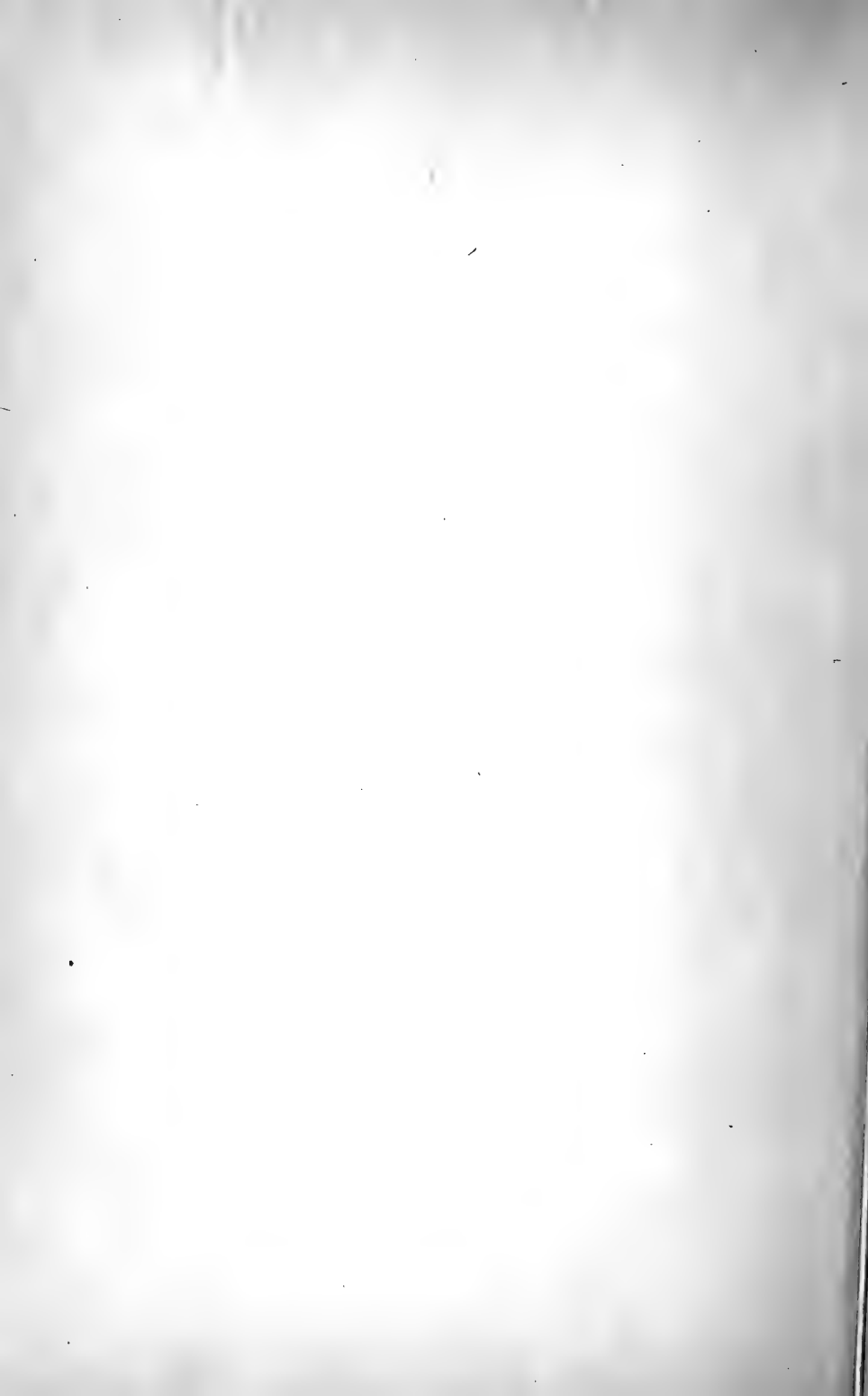


INTRODUCTORY NOTE.

The following annotated list of the fishes of Illinois is based on the collections and field notes of the staff of the State Laboratory of Natural History from the year 1878 to the fall of 1902. It was prepared in the latter year by Mr. Large, while he was in the service of the State Laboratory as its ichthyological assistant. His manuscript was revised for the press in my office, but in a way to make no material change in the substance of his statements, the credit and responsibility for which remain, consequently, with him. The analytical keys prepared by him, so far as they depart from those already printed, are the results of his personal experience in the identification of Illinois fishes, and are made with a view to dispensing, so far as practicable, with obscure characters and structures difficult of access.

S. A. FORBES,
Director of Laboratory.

January 6, 1903.



A LIST OF THE NATIVE FISHES OF ILLINOIS, WITH KEYS.

BY THOMAS LARGE.

As this list is intended particularly for the "man who goes a-fishing," it is desirable that it contain as much information as possible and at the same time be free from all unnecessary technical detail. Although we might wish entirely to avoid scientific names, this is obviously impossible when we remember that at least sixty of our fishes have no common names, and that such names as bass, perch, stone-roller, horny-head, grindle, stickleback, etc., all have more than one application, the same name being applied not infrequently to very different fishes.

Of our species about eighty never attain a greater adult length than five inches. These are very commonly taken for the young of other fishes, and are referred to indiscriminately as "minnows" by the uninformed. It is thought that no apology is needed for directing attention to these smaller members of our fish fauna and including them in a list of the native fishes of Illinois.

Statements concerning distribution and other data made use of in this list are, with a very few exceptions, based upon collections made in Illinois by the State Laboratory of Natural History, at Urbana.

In the use of the keys allowance must be made for individual variations, which are frequently considerable. No determination by the key alone should be thought of as final, but only as leading to a description with which the specimen may be compared. As Jordan's "Manual of Vertebrates" (5th to 8th editions) is probably more accessible than any other previously published list, comparison with descriptions found there is suggested, and to facilitate such comparison references to the species numbers of that list are given when the nomenclature has been changed. The nomenclature employed in this paper is that of Bulletin No. 47 of the United States National Museum.

ARTIFICIAL KEY TO THE FAMILIES OF NATIVE FISHES OF ILLINOIS.
(Adapted from Jordan and Evermann.)

- I. Mouth circular; body elongate; no paired fins; gill-openings seven in number, not covered by an operculum, but opening externally as large pores on the side of the body in the jugular region.....PETROMYZONIDÆ.
- II. Mouth a transverse cleft (more or less modified by form and position of the lips); gill-openings covered by an operculum; one or two pairs of fins, not median.
- A. No median barbel on chin.
1. Ventral fins present, abdominal.
- a. Tail evidently heterocercal.
- b. Body naked, snout wide and spatulate; mouth large; teeth minute or wanting; no barbels.....POLYDONTIDÆ.
- bb. Body with five series of bony shields; mouth inferior, toothless, preceded by four barbels.....ACIPENSERIDÆ.
- bbb. Body with scales.
- c. Scales ganoid; dorsal fin short; no gular plate.....LEPISOSTEIDÆ.
- cc. Scales cycloid; dorsal fin long; large bony gular plate.....AMIIDÆ.
- aa. Tail not evidently heterocercal.
- c. Head with eight long barbels; body naked.....SILURIDÆ.
- cc. Head without elongate barbels (except, in some instances, at corners of mouth); body more or less completely scaled.
- d. A single dorsal fin, not preceded by free spines or detached finlets.
- e. No adipose fin.
- f. Eyes normal; vent behind ventral fins.
- g. Gill membranes broadly joined to isthmus; fins all soft; no teeth in jaws.
- h. Dorsal fin of more than 25 rays, or the dorsal fin shorter and lips thickened and covered with plicate or papillose skin; pharyngeal teeth numerous and comb-like.....CATOSTOMIDÆ.
- hh. Dorsal fin of not more than ten rays; lips usually thin, never plicate, or papillose; pharyngeal teeth fewer than eight, in one to three rows....CYPRINIDÆ.
- gg. Gill membranes free from isthmus; dorsal and anal fins situated well back on body.
- i. Head naked; belly narrow and carinated; silvery fishes.
- j. Mouth large; lateral line present.....HIODONTIDÆ.
- jj. Mouth small or moderate; no lateral line.
- k. Mouth inferior, small; stomach gizzard-like; last rays of dorsal much elongate. DORSOMIDÆ.
- kk. Mouth terminal; maxillary in three pieces; stomach not gizzard-like. CLUPEIDÆ.
- ii. Head more or less scaly; anal fin short.
- l. Lateral line present, somewhat irregular; scales small; teeth on maxillaries, etc., cardiform; jaws depressed, duck-bill like.....LUCIIDÆ.
- ll. Lateral line wanting.
- nn. Upper jaw not protractile; teeth villiform.....UMBRIDÆ.
- mm. Upper jaw protractile, premaxillaries forming its margin.....POECILIDÆ.
- ff. Eyes concealed beneath skin; vent at throat.....AMBLYOPSIDÆ.
- ee. An adipose fin behind a dorsal fin composed of rays and a spine.
- n. Dorsal, anal, and ventral fins with small but distinct spine; scales ctenoid. PERCOPSIDÆ.

- nn. Fins without spines; scales cycloid; many pyloric caeca.....SALMONIDÆ.
 dd. Dorsal fin preceded by four or more free spines.....GASTEROSTEIDÆ.
 ddd. Dorsal fin preceded by a finlet of four slender spines.....ATHERINIDÆ.
2. Ventral fins wholly wanting,
 a. Body much elongated; dorsal, anal, and caudal fins continuous around body.
 ANGUILLIDÆ.
 aa. Body not elongate; fins separate; eyes imperfect.....AMBLYOPSIDÆ.
3. Ventrals thoracic or jugular, the number of rays not I, 5, but usually I, 7; dorsal with three or four spines; scales strongly ctenoid.....APHREDODERIDÆ.
4. Ventral fins thoracic or subjugular; the number of rays definitely I, 5; dorsal with spiny and soft rays; slit behind fourth gill large; body scaled.
 a. Lateral line never extending on rays of caudal fin; often incomplete or wanting.
 b. Pseudobranchia undeveloped,
 c. Anal spines 3 to 10.
 d. Dorsal spines 4; lateral line wanting.....ELASSOMIDÆ.
 dd. Dorsal spines 6 to 12; lateral line well developed.....CENTRARCHIDÆ.
 cc. Anal spines 1 or 2; small fishes under eight inches long.....PERCIDÆ.
 bb. Pseudobranchia developed,
 e. Anal spines 2 (or 1); pseudobranchia small; cylindrical fishes.....PERCIDÆ.
 ee. Anal spines 3; compressed fishes.....SERRANIDÆ.
 aa. Lateral line extending to tip of middle ray of caudal fin.....SCIAENIDÆ.
5. Ventral fins I, 3 or I, 4; slit behind the fourth gill small or wanting; scaleless.
 COTTIDÆ.
- AA. Chin with a median barbel; body elongate; dorsal and anal fins elongate; scales embedded.....GADIDÆ.

FAMILY PETROMYZONIDÆ (THE LAMPREYS).

Ichthyomyzon concolor (Kirtland).—Silvery Lamprey. (5)

Taken five times from the Illinois River and once from the Wabash river at Mt. Carmel.

Ichthyomyzon castaneus Girard. (4)

One example of this species was obtained at Pekin, Ill., April 16, 1880.

Lampetra wilderi Gage.—Brook Lamprey; Small Black Lamprey. (3)

We have records of the occurrence of this species at Cairo, Pekin, and Peoria; also found several times by Dr. Jordan in small streams of Illinois.

FAMILY POLYODONTIDÆ (THE PADDLEFISHES).

Polyodon spathula (Walbaum).—Spoonbill Cat; Spoonbill; Paddlefish.

This fish feeds upon the minute animal and plant life of the water. Its snout probably serves as a delicate sense organ.

Formerly abundant in all large streams, but now apparently decreasing greatly in numbers. Now found only sparingly in the larger streams tributary to the Mississippi and in adjacent ponds and lakes.

FAMILY ACIPENSERIDÆ (THE STURGEONS).

Acipenser rubicundus Le Sueur.—Lake Sturgeon; Rock Sturgeon; Red Sturgeon.

The red sturgeon is usually a rather sluggish fish. The color changes with age, the young being drab and the adults green or red.

Formerly abundant in rivers and in Lake Michigan, but rarely taken now. Occurs five times in our collections, being listed from tributaries of the Mississippi and from the Great Lakes.

Scaphirhynchus platyrhynchus (Rafinesque).—Shovel-fish; Shovel-nose Sturgeon; White Sturgeon.

The broad nose and long filament of the tail make this fish strikingly different from the common sturgeon.

Not uncommon in the Ohio and Mississippi rivers; frequently taken from the Ohio at Evansville, Ind., by fishermen, by whom it is considered worthless for food and thrown away; rare in the Illinois River.

FAMILY LEPISTOSTEIDÆ (THE GARS).

Lepisosteus osseus (Linnæus).—Long-nosed Gar.

Grows to a length of 5 feet. Abundant; predaceous, preying upon fish entangled in net nets; possibly, also, to some extent a scavenger. These fishes undergo certain decided changes with age. Until they reach a length of about 9 inches they are provided behind with a slender membranous filament which is a process of the dorsal lobe of the heterocercal tail. This filament has a rapid, wave-like motion, which is continued with but brief interruptions while the fish is at rest. At about the time of the disappearance of the caudal filament the black side stripe, which up to this time extends from the tip of the snout to the caudal, begins to break up into oval spots, while similar oval spots begin to appear on all the fins, on the mid-dorsal line, and on either side of the body. Those on the body vanish in later life, the ones below the lateral line disappearing first.

Abundant and widely distributed, being found in all parts of the State excepting Lake Michigan. Principally found in the larger streams, though frequently caught in the smaller ones, where it is found in pools.

Lepisosteus platostomus Rafinesque.—Short-nosed Gar.

Length 3 feet. In habits like the preceding, though the two species are not usually abundant in the same localities. Difficult to distinguish from the young of the next species. A young specimen, $1\frac{1}{4}$ inches in length, has been observed in the act of catching and eating a minnow not much smaller (Meredosia, 1900).

Particularly abundant about Havana and Meredosia; absent in our collections from the Rock and Wabash basins. Otherwise distributed about as *L. osseus*.

Lepisosteus tristechus (Bloch & Schneider).—Alligator Gar.

Length 8 to 10 feet. Said by river men to be a dangerous antagonist; also destructive of netting when caught. Found occasionally in the Illinois, Mississippi, and Ohio rivers.

FAMILY AMIIDÆ (THE BOWFINS).

Amia calva Linnæus.—Dogfish; Grindle; Prairie Bass.

Of some commercial importance, being regularly shipped from the Illinois River in winter. Occasionally sold by fish hucksters as "prairie bass." Considered worthless and unfit for food in the northern part of the State; in the southern part, under the name of "grindle," replacing the black bass as the most sought game fish, and considered a good table fish. It is a good fighter when hooked and takes bait well.

Abundant in sloughs and lakes adjoining the Mississippi and Illinois rivers and in the sluggish streams of southern Illinois. Apparently not abundant northward.

FAMILY SILURIDÆ (THE CATFISHES).

ARTIFICIAL KEY TO THE CATFISHES OF ILLINOIS.

- a. Tail forked; color usually light or silvery.
- b. Bony process from back of head articulating with the base of the dorsal fin, making bony ridge from head to dorsal fin.
- c. Anal fin with 32 to 35 rays..... ICTALURUS FURCATUS.
- cc. Anal fin with 25 to 29 rays; barbels long..... I. PUNCTATUS.
- bb. Process from back of head not articulating with front of dorsal fin; bony ridge incomplete..... AMEIURUS LACUSTRIS.
- aa. Tail not forked; color brown, yellow, greenish, black, or gray; not silvery.
- d. Adipose fin a small lobe, its posterior margin not attached to the back.
- e. Spines well developed.
- f. Anal fin 24 to 27 rays; length of base more than $\frac{1}{4}$ the length of body; skin thin and smooth..... A. NATALIS.
- ff. Anal 15 to 22, less than $\frac{1}{4}$ the body in length.
- g. Lower jaw projecting; anal rays 20..... A. VULGARIS.

- gg. Lower jaw not projecting.
- h. Anal rays more than 20.....A. NEBULOSUS.
- hh. Anal rays 17 to 19, with black membranes A. MELAS.
- ee. Spines short, $\frac{1}{2}$ the height of fin, a fleshy continuation extending about as high as fin; spines harmless, muffled by thick skin; head flat; upper portion of caudal fin light or white.....LEPTOPS OLIVARIS.
- dd. Adipose fin keel-like and continuous with the caudal fin or separated from it only by a notch.
- i. White crescent under the posterior margin of the dorsal fin evident; head flattened, with fleshy mounds on either side of a median groove..NOTURUS FLAVUS.
- ii. White crescent behind dorsal fin absent or obscure; small fishes, not exceeding 6 inches.
- j. Body heavy; muscle plates evident on sides; longitudinal dark lines at angles of muscle plates.....SCHILBEODES GYRINUS.
- jj. Body more slender; color uniform, mottled, punctulate.
- k. Adipose fin continuous with caudal, not separated by notch; color plain blackish.....S. NOCTURNUS.
- kk. Adipose fin more or less separated from caudal by notch.
- l. Body not blotched with black; head small; body slender; color in life yellowish, brown, or greenishS. EXILIS.
- ll. Body more or less blotched with black; head broad.
- m. Saddle-like blotches faint; adipose and caudal fins entirely separated.
S. ELEUTHERUS.
- mm. Body mottled with black and gray, with 4 saddle-like blotches on back; adipose and caudal not entirely separatedS. MIURUS.

Ictalurus furcatus (Le Sueur).—Channel Cat; Blue Cat; Great Fork-tailed Cat; Mississippi Cat.

Taken here and there throughout the State in the larger streams tributary to the Mississippi; not, however, so abundant as the common channel cat (*I. punctatus*). Recent examinations by Dr. Evermann of specimens of the "Mississippi Cat" show it to be this species instead of *Ameiurus lacustris* as previously supposed. (Cf. Bull. U. S. National Museum, Vol. III, p. 2789.)

Ictalurus anguilla Evermann & Kendall.—Channel Cat; Eel Cat; Willow Cat.

Probably taken in our larger streams with other channel cats, but not yet positively recognized.

Ictalurus punctatus (Rafinesque).—Channel Cat; Blue Cat; White Cat.

The most abundant of the channel cats. An excellent and marketable food fish. The young stay most frequently in the deep swift water of the rivers and larger creeks. A strong swimmer.

Our collections of this species are from 123 localities, distributed throughout the State with the exception of the upper Illinois valley above the mouth of the Fox River, and the Lake Michigan region. It occurs, however, in three collections from Iroquois county. It does not appear to be common southward of the Illinois basin.

Ameiurus lacustris (Walbaum).—Catfish of the Lakes.

Known from other Illinois members of this genus by its forked tail, larger number of anal rays, and silvery appearance. In these respects it approaches the genus *Ictalurus*, but differs in not having the occipital process articulated with the bones at the base of the dorsal fin.

Doubtless not so common in Illinois as hitherto supposed; until lately generally confused with *Ictalurus furcatus*, under which see note.

Ameiurus natalis (Le Sueur).—Yellow Cat; Yellow Bullhead.

Body thick; skin very smooth and thin. Called by fishermen "greaser" or "greased cat," and readily separated by them from other bullheads.

Common throughout the State, except in streams tributary to Lake Michigan, and in the northwestern portion of the Illinois and Fox basins, occurring in the latter region only in collections from Carthage, Hancock county. Taken, in all, from 76 localities.

Ameiurus vulgaris (Thompson).

Apparently rare in Illinois; possibly not distinguishable from *A. melas*

Ameiurus nebulosus (Le Sueur).—Common Bullhead.

Anal fin long; upper jaw projecting; in many specimens the color mottled (var. *marmoratus*).

Taken from 43 localities in Illinois. Apparently less abundant at Havana and Meredosia than other bullheads.

Ameiurus melas (Rafinesque).—Black Bullhead.

The most common of Illinois catfishes. The young are black in color and swim in schools until about 1¼ inches long.

Abundant throughout the State, with apparent exceptions in the Kankakee, Rock, and middle Kaskaskia basins. Found in 179 localities in all.

Leptops olivaris (Rafinesque).—Mud Cat; Goujon; Flat-head.

A common market catfish of the Illinois River, being excellent as food. Exceedingly ugly; the head very flat, mouth broad, spines short and thickly covered with soft skin; upper part of the caudal white in the young and continuing lighter than the lower portion in adults.

Thirty localities represented in our collections, all of which are from muddy streams. Not found in the Lake Michigan region.

Noturus flavus Rafinesque.—Stone Cat.

This fish is usually mistaken for a young bullhead. From these it differs decidedly in habits and also, as do the other stone cats, in the form of the adipose fin, which is keel-like, and may be either separated from the caudal by a notch or continuous with the upper margin of the latter. This species can usually be separated from the other stone cats by the presence of a white or whitish spot of somewhat crescentic form under the posterior margin of the dorsal.

Confined to the north half of the State where it is found under stones in the swifter portions of the larger creeks and small rivers. Not listed from further southward than the Kaskaskia River, in Douglas county. Found in greater abundance in Mackinaw Creek than elsewhere. Our collections are from 37 localities.

Schilbeodes gyrinus (Mitchill).—Tadpole Cat; Poison Cat. (65)

A stone cat, as shown by the form of the adipose fin, but in habit much like a young bullhead, preferring deep, muddy water. The form of the body is in adults much like that of *Ameiurus natalis*; easily separated from the latter by the dark lateral stripe, which extends the length of the body, connecting the angles of the muscle plates.

Abundant in the sluggish portions of all streams of central Illinois; common in southern Illinois; somewhat rare in the northwestern part of the State.

Schilbeodes nocturnus (Jordan & Gilbert).

Body brown, covered with minute dots; no notch between adipose and caudal; 15 or 16 rays in the caudal. Length 3 inches.

Occurs in ten collections: two from Havana, three from near Lincoln, three from points on the Kaskaskia River, one from Spoon River near Lewistown, and one from the south fork of the Saline River in Saline county.

Schilbeodes exilis (Nelson). (61)

With much the appearance of *Noturus flavus*, including even the white spot behind the dorsal, but in this fish the crescentic spot is much less evident than in the larger species.

From Crane Creek, Freeport, South Henderson and Honey creeks in Henderson county, Iroquois River near Watseka, and creeks in Union county.

Schilbeodes cleutherus (Jordan). (64)

Length 4 inches. Color brownish, with obscure, dark, saddle-like blotches; head broad, flat; barbels not reaching to gill-opening.

The distribution of this catfish is peculiar, it being known at present only from creeks near Lincoln, and from the headwaters of the Kaskaskia and Embarras rivers in Douglas and Piatt counties.

Schilbeodes miurus (Jordan). (63)

Known by its grayish color and the four black blotches on the back.

Common on gravelly rapids throughout the Wabash basin; taken once from Cache River and once from a creek near Pontiac.

FAMILY CATOSTOMIDÆ (THE SUCKERS AND BUFFALOES).

ARTIFICIAL KEY TO THE BUFFALOES AND SUCKERS OF ILLINOIS.

- a. Dorsal fin very long, 25 to 30 rays.
 b. Lips thin, not covered with papillæ; scales large.
 c. Colors dark; mouth large.
 d. Anal rays 9; lips thin; head thick and rounded; mouth protractile forward; dorsal outline much more curved than ventral outline... *ICTIOBUS CYPRINELLA*.
 dd. Anal rays 10; lips thicker; head much enlarged.
 e. Depth $\frac{2}{3}$ of length..... *I. URUS*.
 ee. Depth about two-fifths of length..... *I. BUBALUS*.
 cc. Colors pale, plain; mouth not large.
 f. Body not deep; depth $\frac{1}{3}$ to $\frac{1}{4}$ of length..... *CARPIODES CARPIO*.
 ff. Body deep; depth one third to four-ninths of length.
 g. Dorsal with about 24 rays, nostrils near tip of snout..... *C. DIFFORMIS*.
 gg. Dorsal with 26 or 27 rays, the first rays elongate more or less; head conical, with projecting muzzle *C. VELIFER*.
 bb. Lips thick, papillose; scales not large; head very small; body elongate, not much compressed..... *CYCLEPTUS ELONGATUS*.
 aa. Dorsal fin not elongated.
 h. Lateral line complete.
 i. Lips papillose.
 j. Body fusiform; head rounded.
 k. Scales 95 to 115 in lateral line¹.
 kk. Scales 64 to 68 in lateral line, crowded forward..... *CATOSTOMUS COMMERSONI*.
 jj. Body conical; caudal peduncle slender; head pyramidal, concave between small eyes..... *C. NIGRICANS*.
 ll. Lips thin and plicate.
 l. Dorsal of 15 to 18 rays².
 ll. Dorsal fin of 12 to 14 rays.
 m. Caudal fin normal, upper and lower lobes about equal.
 n. Free margin of dorsal straight. *MOXOSTOMA AUREOLUM*, *PLACOPHARYNX DUQUESNEI*.
 nn. Free margin of dorsal more or less incised..... *MOXOSTOMA MACROLEPIDOTUM*.
 mm. Caudal fin with upper line much longer than the lower; anal fin reaching past the caudal³.
 hh. Lateral line incomplete or wanting.
 o. Sides with regular rows of small black spots; lateral line usually interrupted (wanting in young)..... *MINYTREMA MELANOPS*.
 oo. Sides with irregular blotches of large size; a black stripe in young; lateral line wanting..... *ERIMYZON SUCETTA*.

Ictiobus cyprinella (Cuvier & Valenciennes).—Buffalo; Red-mouthed Buffalo.

The common buffalo-fish of commercial fishermen. Mouth large, protractile forward; color brownish olive; opercle $\frac{1}{2}$ the length of the head. Weight 20 to 30 pounds.

Taken from the Rock, Illinois, and Wabash river basins. Common in large streams.

Ictiobus urus (Agassiz).—Mongrel Buffalo.

Back not much elevated and not compressed into a keel above, but rounded in cross-section.

Distributed about as *I. cyprinella*, though not so common.

Ictiobus bubalus (Rafinesque).—Small-mouthed Buffalo; Razor-backed Buffalo.

Depth of body five-elevenths of length; back thin; belly thick.

Common in large streams and in lakes and sloughs.

Carpiodes carpio (Rafinesque).—Carp Sucker. (62)

Perhaps not rare in large rivers; our collections not, however, as yet carefully studied

¹ *Catostomus catostomus*; of uncertain occurrence in Illinois.

² *Moxostoma anisurum*; of uncertain occurrence in Illinois.

³ *Moxostoma breviceps*; of uncertain occurrence in Illinois.

Carpiodes difformis Cope. (70)

Identified in our Illinois River collections. Probably frequently confused with the next species.

Carpiodes velifer (Rafinesque).—Quillback; Spearfish; Skipjack. (70)

Known by the excessive elongation of the first rays of the dorsal fin.

Very abundant everywhere, but almost worthless as food.

Cycleptus elongatus (Le Sueur).—Black Horse; Missouri Sucker.

Formerly abundant in the Illinois River, but now only occasionally taken. The single specimen taken in our collections of the past three years comes from the mouth of Green River. A specimen was obtained also from the Little Fox River, at Phillipstown, Ill., in 1882.

Catostomus commersonii (Lacépède).—Common Sucker; Fine-scaled Sucker; Black Sucker. (76)

The number of scales varies greatly, giving rise possibly to several more or less distinct varietal forms.

Abundant; found usually in prairie creeks; not yet taken by us in tributaries of Lake Michigan. Not found in our collections from southward of the latitude of the mouth of the Illinois River, with the exception of one collection from near Mt. Carmel, and (singularly enough) ten collections in the Illinois spur of the Ozarks, in the counties of Williamson, Saline, Hardin, Pope, Johnson, and Union. Taken, in all, from 68 localities.

Catostomus nigricans (Le Sueur).—Hammer-head; Hog Sucker; Hog Molly; Mullet; Stone-roller.

A fish of peculiar appearance; head pyramidal, body subconical; eyes very small; mouth large and sucker like. It is a strong swimmer and is chiefly found upon gravelly riffles, where it feeds upon the bottom. As in the case of many other fishes inhabiting similar situations, the back is crossed with dark bars, which probably serve as a means of protection against discovery by wading birds and other enemies.

Abundant in rapid gravelly streams of the Mississippi valley northeastward of a line from the mouth of the Rock River to the mouth of the Embarras River. In this section we have 84 collections of this species, while southwest of this line we have but four, two of these lying very close to the line; viz., Little Wabash River at Effingham, Spoon River at London Mills, Otter Creek in Jersey county, and Clear Creek, Union county. Not found in the few collections which have been made from streams flowing into Lake Michigan.

Erimyzon sucetta oblongus (Mitchill).—Chub-sucker; Sweet Sucker.

The absence of a lateral line serves to distinguish this fish from other suckers. (It should be noted, however, that the young of the next species are without a lateral line also.) The young of this variety are distinguished from adults by the possession of a very black lateral stripe, and may easily be mistaken for minnows.

This fish is abundant in the Wabash basin, in the streams tributary to the Ohio River, and in the headwaters of the Kaskaskia; also frequently taken at Havana. It is much less abundant throughout the Illinois valley, not having been taken by us between the Illinois and Mississippi rivers. It appears in four collections from the Rock River basin.

Minytrema melanops (Rafinesque).—Spotted Sucker; Black Sucker.

Readily recognized by the presence of several longitudinal rows of black dots on the scales of the sides. Lateral line absent in the young and incomplete or broken in adults.

Abundant in the Wabash basin and in the headwaters of the Kaskaskia. One collection from the Saline River at Harrisburg, one from Cedar Creek at Simpson, and one from the Big Muddy at Benton. Rare at Havana and Meredosia and in the northern portion of the State. Not taken between the Illinois and Mississippi rivers. This fish apparently prefers the weedy prairie creeks in situations where it is abundant.

Moxostoma aureolum (Le Sueur).—Common Red-horse; White Sucker; Large-scaled Sucker.

Scales large; body heavy; head larger than in the next, flat between the eyes and squarish in cross-section; nose ending abruptly.

Very abundant in streams of all sizes northward; generally found in the black-prairie regions. Occurs but six times south of the south line of Shelby county, as follows: Jasper County, N. E.; Fayette County, N.; Wabash County, E.; Wayne County, W. (2); Saline County, S.; and Hardin County, center.

Moxostoma macrolepidotum (Le Sueur).—Red-horse.

Scales large; body more elongate than in the last, tapering from before the dorsal fin forward; head rather small, rounded, and bluntly pointed.

Common in streams of the northern half of the State.

Placopharynx duquesnei (Le Sueur).—Red-horse. (85)

Not certainly distinguishable from *M. aureolum* without removal and examination of the pharyngeal teeth. Occurs in Illinois, but our collections have not yet been carefully enough examined to determine how frequently it may have been mistaken for *M. aureolum*.

FAMILY CYPRINIDÆ (THE MINNOWS).*

KEY TO THE GENERA OF ILLINOIS CYPRINIDÆ.

(It must be understood that this key is intended only for Illinois representatives of these genera, and in many cases will not apply to those found elsewhere.)

- a. Minnows with intestine of length more than twice that of the body; peritoneum usually black or dark gray.
- b. Intestine spirally wound around the air-bladder.....CAMPOSTOMA.
- bb. Intestine not wound around the air-bladder.
- c. Scales small, about 63 to 80 in lateral line.
- d. Body plain silvery.....OXYGENEUM.
- dd. Body striped longitudinally, frequently highly coloredCHROMOSUM.
- cc. Scales larger, about 37 to 45 in lateral line.
- e. Scales not crowded before the dorsal, and not differing much in size from those on other parts of the body; breast scaly; first ray of dorsal slender and closely attached to secondHYBOGNATHUS.
- ee. Scales small and irregularly crowded before the dorsal; breast naked; first ray of dorsal $\frac{2}{3}$ the length of second, not closely attached to it, a membrane interveningPIMPHALES.
- aa. Minnows with intestine short, less than twice the length of the body; peritoneum usually pale.
- f. Maxillary without evident barbel.
- g. Scales minute, 70 or 80 in lateral line.‡
- gg. Scales larger, less than 70 in lateral line.
- h. Mouth very small, upturned; lower jaw more nearly vertical than horizontal when mouth is closed; angle formed by cleft of mouth and long axis of body more than 45 degreesOPSOPHODUS.
- hh. Mouth horizontal or more or less oblique; angle formed by cleft of mouth and long axis of body less than 45 degrees.
- i. Body strongly compressed between ventrals and anal fin, forming a ventral keel over which the scales do not pass.....ABRAMIS.
- ii. Body not strongly compressed ventrally.
- j. First ray of dorsal club-like and not in close contact with the second ray, a membrane interveningCLIOLA.
- jj. First ray of dorsal slender and attached closely to the second.
- k. Upper lip not much thickened near angles (lips thin); mouth horizontal or oblique.
- l. Lower portion of head normal, not swollen.....NOTROPIS.
- ll. Lower portion of head swollen, semitransparent; rectangular mucous cavities apparent in bones of face.....ERICYMBA.
- kk. Upper lip much thickened at angles, giving appearance of sucker mouth; snout somewhat projecting, mouth inferior, horizontal.....PHENACOBIOUS.
- ff. Maxillary with a barbel at or near the extremity. This is sometimes quite small and difficult to see in preserved specimens.
- m. A pair of barbels on the upper lip a short distance from the distal extremity.
- n. Scales 50 to 60; eye small, one-fifth the length of head; dorsal usually with rays.....SEMOTILUS.
- nn. Scales 60 to 70; eye large, as long as snout; dorsal usually 8.²
- mm. Barbels at the distal extremities of upper lip.
- o. Scales small, 60 to 70 in the lateral line; premaxillary not protractile.
RHINICHTHYS.

* The common German carp (*Cyprinus carpio*), belonging to the family Cyprinidæ, though not native to Illinois waters, is now found in all streams of the State. It may be recognized by the two long barbels at either side of the mouth, and by the long spine at the front of the dorsal. The large number of rays of the dorsal and the form of the body frequently lead to a confusion of this fish with the buffaloes.

¹ *Leuciscus*; a genus not certainly known to occur in this State.

² *Couesius plumbeus*; a northern form, which may occasionally be found in Illinois.

- oo. Scales larger, 35 to 60 in lateral line; premaxillary protractile.
 p. Head not usually much depressed; mouth usually inferior; common species.....HYBOPSIS.
 pp. Head broad and much depressed; mouth terminal; rare species. PLATYGOBIO.

A.—LONG-INTESTINED MINNOWS.

Campostoma anomalum (Rafinesque).—Dough-belly; Stone-roller; Greased Chub; Creek Chub.

Differs from all other minnows in having its elongate intestine spirally wound around the air-bladder. Mouth inferior and somewhat sucker-like, but the lips smooth. Body mottled with black; the fins highly colored in spring, and the males at this season with tubercles on the head and many parts of the body. A fine bait minnow, easily taken with a minnow seine in small creeks of running water; very tenacious of life in the minnow pail and on the hook.

Abundant throughout the State. More common in small than in larger streams.

Oxygenium pulverulentum Forbes.

A single specimen of this fish was taken in 1885 from the Illinois River by Professor Forbes, which was so different from any known fish that it seemed necessary to refer it to an entirely new genus and species. As it has not been since taken, a doubt is suggested whether the fish may not be a hybrid or merely an example of very wide variation. There is no warrant, however, for discarding the genus and species until breeding experiments show that it is a hybrid, or until the discovery of more specimens removes the doubts.

Chrosomus erythrogaster (Rafinesque).—Red-bellied Dace.

A very surprising little minnow, found in the muddier small creeks. The scales are very fine. The color of the female is plain olive, silvery or white beneath, with black dots on the back and narrow silvery and black stripes on the sides; in the males the white is replaced by gorgeous cherry-red shading to golden forward. The base of the dorsal is red; the other fins and the gill-covers (opercles) are a rich yellow. The red color, while very deep and rich, is peculiarly evanescent, disappearing and reappearing often in a surprising manner. It is not a distinctly spring coloration as has hitherto been supposed; specimens in our aquaria, on the contrary, have shown high color in almost all the summer months and as late as October.

Occurs frequently in the Rock River basin and in creeks flowing into the Illinois River in LaSalle county. Has been taken from creeks near Canton and Farmington, from a spring branch near Wolrab Mills, Hardin county, and from creeks in Union county; also reported from a spring in southwestern Clark county.

Hybognathus nuchalis (Agassiz).—Silvery Minnow.

A large silvery minnow, with large scales, spindle-shaped body, and pointed head. The lower jaw is thin and hard, with a small hard lump just inside the mouth in front. Dies too quickly to be a good bait minnow.

Chiefly found in deep muddy water in large creeks or rivers. Somewhat rarely found in the swift gravelly streams of central Illinois. Abundant to the southeastward, near the Mississippi and Illinois rivers. Collected once from a tributary of Lake Michigan, at South Chicago.

Hybognathus nubilus (Forbes).

A small fish; in appearance very much like *Notropis heterodon*, the similarity extending to the form of the body, head, and fins, and the black stripe on the side which passes through the eye and around the snout. The edge of the lower jaw is hard and sharp and has a perceptible tubercle on its upper side at the tip. Length rarely greater than 2 inches (to base of caudal fin).

We have collections of this species from the Ohio River at Cairo, from the neighborhood of Peoria, and from Galena, Carmi, and Henry.

Pimephales promelas (Rafinesque).—Black-head; Minnow; Fat-head.

A short thick fish with very blunt head. The males in spring very dark in color, and with two rows of large tubercles around the snout. Differs from *P. notatus* in the thicker body and in the incompleteness of the lateral line.

Distributed through the Mississippi, Rock, Illinois, and Kaskaskia basins, usually in the deep holes of small sluggish creeks; also found in the small creeks of Coles county, in the Wabash basin. Taken, in all, from 64 localities.

Pimephales notatus (Rafinesque).—Blunt-nosed Minnow.

Differs from *P. promelas* in having a rather slender body with the lateral line complete; tuberculations and colors not so noticeable as in the preceding.

Very abundant throughout the State, occurring in 333 of our collections. In the eastern Wabash basin so abundant as to be a nuisance to the collector. Not so numerous in the larger streams.

AA.—SHORT-INTESTINED MINNOWS.

Semotilus atromaculatus (Mitchill).—Horned Face; Creek Chub.

A large fat minnow, reaching 10 inches in length. The fine scales on the forward part of the body, the large mouth, and the small barbel on the upper lip near the corner of the mouth, serve usually to distinguish it. It is an active swimmer, feeding on insect larvae, worms, and small fishes. It is provided with a powerful set of pharyngeal teeth. One of our best bait minnows; easily taken in creeks.

Abundant in streams of smaller size throughout the State. Rarely taken in lakes or sloughs connected with the Illinois River. Occurs in 149 of our collections.

Opsopæodus emilia (Hay).

The validity of this species is frequently questioned. It differs from *O. megalops* in the complete lateral line and the black spot on the anterior rays of the dorsal.

Specimens identified as this species occur in collections from the Illinois River at Havana, the Big and Little Fox rivers in White county, and from French Creek at Grayville.

Opsopæodus megalops (Forbes). (158b)

A fish with a very small upturned mouth, a black spot on the posterior rays of the dorsal, and an incomplete lateral line. Delicate lines of black mark the edges of the scales.

Occurs in 67 collections, mainly from the Illinois River and from the streams of southeastern Illinois. Also found at Urbana and near Galena. Never abundant, but found only sparingly, usually in water of moderate depth with muddy bottom.

Abramis crysoleucas (Mitchill).—Golden Shiner; Roach; Bream. (159)

This fish is distinguished from all other minnows by the keel on the belly behind the ventral fins. The body is compressed to a thickness of about one-fifth to one-sixth of the depth. Mouth much upturned; scales large and rounded on their posterior borders; 13 rays in anal.

Found in still water in all parts of the State. Not abundant in collections from the Rock River basin. Occurs in 257 of our collections.

Cliola vigilax (Baird & Girard).—Fat-head.

This minnow approaches *Pimephales* in the fine scales before the dorsal, in the general form of the body, and in not having the first ray adnate to the second of the dorsal, while it differs in having a long intestine and a pale peritoneum. In separating this species from *P. notatus* we have found that we can usually depend upon the paler color and more obtuse head of *Cliola*. The black spot at the base of the caudal is also usually more distinct than in *P. notatus*. As in the latter, there is a black spot on the first rays of the dorsal in this species.

Found in 170 collections, made throughout the State, with the exception of the Lake Michigan region. Not abundant in the Rock River basin.

KEY TO SPECIES OF THE GENUS NOTROPIS FOUND IN ILLINOIS.

- a. Body neither stout nor much compressed; small cylindrical fusiform fishes not more than 2½ inches in length; depth not more than ¼ of length.
 - b. A black stripe around snout, through eye and on side to base of caudal.
 - c. No black on lower jaw; chin white.....N. CAYUGA.
 - cc. Mouth more oblique, lower jaw with some black.
 - d. Mouth very small; lower jaw included.....N. ANOGENUS.
 - dd. Mouth large; lower jaw projecting¹.....N. HETERODON.
 - bb. Sides without black stripe (dusky or silvery); sometimes dusted on sides and head with black specks.
 - e. Fourteen to 17 scales before dorsal.
 - f. Anal rays 7 or 8.
 - g. Dorsal stripe present; no caudal spot.....N. BLENNIUS.
 - gg. No dorsal stripe.
 - h. Dorsal rays 8, anal 8; fins high.²
 - hh. Dorsal rays 7, anal 7.....N. SCYLLA.

¹Care must be taken to avoid confusion of *cayuga*, *anogenus* and *heterodon*, particularly *heterodon*, with *Hybognathus nubila*.

²*N. volucellus*; not certainly known to occur in Illinois.

- ff. Anal rays 9; sides dusted with black specks.....N. GILBERTI.
 ee. Twelve scales before dorsal.
 i. Eye small, $\frac{1}{4}$ length of head.¹
 ii. Eye large, $\frac{2}{3}$ length of head or larger.....N. SHUMARDI.
 aa. Body compressed, at least posteriorly; depth noticeably greater than width; (head sometimes thick).
 j. A black spot at base of caudal.....N. HUDSONIUS.
 jj. No spot at base of caudal.
 k. Scales before dorsal not much finer than elsewhere on the body.
 l. Anal fin of 7 to 9 rays.
 m. Body deep, compressed; length 3 to 6 inches.
 n. Scales uniform in size; body not heavy forward; regularly marked with diagonal lines forming lozenges on sides of scales; black lateral stripe made up of small diagonal bars on posterior half of body; dorsal fin usually with a black spot on posterior rays; no red coloration.....N. WHIPPLII.
 nn. Body heavy before dorsal; nape high; much red coloration in adult males; mouth large; scales somewhat crowded forward.
 o. Length of exposed portion of scales equal to about $\frac{1}{2}$ depth of scales; eye not large.....N. LUTRENSIS.
 oo. Scales very deep, length of exposed portion narrow on forward part of body and rows running out behind dorsal fin; eye large in young, variable in adult.
 N. CORNUTUS.
 mm. Body rather stout; not much compressed; head thick; depth of body $\frac{1}{4}$ to 1-5 of length; silvery fishes without red or yellow coloration of body or fins.
 p. Anal rays 9; eye 5-13 of head; lateral line much decurved.....N. ARIOMMUS.
 pp. Anal rays 7; eye 3-11 of head.....N. JEJUNUS.
 ll. Anal fin of 10 or 11 rays; body elongate, silvery; depth 4-19 to 1-6 of length; eye large; mouth large, oblique.
 q. Depth 2-11 to 1-6 of length.
 r. Lateral line much decurved; mouth and eye moderate.....N. ATHERINOIDES.
 rr. Lateral line nearly straight; mouth and eye large.....N. ARGE.
 qq. Depth 4-19 of length.
 s. Seven rows of scales between lateral line and dorsal fin; eye $\frac{1}{3}$ length of head; mouth small, oblique.....N. DILECTUS.
 ss. Five rows of scales between lateral line and dorsal fin; eye $\frac{1}{4}$ of head; mouth large and very oblique.....N. RUBIFRONS.
 kk. Scales before dorsal very fine, not in regular rows, about 30 on median line; body not much elongate.
 t. Anal rays 10 to 12.....N. UMBRATILIS.
 tt. Anal rays 9.....N. CORNUTUS.

Notropis anogenus Forbes.

Taken from the Fox at McHenry and in South Chicago.

Notropis cayuga Meek. (98b)

Tail forked; mouth not so large as in the next and less oblique. A dark stripe around the snout and through the eye, continued on the sides to the base of the caudal fin as a dusky band which is crossed by numerous darker crescentic or X-shaped marks.

Not abundant, although found in 45 localities, distributed throughout the State. Occurs most frequently in the Illinois River and northward.

Notropis heterodon (Cope).

External appearance so much like that of *N. cayuga* as to lead easily to their confusion. Differs from the latter in the larger more oblique mouth, the lower jaw partaking at its edges of the black of the lateral band.

Not uncommon in the streams to the northward of the Illinois River. Widely distributed, but rare southward.

¹ *N. longirostris*; not certainly known to occur in this State.

Notropis blennioides (Girard).—Straw-colored Minnow. (103)

A very plain minnow, wholly without striking color-marks. Scales faintly edged with dark brown; a brown mid-dorsal stripe, which is broader at the base of the dorsal fin than elsewhere. Muzzle decurved; mouth almost horizontal.

A common species, quite regularly distributed throughout the State. Occurs in 174 collections.

Notropis scylla (Cope). (105)

Very much like the preceding, but with short stout body, blunt head, and rather small mouth.

Rare in Illinois. Specimens in six collections, from central and western Illinois, have been referred to this species.

Notropis gilberti Jordan & Meek.

A slender species, with long head and caudal peduncle. Mouth large, almost horizontal; scales before dorsal, 17.

Specimens in 17 collections have been referred to this species. These collections are from streams in LaSalle county and Macoupin county, and from tributaries of the Mississippi River west of the Illinois basin.

Notropis shumardi (Girard). (106)

A fish with a large eye and a large oblique mouth; the head broad across the top.

Occurs from localities as follows: Wabash basin, Cedar Lake, Sangamon River and tributaries, Rock River at Erie, Illinois River at Havana, and creeks near Canton and Carlinville.

Notropis hudsonius (De Witt Clinton).—Spot-tail.

A large pale minnow, with a black caudal spot.

Most commonly found in the Illinois River and tributary sloughs and lakes; also, less commonly, in various parts of the State near the Mississippi River, and in tributaries of Lake Michigan.

Notropis lutrensis (Baird & Girard).—Red-fin.

This fish is proportionately deeper than any of our other minnows, with the possible exception of *Abramis*, the thickness and depth immediately behind the head increasing with age. Body opalescent and fins red; spring males highly colored; females duller in color than the males.

This species is confined to western and southern Illinois. Its eastern limits seem to be in LaSalle and McLean counties. It is exceedingly abundant in Union county, and is found in sluggish streams as far north as the mouth of Green River. Also found, peculiarly isolated, in Richland Creek, Stephenson county. We have taken it in 117 localities.

Notropis whipplii (Girard).—Lemon-fin; Steel-blue Minnow.

The young of this species are distinguished with difficulty from *N. lutrensis*. The adults are larger and more elongate than the latter, the upper and lower curves of the body being gentle and quite uniform from the tip of the pointed snout to the base of the caudal fin. Coloration less brilliant than in *N. lutrensis*; the sides and back marked off into diamond or lozenge-shaped areas by blue lines parallel to and near the exposed edges of the scales, these markings being more or less distinctive; a black spot usually present on the dorsal fin; fins of the males in spring a transparent lemon-yellow.

Taken in 293 collections, from all parts of the State. Most abundant in the rapid gravelly streams in the area of the later glacial drift. Less common in the lower Illinois basin and westward.

Notropis cornutus (Mitchill).—Horned Dace; Shiner. (113)

This species is the gamiest of the minnows, growing to a length of about 9 inches. Recognized by the great depth of the exposed edges of the scales. Spring males much colored with salmon-pink, and the head covered with tubercles.

Occurs in collections from 153 localities, but is almost wholly absent from collections made between the southern Illinois hill region and the latitude of the mouth of the Illinois River, this area of scarcity corresponding very well with the older glaciated area of southern Illinois. In this region we have obtained but two collections, one from the Little Wabash River, in Clay county, and one from a creek in eastern Wabash county.

Notropis jejunus (Forbes).

A large pale silvery minnow, without conspicuous color markings; in the rounded form of the scales agreeing with *Hybognathus nuchalis*.

Specimens found in 49 of our collections, made principally in the Illinois River and to the northwestward. Found a few times in tributaries of the Wabash and Ohio rivers in southern Illinois, once in Lake Michigan, and once in Logan county.

Notropis atherinoides Rafinesque.

The first fish of the genus to be named. A long thin silvery minnow, with long lower jaw and oblique mouth. Lateral line decurved. Specimens from Lake Michigan with a very black stripe on the side.

This species and the three following are found throughout Illinois, but are not sharply separated in our preliminary determinations, if, indeed, that is possible.

Notropis arge (Cope).

Differs from *N. atherinoides* in the larger eye and almost straight lateral line.

Notropis dilectus (Girard).

Depth greater and mouth smaller than in *N. atherinoides*.

Notropis rubrifrons (Cope).*Notropis umbratilis* (Girard).—Red-fin. (123)

Body short and compressed; very fine scales before the dorsal; anal fin long (rays 11). The males are highly colored; body of variegated bluish, greenish, purple, and opalescent; fins deep red in spring.

Found everywhere, but occurs most commonly in large creeks and small rivers, being most abundant southward. The several varieties of this species which occur in the State have not yet been carefully discriminated in our collections.

Ericymba buccata Cope.

Body cylindrical; in general appearance like the straw-colored minnow (*N. blennioides*). Lower jaw much enlarged, with mucous cavities which appear on the outside as vitreous streaks; eyes directed slightly upward, giving to the fish a peculiar watchful expression.

Abundant in the upper Wabash basin; taken also from the Iroquois basin near Watseka. Its occurrence in the latter place due probably to its crossing the low divide near Hoopston by aid of high water or the changing of water courses through artificial drainage.

Phenacobius mirabilis (Girard).—Sucker-mouth Minnow.

Mouth inferior; upper lip thickened outwardly and sucker-like; form of body similar to that of the common red-horse. This species and *P. scopifer* (Cope) are not readily distinguishable in our collections. The first is described with 48 to 52 scales in the lateral line, the second with 43 to 45, this being the usual basis of separation. Our specimens are intermediate, having from 43 to 50 scales. We have therefore called them collectively *P. mirabilis*.

Taken in 140 localities, in moderately swift water, throughout the State.

Rhinichthys atronasmus (Mitchill).—Black-nosed Dace.

In general appearance very much like the Stone roller (*Campostoma anomalum*), but with a barbel at each corner of the mouth; the males differing in having a stripe on the side which varies with seasons from crimson to pale salmon-color.

Found in rapid streams, widely distributed throughout the State, but nowhere common. Not yet taken from tributaries of the Wabash or of Lake Michigan.

KEY TO ILLINOIS SPECIES OF THE GENUS HYBOPSIS.

- a. Small slender species with mouth inferior; usually silvery.
 - b. Barbels 4..... H. TETRANEMUS.
 - bb. Barbels 2.
 - c. Eye small, its length less than $\frac{1}{3}$ that of head.

- d. Length of eye about $\frac{1}{4}$ of head; length of barbel about $\frac{1}{3}$ of head; scales every where dusted with black specks over silvery color.....H. HYOSTOMUS.
- dd. Length of eye about 1.6 of head; length of barbel about 3.5 of eye; fine black specks on posterior border of scales of back; lower lobe of caudal dark, with white border.¹
- cc. Eye large, its length about $\frac{1}{3}$ or more of head; sides blotched; dusky or silvery.
- e. Mottled with black or brown.
- f. Scales 16 to 18 before dorsal.....H. DISSIMILIS.
- ff. Scales 20 to 24 before dorsal.....H. WATAUGA.
- ee. Not mottled; silvery, dusted with dark specks, or scales edged with dusky.
- g. Head large, length $\frac{1}{4}$ that of body, flattened above; muzzle bluntly decurved; eye, $\frac{1}{3}$ length of head.....H. AMBLOPS.
- gg. Head short, length less than $\frac{1}{4}$ of body; cheeks nearly vertical; a fleshy pad on end of snout.....H. STORERIANUS.
- aa. Large species, with rather heavy body; mouth large, almost terminal; not silvery, H. KENTUCKIENSIS.

Hybopsis tetranemus Gilbert.

The only native minnow with four barbels. A small, slender, silvery fish, with large fins. Length 2 inches.

Hybopsis hyostomus (Gilbert).

Snout long and acute, projecting half its length beyond the mouth. A silvery minnow. Specimens referred to *H. hyostomus* have been taken from the Illinois River at Havana and Naples, and from the middle fork of the Big Vermilion River on the Champaign-Ford county line.

Hybopsis dissimilis (Kirtland).—Spotted Shiner.

In form much like the sucker-mouth minnow (*Phenacobius*); length 3 to 4 inches. Distinguished readily from *Phenacobius* by the pair of barbels, the form of the lip, and the dark irregular mottling of the back and sides.

Taken from Rock River at Rockford and Dixon, from Tomahawk Creek near La Salle, Spoon River at London Mills, Sangamon River at Decatur, and Embarras River at Charleston.

Hybopsis watauga Jordan & Evermann.

Like *H. dissimilis* in many respects, but with a bluish stripe passing around the snout, the stripe bearing 5 to 12 small black spots.

Hybopsis amblops (Rafinesque).—Silver Chub; Big-eye Chub.

Head large and flattened; eyes directed upward; color silvery.

Not infrequent in the streams of the Wabash and Ohio basins; taken five times from the middle course of the Illinois River and once from near its mouth; taken also from near the mouth of Rock River, from a pond near Quincy, from the Sangamon River, and five times from the Kaskaskia River.

Hybopsis storerianus (Kirtland).

Second in size among the species of this genus. A silvery chub, in appearance and size somewhat like *Hybognathus nuchalis*. Mouth inferior, overhung by the snout, which has a peculiar fleshy pad on the end; barbels minute; cheeks vertical; eye high and situated midway between front and back of head; body tapering forward from the front of the dorsal; head small.

Nowhere common, though widely distributed in Illinois—from Cairo to East Dubuque and from Danville to Quincy. Not taken from the Little Wabash, Big Muddy, Kaskaskia, or Rock River basins, and found at only two points in the Illinois basin—the Illinois River at Ottawa and Crooked Creek in Hancock county.

Hybopsis kentuckiensis (Rafinesque).—River Chub; Horny-head.

A minnow of large size, growing to a length of 6 to 9 inches. Body fusiform, stout, about evenly curved dorsally and ventrally; mouth wide; color olivaceous, sometimes bluish; fins frequently tinged with yellowish or red. An excellent bait fish for bass because of its hardness.

Confined to northern Illinois, not being found further south than Crab-apple Creek in Moultrie county, Salt Creek in Logan county, and Flower Creek in Hancock county.

¹*H. gelidus*; not certainly known to occur in Illinois.

Coesius plumbeus (Agassiz).

This species may be found in Illinois, but has not yet been taken. Similar to *Semotilus*, but with smaller scales.

Platygobio pallidus Forbes (147b.—Misprinted in Appendix, 8th ed., as *P. gracilis*.)

A small silvery species, reaching a length of 3 inches; barbel prominent. Differs from the young of *P. gracilis*, with which it has been confused, in the shorter and broader head, broader interorbital space, wider mouth, and shorter dorsal, anal, and pectorals.

Found only in the Ohio River near Cairo, from which locality we have 21 specimens, the largest of which are about 3 inches long.

FAMILY ANGUILLIDÆ (THE EELS).

Anguilla chrysypa Rafinesque.—American Eel. (218)

Ascending rivers from the sea, to which it returns to spawn in the deep water. Common in large streams in spring.

FAMILY HIODONTIDÆ (THE MOON-EYES).

Hiodon alosoides (Rafinesque).—Moon-eye.

Known from the next by the strong carination of the belly both before and behind the ventral fins. Dorsal fin with 9 rays.

A fish of the large rivers; no longer common in the waters of Illinois.

Hiodon tergisus (Le Sueur).—Moon-eye; Toothed Herring.

Belly not strongly carinate before the ventrals; dorsal fin with 12 rays.

Occasionally taken from the Illinois and Mississippi rivers; formerly more abundant.

FAMILY DOROSOMIDÆ (THE GIZZARD SHADS).

Dorosoma cepedianum (Le Sueur).—Gizzard Shad; Hickory Shad; Skipjack.

This fish will readily be recognized by the elongation of the posterior rays of the dorsal. Very abundant in large streams everywhere, and occasionally taken from pools in small streams.

FAMILY CLUPEIDÆ (THE HERRINGS).

Pomolobus chrysochloris Rafinesque.—Skipjack; Blue Herring. (171)

Not common, but only occasionally taken from large streams. Has been obtained by us from the Illinois, Ohio, and Mississippi rivers.

Alosa sapidissima (Wilson).—Common Shad. (172)

Introduced into waters tributary to the Gulf of Mexico, and since taken from the Ohio River at Louisville by Dr. Evermann, of the U. S. Fish Commission.

FAMILY SALMONIDÆ (THE SALMON FAMILY).

Coregonus quadrilateralis Richardson.—Round Whitefish.

Lake Michigan.

Coregonus clupeiformis (Mitchill).—Common Whitefish.

Lake Michigan, chiefly in deep water.

Argyrosomus artedi (Le Sueur).—Cisco; Lake Herring. (186)

Descending the canals from Lake Michigan to the Illinois River. One specimen taken at Meredosia and three at Ottawa.

Argyrosomus hoyi Gill—Moon-eye Cisco.

Lake Michigan, in deep water.

Argyrosomus prognathus (H. M. Smith).—Long-jaw Bloater.

Lake Michigan.

Argyrosomus nigripennis Gill.—Blue-fin; Black-fin.

Lake Michigan in deep water.

Argyrosomus tullibee (Richardson).—Tullibee; "Mongrel Whitefish."

Lake Michigan.

Cristivomer namaycush (Walbaum).—Great Lake Trout; Mackinaw Trout.

Lake Michigan.

Salvelinus fontinalis (Mitchill).—Brook Trout; Speckled Trout.

Attempts have frequently been made to introduce this and other trout into the streams of Illinois, but apparently entirely without success. Trout will not thrive where the temperature of the water at any time exceeds 60 degrees.

FAMILY UMBRIDÆ (THE MUD-MINNOWS).

Umbra limi (Kirtland).—Mud-minnow.

This little fish has a form very much like that of the common dogfish (*Amia calva*). It can, however, be at once distinguished from the latter by its small dorsal fin, which has but 14 rays, while the number is 42 to 53 in *Amia*.

Usually taken from grassy ponds or muddy creeks, which it apparently prefers to larger open waters. Taken in 29 localities throughout the State.

FAMILY LUCIIDÆ (THE PIKES).

Lucius vermiculatus (Le Sueur).—The Little Pickerel. (214)

The Little Pickerel seldom exceeds 12 inches in length. It differs from our other species (*L. lucius*) in this respect, and in having the cheeks and opercles fully scaled.

Found in grassy prairie creeks and along weedy margins of larger streams throughout the State.

Lucius lucius (Linnæus).—Common Pike; Pickerel. (216)

A voracious feeder, taking fishes of considerable size; the jaws provided with strong backward-pointing teeth. Differs from the preceding in having the lower portion of the opercle bare.

No longer common, but found in all sections of the State.

Lucius masquinongy (Mitchill).—Muskallunge. (217)

Differs from the preceding two species in having the lower portion of both cheeks and opercles bare.

Taken in Lake Michigan; has been said to occur in the lakes of northern Illinois (Nelson).

FAMILY PÆCILIIDÆ (THE KILLIFISHES).

Fundulus diaphanus menona (Jordan & Copeland).—Top-minnow.

Found in Illinois only in the lakes of the northeastern part and in Rock River.

Fundulus dispar (Agassiz).—Top-minnow. (208)

The body marked with several narrow vertical bars of dark color.

Found throughout the State in the quiet weedy pools of smaller streams, or along the margins of larger streams. Quite rare northward.

Fundulus notatus (Rafinesque).—Top-minnow. (206)

On the side and around the snout a large dark purplish stripe, with sometimes a suggestion of bars.

Common throughout the State in such situations as described for *F. dispar*.

Gambusia affinis (Baird & Girard).—Top-minnow. (211)

A tiny top-minnow, with deep body. The males are very minute and scarce.

Taken from 17 localities in southern Illinois; two specimens from Havana provisionally referred to this species.

Gambusia nobilis (Baird & Girard).—Top-minnow.

Similar to *G. affinis*, but less common in our collections. Possibly identical with the preceding, specimens being overgrown examples of that species.

From Johnson county, and from ponds near the Wabash River opposite Mt. Carmel.

FAMILY AMBLYOPSIDÆ (THE BLIND FISHES).

Chologaster papilliferus Forbes.

The eyes of these fishes are imperfect, and they otherwise show relationships with the blind fishes of the caves, which have not yet been taken in Illinois.

Taken only from a spring under a bluff of the Mississippi River west of Cobden Ill. These fishes have been obtained by only two or three collectors. Mr. E. B. Forbes, the most recent collector, secured about two dozen specimens, which he was able to dip up from among the rocks with a tin cup.

FAMILY GASTEROSTEIDÆ (THE STICKLEBACKS).

Eucalia inconstans (Kirtland).—Brook Stickleback.

A northern form, not common in Illinois; has been taken from a spring-fed slough of Indian Creek near Wedron, in LaSalle county.

FAMILY PERCOPSIDÆ (THE TROUT PERCHES).

Percopsis guttatus Agassiz.—Trout Perch; Sand-roller.

This peculiar fish is no doubt frequently overlooked by inexperienced collectors, who mistake it for a minnow. Its small adipose fin will distinguish it from all other scaly fishes common to Illinois except the whitefishes, from which it differs in the form of the body and in the spiny rays of the dorsal, anal, and ventral fins. The sides are marked with round dusky spots; color otherwise pale.

Found in Lake Michigan, and in the Illinois River, from Ottawa to Meredosia. Not very common.

FAMILY APHREDODERIDÆ (THE PIRATE PERCHES).

Aphredoderus sayanus (Gilliams).—Pirate Perch.

This fish, like the last, is frequently overlooked by collectors because of its superficial resemblance to the sunfishes; called "half-breeds" by a boy who thought them a cross between sunfish and minnows. Head broader than in the sunfishes; dorsal spines but 3 or 4 in number; vent in adults in front of the ventral fins.

Taken in 92 collections, from muddy pools throughout the State.

FAMILY ATHERINIDÆ (THE SILVERSIDES).

Labidesthes sicculus (Cope).—Brook Silverside; Skipjack.

A slender silvery fish, commonly mistaken by unobserving fishermen for a minnow. The small tuft-like spinous dorsal fin with 4 rays; soft dorsal with 11 rays; anal elongate, consisting of a spine and 23 soft rays. The form of the mouth is peculiar, being prolonged into a sort of beak, the lower jaw curved downward.

Abundant near the shores of larger streams and lakes, and frequently taken from the grassy parts of prairie creeks. Generally distributed over the State.

FAMILY ELASSOMIDÆ (THE PIGMY SUNFISHES).

Elassoma zonatum Jordan.—Pigmy Sunfish.

A tiny sunfish-like fish without a lateral line and with only 4 or 5 dorsal spines; on the sides 11 dark vertical bands; beneath the dorsal a black spot, and at the base of the caudal a blackish bar.

From five Illinois localities, all in the southern part of the State, as follows: Drew Pond, White county; Swan Pond, St. Francisville; Little Fox River, Phillipstown; Wabash River, Wabash station; and Running Lake, Union county.

FAMILY CENTRARCHIDÆ (THE SUNFISHES).

KEY TO ILLINOIS GENERA OF CENTRARCHIDÆ.

- a. Dorsal and anal fins nearly equal in size.
 b. Dorsal spines 5 to 8..... POMOXIS,
 bb. Dorsal spines 11 or 12.....CENTRARCHUS.
 aa. Dorsal fin much larger than anal.
 c. Body short and deep; depth usually more than 2-5 of length.
 d. Anal spines 6.....AMBLOPLITES.
 dd. Anal spines 3.
 e. Tongue and pterygoids with teeth; mouth large; depth 2-5 to 1-2 of length.
 CHÆNOBRYTTUS.
 ee. Tongue and pterygoids toothless; depth about 2-5 of length.
 APOMOTIS, EUPOMOTIS, AND LEPOMIS.
 cc. Body elongate; depth 1-3 of length; dorsal fin low, with 19 spines; deep emargination at juncture of soft and spinous dorsals; mouth large... MICROPTERUS.

Pomoxis annularis Rafinesque.—White Crappie; Crappie.

Differing from the next species in the more gradual slope of the profile from the front of the dorsal, the lighter general color, the arrangement of the dark color in definite bands on the side, and the lesser depth of body.

Dorsal and anal fins of about equal size; dorsal spines 6 or 7, more commonly 6.

Very abundant and generally distributed through the State, with the exception of the Rock and Wabash basins, where it is not very common.

Pomoxis sparoides (Lacépède).—Calico Bass; Strawberry Bass; Black Crappie; Crappie.

Colors darker than in *P. annularis*; dorsal and anal larger and much mottled with black; sides irregularly mottled with dark green or black. Profile of head steeper and more abruptly recurved just behind the snout than in the preceding; dorsal spines from 6 to 10 in number, usually 7 or 8.

Widely distributed, but not abundant in rapid streams.

Centrarchus macropterus (Lacépède).—Round Sunfish; Flyer.

A small fish with rows of dark spots on the sides much as in the rock bass (*Ambloplites rupestris*); body very thin; dorsal and ventral outlines strongly and symmetrically curved; dorsal and anal fins about equal in size.

Taken only from southern Illinois. Our collections are from Anxier Creek and north fork of the Saline River in Hamilton county, a branch of the Big Muddy in Franklin county, Cache River in Johnson county, and two localities on Clear Creek in Union county.

Ambloplites rupestris (Rafinesque).—Goggle-eye; Red-eye; Rock Bass.

Well known by the common names given above. Living in deep pools near swift water or in drifts, where it bites quite readily on any ordinary bait, sometimes even taking a fly cast for bass. A young fisherman's fish, and of fair quality as a pan-fish.

Common in the northern part of the State; taken once from the Kaskaskia River at Cowden, and once in Union county. Infrequently taken in large bodies of water.

Chænobryttus gulosus (Cuvier & Valenciennes).—Warmouth Bass; Goggle-eye.

Somewhat like the last in general appearance and habits, but with much deeper color and more of a liking for sluggish water. A fair fish for pond culture, growing to considerable size and making a very good fry.

Common in favorable situations throughout the State; rare in the Wabash basin, Rock River basin, and in the gravelly streams of central Illinois.

KEY TO ILLINOIS SUNFISHES OF THE GENERA APOMOTIS, LEPOMIS, AND EUPOMOTIS.

- a. Body elongate; depth 2-5 of length; scales in lateral line 45 to 55; mouth large; usually a stellate black spot on base of soft dorsal; in life with a coppery margin on opercular flap and pale blue spots on the scales.....APOMOTIS CYANELLUS.
- aa. Body not elongate; depth 4-9 to 5-10 of length.
- b. Lateral line developed on less than half the scale.....APOMOTIS SYMMETRICUS.
- bb. Lateral line well developed, pores on all but a few scales.
- c. Black opercular flap without margin of lighter color.
- d. Anal rays 8 to 10; scales in lateral line 36 to 45, 31 to 40 developed pores; opercular flap frequently large and long, always broad, and striate longitudinally. LEPOMIS MEGALOTIS.
- dd. Anal rays 10 to 12; scales in lateral line 43 to 52, pores developed on 40 to 50 scales; opercular flap not much elongate; a black spot on dorsal fin. LEPOMIS PALLIDUS.
- cc. Opercular flap with a margin of light color or a red spot on posterior edge.
- e. Scales in lateral line usually less than 40.
- f. Anal with 8 to 10 soft rays; sides regularly spotted with red, orange, or dark brown spots.
- g. Opercular flap short, portion on bone of operculum black, membranous portion pale.....LEPOMIS GARMANI.
- gg. Opercular flap an elongate membrane, the center black and the margin very pale pink or silvery white.....LEPOMIS HUMILIS.
- ff. Anal usually with 11 soft rays; sides not regularly spotted as described above. EUPOMOTIS HEROS.
- ee. Scales in lateral line 40 to 47.
- h. Opercular flap with a pale margin.....APOMOTIS ISCHYRUS.
- hh. Opercular flap with red spot on edge; 4 rows of scales on cheeks; also wavy blue streaks.....EUPOMOTIS GIBBOSUS.

Apomotis cyanellus (Rafinesque).—Blue-spotted Sunfish; Green Sunfish. (307)

Of sufficient size to make it a pan-fish of some economic importance; taken readily by unskilled anglers.

Distributed with remarkable impartiality throughout the State in the smaller streams, the largest specimens coming from small sluggish creeks. We have taken it in 220 localities.

Apomotis ischyryus (Jordan & Nelson). (310)

Our collections of this species include the original type, from the Illinois River, and two or three others of very doubtful identity.

Apomotis symmetricus (Forbes). (309)

This species is represented in our collections by specimens from Union county, from Cairo, and from several points on the lower Wabash River; has also been taken in the Illinois River.

Lepomis garmani Forbes.

A very handsome fish, of dark color, with rows of orange-colored spots on the sides; among the most finished in appearance of all sunfishes.

From Pecatonica River at Freeport, a creek near Warsaw, Round Pond at Hamilton, middle course of the Illinois River, creeks near Lincoln, and Big Fox River in White county.

Lepomis megalotis (Rafinesque).—Long-eared Sunfish.

In this fish the opercular flap is quite variable in size, being $\frac{1}{3}$ the length of the head sometimes in large specimens.

Common in clear streams southeastward of the region of Pontiac, which is the locality of farthest northward occurrence. Not yet taken from the Illinois River or from streams west of it.

Lepomis humilis (Girard).—Orange-spotted Sunfish.

This fish may be easily recognized by the silvery white or pale pink margin of the thin flexible opercular flap; the palest of our sunfishes. A considerable degree of sex dimor-

phism is exhibited by this species. The males have orange-colored spots on the sides instead of dark brown, as in the females; measurements of males and females by Mr. W. E. Howard of Ottawa, Ill., have shown also that in the former the profile is steeper, with forehead concave, and that the ventrals are longer, reaching past the vent.

Found very generally distributed in the State, except in the upper Rock River basin, Fox River and tributaries, and the DuPage, Desplaines, and Kankakee basins. Not common in the sluggish portions of creeks.

Lepomis pallidus (Mitchill).—Blue-gill.

The most important of the sunfishes as a food fish. The name blue-gill refers to the blue color usually found on the lower portion of the cheeks. Form of the body orbicular; a black spot usually present on the dorsal posteriorly.

Generally distributed and quite common in the larger streams; apparently not found in the upper portion of the Wabash basin; not very common southward.

Eupomotis heros (Baird & Girard). (318b)

In appearance like the preceding, but with a blood-red margin on the opercular flap in the male.

Taken from two ponds near St. Francisville, and from a pond opposite Mt. Carmel; a specimen also recorded from Onion Creek, at Topeka, Ill.

Eupomotis gibbosus (Linnæus).—Pumpkin-seed; Common Sunfish. (319)

Wavy blue lines on the cheeks and opercles; colors very bright, with much yellow; opercular flap with red on the posterior margin.

Abundant in the Illinois basin; especially so in the lakes of northeastern Illinois. Otherwise widely distributed, but not abundant. Not found in collections from the Wabash or its tributaries.

Micropterus dolomieu Lacépède.—Small-mouth Bass; Green Bass; Red-eye Bass.

The gamiest of Illinois fishes. Often confounded with the large-mouth bass by the inexperienced, although the separation on a basis of the finer scales in this species (17 rows on cheek and 72 to 80 in the lateral line) is quite easy. The young may be readily recognized by the white margin of the caudal fin.

Found in large clear streams. Not taken from the Wabash or Kaskaskia basins. Otherwise generally distributed in favorable situations.

Micropterus salmoides Lacépède.—Large-mouth Bass; Black Bass; Green Bass.

Scales on the cheeks in about 10 rows; 65 to 70 in the lateral line. The young have a very marked black stripe on the sides and around the snout. This stripe breaks up later into spots, which gradually disappear with age, but are usually noticeable until the third year, and sometimes later.

Common throughout the State in the sluggish portions of streams.

FAMILY PERCIDÆ (THE PERCHES).

KEY TO ILLINOIS GENERA OF THE FAMILY PERCIDÆ.

- a. Pseudobranchia well developed; branchiostegals 7; no anal papilla; mouth large, terminal; fishes growing to a weight of 1 lb. or more.
 - b. Canine teeth on jaws and palatines; body cylindrical, elongate; ventrals separated by a space equal to width of base.....STIZOSTEDION.
 - bb. No canine teeth; body oblong, slightly compressed.....PERCA.
- aa. Pseudobranchia small or wanting; branchiostegals 6; anal papilla usually present; small fishes, never exceeding 10 inches in length, usually much smaller.
 - c. Lateral line developed, at least anteriorly.
 - d. Body usually almost cylindrical; nuchal region never much compressed; skull immediately behind eyes, C-shaped in cross section.
 - e. Breadth of cranium between eyes about equal to diameter of orbit; snout pig-like, projecting much beyond mouth.....PERCINA.

- ee. Breadth of interorbital space less than diameter of eye.
- f. Body not extremely elongate and not hyaline.
- g. Mouth more or less oblique, terminal; head rather pointed; belly with enlarged scales or a naked strip.
- h. Premaxillary broadly joined to skin of forehead, free only at sides. HADROPTERUS.
- hh. Premaxillary separated from skin of forehead by a groove, which is sometimes crossed by a narrow frenum..... COTTOGASTER.
- gg. Mouth inferior, horizontal; profile much decurved.
- i. Anal spines 2, well developed; ventral fins close together, an enlarged scale between their bases. DIPLESION.
- ii. Anal spine 1, weak; ventrals separated by a space equal to width of base, BOLEOSOMA.
- ff. Body extremely elongate; hyaline in life.
- j. Body very pale, marked with rows of black spots; very slender, cylindrical; premaxillary protractile..... AMMOCRIPTA.
- jj. Body mottled with dark above and with black spots on sides; terete; head depressed; snout long; premaxillary not protractile..... CRYSTALLARIA.
- dd. Body compressed (or cylindrical); skull just behind eyes \cap -shaped in cross-section; premaxillary never protractile; belly covered with ordinary scales.
- k. Lateral line straight; body rather stout; caudal peduncle not noticeably long and slender; head usually more or less pointed; mouth nearly or quite terminal..... ETHEOSTOMA.
- kk. Lateral line arched, parallel with line of back; caudal peduncle slender; profile much decurved; mouth inferior..... BOLEICHTHYS.
- cc. Lateral line wanting..... MICROPERCA.

Stizostedion vitreum (Mitchill).—Wall-eyed Pike; Jack Salmon.

A well known fish, of large size, with fusiform body; well developed canine teeth on the jaws and palatine bones, as in the next species; a large jet-black spot on the posterior two membranes of the spinous dorsal.

Common in the Illinois basin and in the northwestern portion of the State. Taken once from the Kaskaskia River at Vandalia, and in large numbers from the Wabash above Mt. Carmel.

Stizostedion canadense (Smith).—Sauger; Sand Pike.

Spinous dorsal with two or three rows of round black spots, but without a black blotch on the posterior rays; second dorsal with three irregular rows of round dark spots.

We have specimens from the Rock River at Dixon, from lakes about Quincy, and from the Illinois River at Pekin. Reported from other places northward. Less common than the preceding species.

Perca flavescens (Mitchill).—Yellow Perch; Ringed Perch.

A very common lake fish, found also in streams. Much sought by the pot-fisherman; may often be caught on a hook baited with a piece of red flannel; the individuals of a school will usually bite until the last one is taken. The flesh is of fine flavor when fried.

Common in Lake Michigan, and in the small glacial lakes. Also common in the Illinois River at Ottawa, Peoria, Havana, and Meredosia, and in lakes about Quincy.

Percina caprodes (Rafinesque).—Log Perch; Hog Perch; Giant Darter.
(337)

A fish well known to boys and often caught by them on pin-hooks, "along with 'red-eyes' 'stone-toters,' 'horny-heads,' and other 'boys' fish.'" Its large size, cylindrical form, yellowish color, with narrow black bars, and its pig-like snout will serve to distinguish it from other darters.

Occurs infrequently in the south half of the State. Frequently taken northward in gravelly situations.

KEY TO ILLINOIS SPECIES OF THE GENUS HADROPTERUS.

- a. Head pointed; lower jaw projecting; colors never very dark; a row of black spots on sides; a brilliant red or orange band on membranes of spinous dorsal. H. PHONOCEPHALUS.
- aa. Head more obtuse; lower jaw included, but mouth terminal; much dark coloration on sides.
- b. Gill membranes either connected or not connected across the isthmus, the connection, if present, not exceeding in width the diameter of the eye; border of preopercle not serrate.
- c. Dorsal spines 13 to 15..... H. ASPRO.

cc. Dorsal spines 11 or 12.

d. Nape scaled; no red or green markings; sides with 8 or 9 quadrate black spots.

H. OUACHITAE.

dd. Nape naked; coloration brilliant in life, variously yellowish, black, green, bronze, and rust-red; 7 dark bars extending from lower part of side over back and down opposite side..... H. EVIDES.

bb. Gill membranes broadly connected across isthmus; margin of preopercle serrate.

H. SCIERUS.

Hadropterus phoxocephalus (Nelson). (341)

Form slender; head pointed; mouth nearly terminal; sides with quadrate or diamond-shaped dark blotches, smaller than in *H. aspro*, sometimes grading into bands; back also blotched or banded with dark; spinous dorsal with a band of orange-red.

Taken from 77 localities, distributed throughout Illinois; usually found in the rapids of large creeks or rivers; rare in southern Illinois.

Hadropterus aspro (Cope & Jordan).—Black-sided Darter. (340)

Sides marked with large black spots. The gill membranes rather narrowly joined across the isthmus, overlapping or merely joining at the front, all gradations between these conditions occurring. The edges of the preopercle not serrate; premaxillary not protractile; mouth large and terminal.

In rapid streams in all parts of the State.

Hadropterus evides (Jordan & Copeland). (343)

A few specimens from Rock River in Ogle county, 1877.

Hadropterus scierus Swain. (342)

Differing distinctly from *H. aspro* in the serration of the preopercle and in the broader connection of the gill membranes across the isthmus.

One specimen taken from Skillet Fork, in Wayne county. Several others referred to this species are possibly only varieties of *H. aspro*.

Cottogaster uranidea (Jordan & Gilbert).

Not identified in our collections, but reported from the lower Wabash basin, in Indiana, by Dr. Evermann.

Cottogaster copelandi (Jordan). (336)

Occurs throughout central Indiana in clear brooks.

Cottogaster shumardi (Girard). (336)

With much the appearance of the black-sided darters (genus *Hadropterus*), from which it is separated by the protractile premaxillary. Males with a very deep and long anal fin, which reaches beyond the base of the caudal in some instances.

Not common in Illinois. Found in the Wabash River in Wabash county, in the Kaskaskia River at Carlyle and Cowden, twice in the Illinois River, near Meredosia, and five times at Havana.

Dipleision blennioides (Rafinesque).—Green-sided Darter. (332)

A large darter, with much decurved profile, small mouth, and large fins; with prominent green markings. One of the handsomest of our darters.

Confined to the Wabash basin, where it is abundant in the streams of Champaign and Vermillion counties, less abundant in the Embarras River and its tributaries, and present in one collection from the Little Wabash River in Clay county. Occurs in 25 of our collections.

Boleosoma nigrum (Rafinesque).—Johnny Darter. (325-326)

An inconspicuous little fish; the body slender and of pale straw-color, sprinkled with brown dots or W-shaped marks.

The Johnny darter lives in almost all situations, but is most commonly found on sandy bottoms. Abundant throughout the State in all our streams and lakes. Taken in 232 of our collections.

Boleosoma camurum Forbes. (330)

Differs from *B. nigrum* in the more slender body, longer caudal peduncle, and incomplete lateral line.

Found in southern Illinois and in the Illinois River at Peoria and Henry in early collections. More recently it has been taken from Havana, French Creek at Grayville, Salt Creek near Lincoln, and Johnny Run in southwestern Grundy county.

Crystallaria asprella (Jordan). (324)

Form of the head peculiar, much depressed; caudal peduncle very slender; something of the color-markings of the black-sided darters.

Specimens have been obtained from the Wabash River at New Harmony, from the Mississippi River at East Dubuque and Warsaw, and from the Rock River at Cleveland, Milan, and Erie, large numbers having been obtained at the latter place. Generally rare; unusual to take more than one in a place.

Ammocrypta pellucida (Baird).—Sand Darter. (322)

Body translucent in life; on each side a row of black spots. Scales absent from the belly and inconspicuous elsewhere; cheeks, opercles, and temporal regions scaled. These fish will instantly bury themselves in the sand by a swift movement.

Not rare in the Wabash basin, from which we have specimens in 13 of our collections. Found also in the headwaters of the Kaskaskia, in the Sangamon and its tributaries, in Crooked Creek near Ripley, Spoon River near Lewistown, Bear Creek near Marcelline, Otter Creek at Streator, and the Kishwaukee River at New Milford.

KEY TO ILLINOIS SPECIES OF THE GENUS *ETHEOSTOMA*.

- a. Lateral line complete.
- b. Gill membranes joining in a wide angle or curve across the isthmus... *E. ZONALE*.
- bb. Gill membranes scarcely connected; muzzle decurved as in *Boleosoma*.
E. CAMURUM.
- aa. Lateral line more or less incomplete, or, if complete, the gill membranes joining at an acute angle across the isthmus.
- c. Angle between gill membranes acute; membranes joined across in some cases; lower jaw not projecting.
- d. Humeral region without a distinct black scale-like process.
- e. Cheeks and opercles scaled.
- f. Scales about 60; soft dorsal of 10 or 11 rays..... *E. IOWÆ*.
- ff. Scales 47 to 55; soft dorsal with 12 to 14 rays; lateral line almost complete.
E. JESSIE.
- ee. Cheeks naked; opercles scaled..... *E. CERULEUM*.
- dd. Humeral region with a distinct black process or scale.
- g. Scales in about 50 diagonal rows; lateral line developed on less than 30 scales.
- h. Cheeks naked; opercles scaly..... *E. TIPPECANOE*.
- hh. Cheeks and opercles naked..... *E. OBEYENSE*.
- gg. Scales in about 60 diagonal rows; lateral line almost complete.... *E. SQUAMICEPS*.
- cc. Gill membranes joining broadly across the isthmus in a gentle curve (no angle). body slender; head pointed; lower jaw projecting; first dorsal in males with fleshy knobs on ends of spines in breeding season..... *E. FLABELLARE*;

Etheostoma zonale (Cope).

Readily distinguished from other darters of this genus by the broad connection of the branchiostegal membranes across the isthmus. Body in spring with bands of greenish, which become bluish in later summer.

By far the greater number of our collections of this species come from streams north of the upper course of the Illinois River, including the Rock River basin. In addition we have one collection from the Little Fox River in White county, a few from streams in Woodford county, and some from the Vermilion River and tributaries in Livingston and LaSalle counties.

Etheostoma camurum (Cope).—Blue-breasted Darter.

Highly colored, "perhaps the prettiest of fresh-water fishes."

Early collections of this species appear from Peoria, from Union county, and from the Saline and lower Wabash basins. A darter which belonged apparently to this species, taken more recently by Mr. J. P. Bauer, of the U. S. Fish Commission, from a pond near Naples, Ill., was brought into the laboratory at Meredosia and inadvertently lost before the preliminary identification could be verified.

Etheostoma iowæ Jordan & Meek. †

† The males of this species are strikingly marked on the sides and on the spinous dorsal with dark brown and rust-red. The females are plainer, with olive bands, and bear some resemblance to the females of the rainbow darter.

From Pistakee Lake; Green River at Geneseo; Pecumsaugum Creek in LaSalle county; Salt Creek, Lincoln; Little Fox River, White county; and E. Dutchman's Creek, Vienna. Quite abundant in Pecumsaugum Creek.

Etheostoma jessie (Jordan & Brayton).

A quite common darter, of brown color, with a curved band of orange-red on the spinous dorsal.

The common darter of large sluggish streams; not found north of the Illinois basin and not common in southern Illinois, except in the south portion of the Wabash basin.

Etheostoma caeruleum Storer.—Blue Darter; Rainbow Darter; Soldier-fish.

The males are strikingly marked with red and blue, which colors appear in bands on the sides and on the dorsal fin. The females are plainer, with drab and olive bands. Body quite thick and deep; head large. Common throughout the State.

Etheostoma tippecanoe Jordan & Evermann.

A few specimens have been provisionally referred to this species, but are questionable.

Etheostoma obeyense Kirsch.

Several specimens have been found in Hardin county which correspond to descriptions of this Kentucky species.

Etheostoma squamiceps Jordan.

This fish is much like the next in general appearance, with head of similar form and of brownish color. The body is much heavier than is common among darters.

Taken in five localities in Hardin county, and once near Anna, in Union county.

Etheostoma flabellare Rafinesque.

Body long; lower jaw projecting; mouth large. Color decidedly brownish; males with an orange-colored spinous dorsal, the spines of which are tipped with fleshy knobs; fins in both sexes large and barred with black in delicate pattern. Northern specimens have the color on the sides arranged in parallel lines of brown, and are known as variety *lineolatum* (Agassiz).

This species is taken occasionally from creeks and small rivers in all parts of the State.

Boleichthys fusiformis (Girard). (366)

A fine-appearing little fish. Body deep anteriorly; caudal peduncle slender; profile much decurved; lateral line not reaching further back than the second dorsal, placed high, and parallel with the line of the back. Rare, but widely distributed.

Microperca punctulata Putnam.—Least Darter. (368)

A tiny fish, among the smallest of the vertebrates; commonly not more than an inch in length and ordinarily escaping the collector. Known from all other darters by the absence of the lateral line.

Most frequently taken from the lakes and streams of northeastern Illinois. Taken also from Mackinaw Creek in Woodford county, Skillet Fork in Wayne county, and Drury Creek in Union county.

FAMILY SERRANIDÆ (THE SEA BASS).

Roccus chrysops (Rafinesque).—White Bass.

Body deep, appearance much as in the Centrarchidæ. Color silvery, with a variable number of narrow dusky lines on the sides. Anal spines graduated in length. An excellent food fish.

Not uncommon in the Illinois River; found also in the Mississippi and in large streams tributary to it and the Illinois. Not reported from the Wabash basin.

Morone interrupta Gill.—Striped Bass; Yellow Bass; Streaker.

A fish similar to the last, but with more distinct markings on the sides, the dark lines being interrupted below the lateral line and near the front of the anal fin. First anal spine longer than the rest. Distributed like *Roccus chrysops*.

FAMILY SCIÆNIDÆ (THE CROAKERS).

Aplodinotus grunniens Rafinesque.—Grunter; Sheepshead; White Perch.

Ventral line almost straight; back much arched; color silvery; dorsal fin long; the lateral line extending to the end of the caudal fin on the middle ray. An excellent food fish.

Distributed as the two preceding species; also reported from the Saline River.

FAMILY COTTIDÆ (THE SCULPINS).

Cottus ictalops (Rafinesque).—Miller's Thumb; Muffle-jaw; Spring-fish.
(406)

A scaleless fish with loose skin about the head; spinous and soft dorsal fins; a spine and four rays in the ventral fin.

Found occasionally in springs and in the clear water of creeks. Taken most abundantly in southern Illinois in early collections.

Cottus ricei Nelson.

Described in 1876 from two specimens which were taken from deep water of Lake Michigan off Evanston. Four ventral rays.

Uranidea kumlienii Hoy.

From deep waters of Lake Michigan. Three ventral rays.

Uranidea hoyi Putnam. (411)

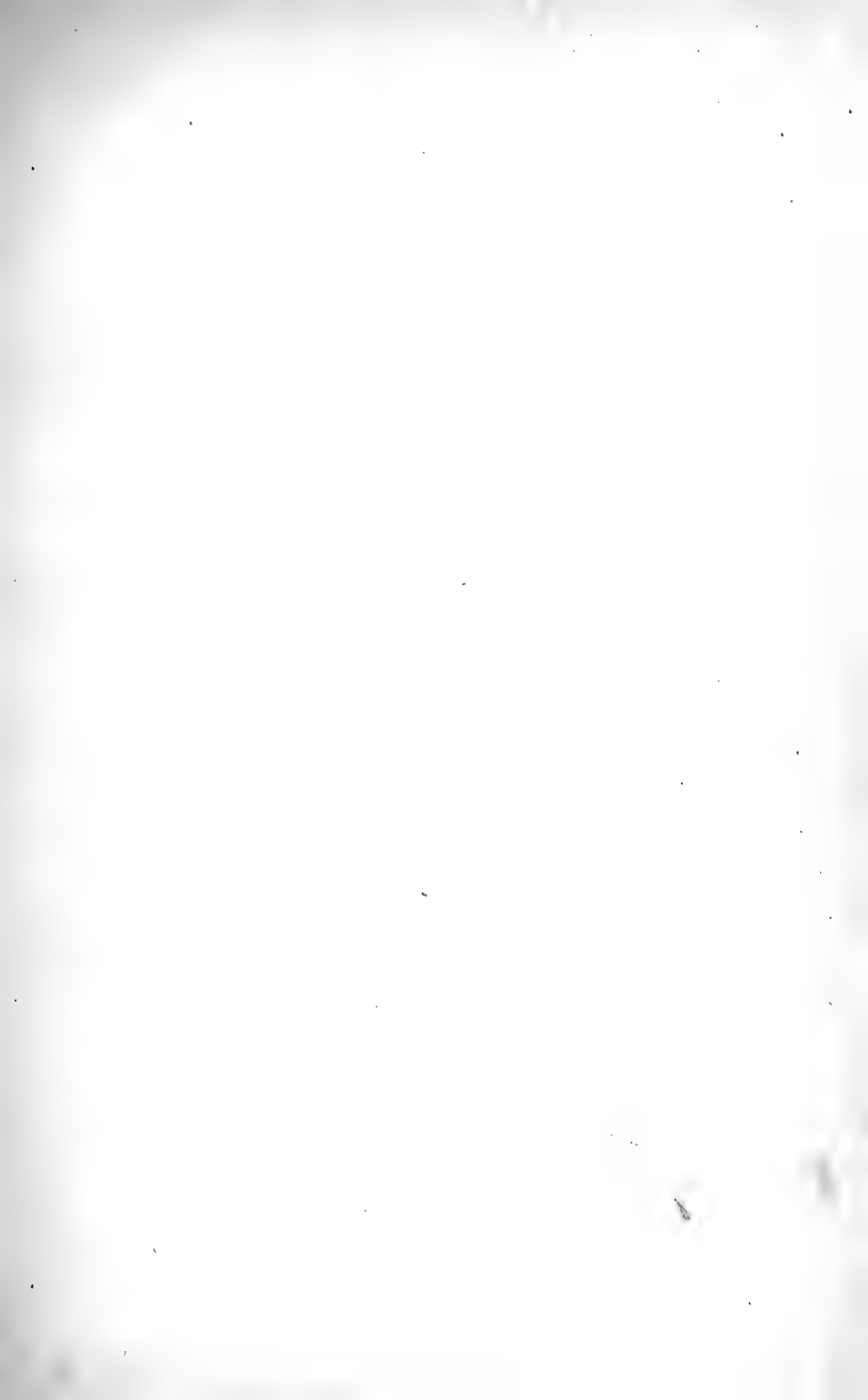
From deep waters of Lake Michigan. Three ventral rays.

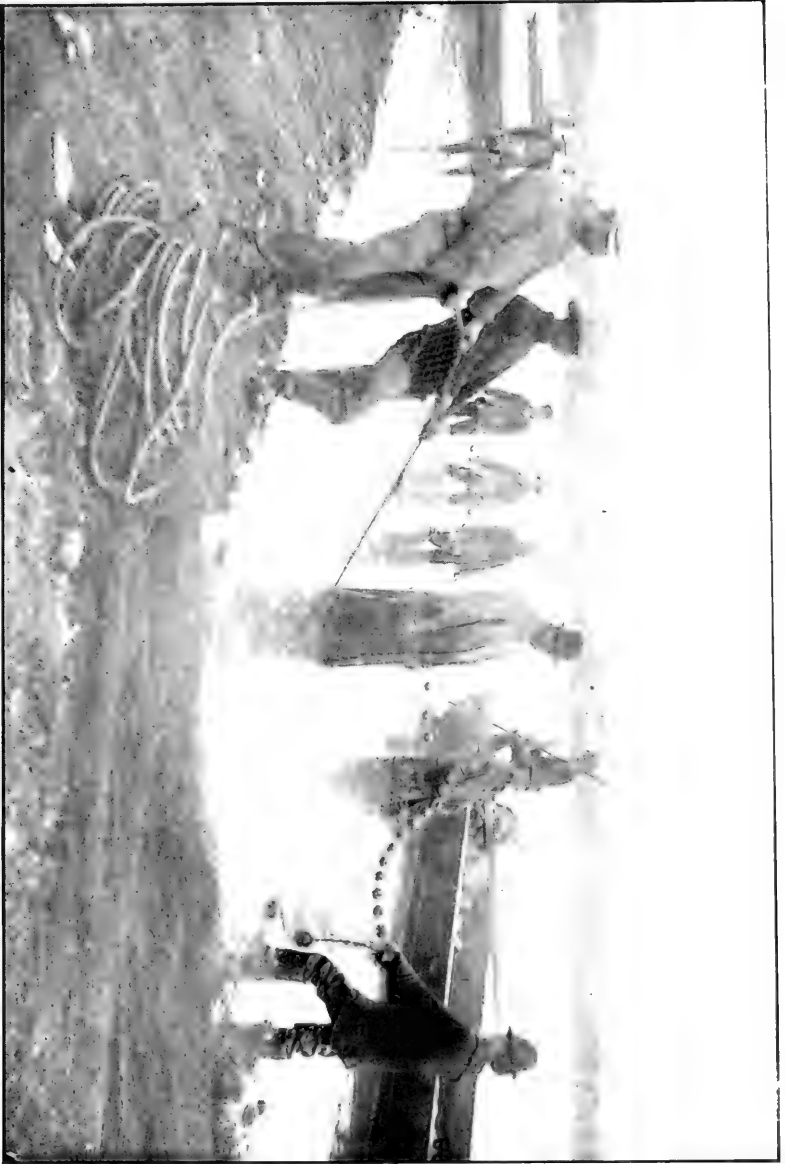
FAMILY GADIDÆ (THE CODS).

Lota maculosa (Le Sueur).—Burbot; Ling; Lake Lawyer.

Readily known by its elongate body, short first and long second dorsal, long anal, and single barbel on chin. The fresh-water representative of the cod family.

Not uncommon in the large lakes of North America. Occasionally found in the streams of the Mississippi valley.





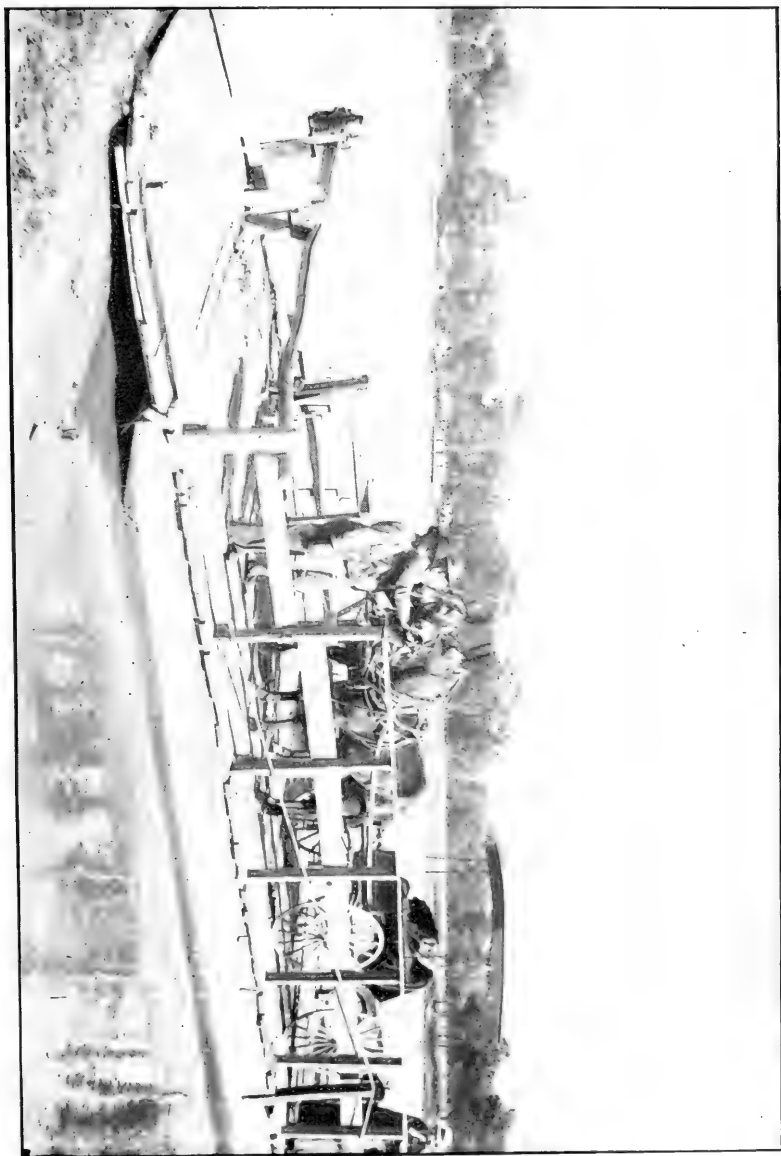
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